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with participation of:

- EPS (Egypt)
- Tropics (Ethiopia)
- YAM (Sudan)

EASTERN NILE POWER TRADE PROGRAM STUDY

AfDB

Analysis of the network expansion plan In the year 2015/2016

VOL 3.1 - EGYPT

FINAL REPORT

15 November 2007

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PHYSICAL UNITS AND CONVERSION FACTORS

bbl	barrel (1t = 7.3 bbl)
cal	calorie (1 cal = 4.1868 J)
Gcal	Giga calorie
GWh	Gigawatt-hour
h	hour
km	kilometer
km^2	square kilometer
kW	kilo Watt
kWh	kilo Watt hour (1 kWh = 3.6 MJ)
MBtu	Million British Thermal Units (= 1 055 MJ = 252 kCal)
	One cubic foot of natural gas produces approximately 1,000 BTU
MJ	Million Joule (= $0,948.10^{-3}$ Mbtu = 238.8 kCal)
MW	Mega Watt
m	meter
m^3/d	cubic meter per day
mm	millimeter
mm^3	million cubic meter
Nm^3	Normal cubic meter, i.e. measured under normal conditions, i.e. 0℃ and 1013 mbar
	(1 Nm^3 = 1.057 m^3 measured under standard conditions, i.e. 15℃ and 1013 mbar)
t	ton
Toe	tons of oil equivalent
Tcf	ton cubic feet
℃	Degrees Celsius

General Conversion Factors for Energy

To:	TJ	Gcal	Mtoe	MBtu	GWh
From:	multiply by:				
TJ	1	238.8	2.388×10^{-5}	947.8	0.2778
Gcal	4.1868×10^{-3}	1	10^{-7}	3.968	1.163×10^{-3}
Mtoe	4.1868×10^{4}	10^{7}	1	3.968×10^{7}	11630
MBtu	1.0551×10^{-3}	0.252	2.52×10^{-8}	1	2.931×10^{-4}
GWh	3.6	860	8.6×10^{-5}	3412	1

ABBREVIATIONS AND ACRONYMS

ADB	African Development Bank
ADF	African Development Fund
CC	Combined Cycle
CCGT	Combined Cycle Gas Turbine
CIDA	Canadian International Development Agency
CT	Combustion Turbine
DANIDA	Danish Development Assistance
DFID	Department for International Development (UK)
DIDC	Department for International Development Cooperation (GoF)
DSA	Daily Subsistence Allowance
EEHC	Egyptian Electricity Holding Company
EEPCO	Ethiopian Electric Power Corporation
EHV	Extra High Voltage
EHVAC	Extra High Voltage Alternating Current
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
EN	Eastern Nile
ENCOM	Eastern Nile Council of Ministers
ENSAP	Eastern Nile Subsidiary Action Program
ENSAPT	Eastern Nile Subsidiary Action Program Team
ENTRO	Eastern Nile Technical Regional Office
ENTRO PCU	Eastern Nile Technical Regional Office Power Coordination Unit
FIRR	Financial Internal Rate of Return
GEP	Generation Expansion Plan
GTZ	German Technical Co-operation
HPP	Hydro Power Plant
HFO	Heavy fuel oil
HV	High Voltage
HVDC	High Voltage Direct Current
ICCON	International Consortium for Cooperation on the Nile
ICS	Interconnected System
IDEN	Integrated Development of the Eastern Nile
IDO	Industrial Diesel Oil
IMF	International Monetary Fund
JICA	Japanese International Co-operation Agency
JMP	Joint Multipurpose Project
LNG	Liquefied Natural Gas
LOLP	Loss of Load Probability

LPG	Liquefied Petroleum Gas
LRFO	Light Residuel Fuel Oil
MENA	Middle East, North Africa Countries
MIWR	Ministry of Irrigation & Water Resources (Sudan)
MWR	Ministry of Water Resources (Ethiopia)
MWRI	Ministry of Water Resources and Irrigation (Egypt)
MSD	Medium Speed Diesel (TPP)
NBI	Nile Basin Initiative
NEC	National Electricity Corporation (Sudan)
NECC	National Electricity Control Centre (Egypt)
NELCOM	Nile Equatorial Lake Council of Ministers
NELSAP	Nile Equatorial Lake Subsidiary Action Program
NG	Natural Gas
NGO	Non Governmental Organization
NORAD	Norwegian Aid Development
NPV	Net Present Value
O&M	Operations and Maintenance
OCGT	Open Cycle Gas Turbine
OPEC	Organization of the Petroleum Exporting Countries
PBP	Pay Back Period
PHRD	Policy & Human Resource Development Fund
PIU	Project Implementation Unit
PRSP	Poverty Reduction Strategy Paper
RCC	Regional Electricity Control Centre (Egypt)
RE	Rural Electrification
SAPP	Southern Africa Power Pool
SIDA	Swedish International Development Agency
SSD	Slow speed diesel (TPP)
STPP	Steam Turbine Power Plant
STS	Senior Technical Specialist
TAF	Technical Assistant Fund
TPP	Thermal Power Plant
UA	Unit of Account
UNDP	United Nations Development Program
WB	World Bank

1. PRESENTATION

The purpose of this analysis was to assess the 2015 proposed Egyptian network.

Preliminary observation

The analysis of the target network for 2015 is based on the EEHC data. It consists mainly of:

- A PSS/E file containing the existing 2006/2007 network elements;
- Excel files containing the list of the network elements for the following years : 2002, 2005, 2010 and 2015, and others files containing forecasted modifications for the corresponding years.

A brief analysis of these files was carried out, and the short-circuit calculation was performed, based on the criteria adopted by EEHC:

- Voltage at each bus bar equal to 110% of the nominal voltage;
- Impedance of the generators equal to the sub-transient reactance.

For the 2006/2007 peak, the short-circuit current exceeded the maximum value (40 kA for the 220 and 500 kV system) in the following 220 kV substations:

- Cairo 220 kV 53 kA
- Bassous 220 kV 44.4 kA
- Sob.Ka 220 kV 43.4 kA

All 500 kV and the other 220 kV nodes were compliant with this constraint.

For the 2015 target network, due to the expansion of the generation and the network reinforcement, the situation had worsen. The short-circuit current values were too high in Cairo, Delta and Canal zones, the maximum value reaching 80 kA in Metro 220 kV.

Such a situation is not satisfying. Before going deeper in the analysis and the study of the Egyptian system, remedial actions must be undertaken. In general, the reduction of the short-circuit power in a 220 kV system including a higher voltage level, 2 ways can be considered:

- To operate the 220 kV in separated areas supplied by 500/220 kV transformation (and to separate the 220 kV busbars if necessary in the 500/220 kV substations)
- To connect the new generating units to the highest voltage level, i.e. the 500 kV

These solutions were used to reduced the short-circuit power for the 2015 target network.

Note: the new interconnection with Sudan and Ethiopia will not adversely affect the short-circuit power on the Egyptian system. In case of AC solution, the length of the line will limit the increase of short-circuit power close to the interconnection substation. Moreover, the interconnection substation (in the south of Egypt) is far from the area with high short-circuit power. In case of DC solution, the short-circuit power will be strictly not affected.

2. HYPOTHESIS

2.1 LOAD DEMAND

The medium scenario has been confirmed, with a load for 2015/2016 reaching 198 960 GWh, and a peak of 31 564 MW.

The value of this peak represents an increase of 12 % compared the 28 130.8 MW value for 2015 peak in the EEHC excel file, target situation for the proposed network, and this led to elements overload.

2.2 GENERATION

The new generation equipments commissioned for the year 2015/2016 are the following ones:

- Two 750 MW combined cycles in Kurimat
- Kurimat solar thermal power plant (150 MW)
- Two 750 MW combined cycles and two 250 MW open cycle gas turbines in Nobaria
- A 750 MW combined cycle in Talkha
- A 750 MW combined cycle and two 250 MW open cycle gas turbines in Cairo North
- A 750 MW combined cycle in ATF
- A 750 MW combined cycle in Sharm el Sheir
- Two 650 MW steam turbines in Abu Kir
- One 650 MW steam turbine in Sidi Krir
- Four 450 MW team turbines in Suez
- A 750 MW combined cycle and one 250 MW open cycle gas turbines in North Delta
- Two 650 MW steam turbines in North Delta
- A 350 MW steam turbine in Ayoun Mousa
- Two 350 MW steam turbines in Tebbin
- Two 350 MW steam turbines in Cairo West
- One 1000 MW nuclear power plant in Dabaa
- A 64 MW dam in Nag Hammadi
- A 40 MW dam in Assiut
- 1415 MW of wind farm in Zafarana and Geib El Zeit
- A 350 MW steam turbine in Damanour

2.3 TRANSMISSION SYSTEM

The 500 kV network has been reinforced, in order not to be on overload with the 2015/2016 load and the new generation. The scheme proposed to reduced the short-circuit current in 2015 was the separation of some 220 kV circuits between some 500/220 kV substations in Cairo and Delta zones.

2.3.1 TRANSMISSION LINES

To face the updated load demand, the generation supply and the topology modification to reduce the short-circuit power, the following 500 kV circuits have been added to the reinforcement described in Module 3, to alleviate the overload in normal situation:

- A second circuit between North Delta and Abu Zaabal
- A second circuit between Nobaria and Cairo 500
- A new circuit between Suez 500 and Heliopolis
- A new circuit between Sidi-Krir and a new 500 kV substation in Abu Kir
- A new circuit between Abu-Kir and Nobaria

2.3.2 TRANSFORMERS

The 500/220 kV transformation has been reinforced in the following substations:

- a fourth and a fifth 500 MVA 500/220 kV transformer in Cairo 500
- a third and a fourth 500 MVA 500/220 kV transformer in Abu Zaabal
- a second, a third and a fourth 500 MVA 500/220 kV transformer in Heliopolis
- a second 500 MVA 500/220 kV transformer in Bassous
- a second 500 MVA 500/220 kV transformer in Tebbin
- a second 500 MVA 500/220 kV transformer in High Dam
- a second 500 MVA 500/220 kV transformer in Kurimat
- two 500 MVA 500/220 kV transformers in Abu Kir

2.3.3 INTERNATIONAL INTERCONNECTIONS

The interconnection between Egypt and Libya has been reinforced by a 500 kV circuit (according to Module 3) and the exportation from Egypt to Libya reached 200 MW.

The flow on the interconnection between Egypt and Jordan was fixed at 200 MW from Egypt to Jordan.

3. ANALYSIS OF THE TRANSMISSION SYSTEM, YEAR 2015/2016

Recall: the simulations were performed at the annual peak 2015/2016, which reaches 31 564 MW. Moreover, Egypt exported 200 MW to Jordan and 200 MW to Libya.

The detailed results of the simulations are presented in Appendix M6 V3-1 attached at the report.

3.1 UNIT COMMITMENT

The detailed unit commitment is displayed in Appendix M6 Vol3.1, in the chapter 1.4.

The new generation is displayed in chapter 2.2 .

The total generation reached 31995 MW.

The load factor of the wind farm is 0.4. Therefore, the total wind generation reached 738 MW.

3.2 ANALYSIS OF THE 500 AND 220 KV NETWORKS

With the proposed reinforcements, the system faced the Normal situation without overload.

3.2.1 NORMAL SITUATION (SEE APPENDIX M6 VOL3.1 §1)

The voltage profile of the Egyptian network is kept within the limit (+/- 5 %) for each voltage level, except in Luxor 132 kV, where the voltage reached 0.93 %. Capacity bank should be installed in Luxor and the neighbouring substations to increase the voltage on the 132 kV, or to shift some load on the 220 kV substation.

All generators operated within their reactive limits. The units around Cairo, at Nobaria and North Delta substations and in the Nile valley (between Aswan and Kurimat) have to be operated with a high level of reactive generation. A better reactive compensation in Cairo and along the Nile valley would improve the voltage profile.

With the proposed reinforcement, the flow over the network elements remained below their thermal rating.

3.2.2 N-1 SITUATIONS (SEE APPENDIX M6 VOL3.1 § 2)

3.2.2.1 Analysis of the 500/220 kV transformation

Several load flow calculations were performed to simulate the tripping of one transformer on the 500 kV backbone between High Dam and Cairo. Several N-1 situations induced constraints on the system:

- the tripping of one of the two 500 MVA transformers in High Dam (one already proposed as additional reinforcement) left the remaining one 32% overloaded. A third transformer would be requested to face the N-1 situation at peak load.
- the tripping of the 750 MVA transformer in Nag Hammadi induced a 33 % overload on the Sohag transformer. Moreover, the voltage on the 220 kV system is out of the limits around Nag Hammadi (Nag Hammadi 220 kV at 0.84 pu). A second transformer would be necessary to face the N-1 situation at peak load.

Due to the heavy reinforcement proposed on the 500/220 kV transformation around Cairo, the N-1 study of the transmission planning is not relevant.

3.2.2.2 Analysis of the 500/132 kV transformation

Several load flow calculations were performed to simulate the tripping of one transformer on the 500 kV backbone between High Dam and Cairo. Several N-1 situations induced constraints on the system :

- The tripping of the 570 MVA transformers in Nag Hammadi left the two 375 MVA remaining transformers 38% overloaded. A third 375 MVA transformer would be requested to face the N-1 situation at peak load.
- The tripping of one of the two 285 MVA transformers in Samalut induced a 35 % overload on the remaining one. A third transformer would be necessary to face the N-1 situation at peak load.

3.2.2.3 Analysis of the 500 kV lines

Several load flow calculations were performed to simulate the tripping of one 500 kV circuit between High Dam and Cairo, where the interconnection is expected to be connected. No overload occurred on the system, in 500, 220 or 132 kV system, and the voltage remained within the N-1 limits (0.9 to 1.05 pu), except in case of tripping of the 500 kV line Samalut - Kurimat. No solution was found by the software. A 500 kV reinforcement is necessary between Samalut and Cairo zone (including Kurimat), for instance a second circuit between Kurimat and Samalut.

As many reinforcements were proposed to face N situation around Cairo (North and East), the N-1 calculation is therefore not relevant on this area.

3.2.2.4 Analysis of the 220 kV lines

Several load flow calculations were performed to simulate the tripping of one or two 220 kV circuit between High Dam and Cairo, where the interconnection is expected to be connected. The N-2 criteria was satisfied, except in the following cases:

- In case of the tripping of both line Nag Hammadi - Qena, the voltage in Qena West and Luxor East dropped to 0.78 pu, 10 % under the minimum voltage limit. A third circuit is requested.
- In case of tripping of both lines Kurimat - B.Suif East, no solution was found by the software. In case of N-1, the remaining line is slightly overloaded (3 %). A third circuit is requested
- In case of tripping of both line Kurimat - Fayoum, the voltage drop in Fayoum reached 10 %, and the three 500/220 kV transformers in Cairo 500 were on slight overload (3 %). In case of N-1, the remaining line was overloaded by 10 %. A double circuit reinforcement is requested.
- The tripping of Sohag- Sohag East: the voltage drop along the line Assiut - Sohag East 220 kV reached 15 %. The voltage a Sohag East was just under the limit

3.3 SHORT-CIRCUIT CALCULATIONS

Three-phase to ground and one-phase to ground short-circuit calculations were performed taking into account the following assumptions:

- V = 1.1 Vn
- Impedance of generator = X"d (sub transient reactance)

The short-circuit power of the Egyptian system is compliant with the 40 kA limitation on the 220 and 500 kV system.

The results are displayed in Appendix M6 Vol3.1 § 3

4. CONCLUSION

The behaviour of the transmission system planned for the year 2015/2016, based on the 2015 planning data, was analysed.

Load Flow calculations were performed in normal, N-1 and in N-2 situations for the peak demand.

To face the N situation, the proposed reinforcements are listed hereafter:

- A second circuit between North Delta and Abu Zaabal
- A second circuit between Nobaria and Cairo 500
- A new circuit between Suez 500 and Heliopolis
- A new circuit between Sidi-Krir and a new 500 kV substation in Abu Kir
- A new circuit between Abu-Kir and Nobaria
- A fourth and a fifth 500 MVA 500/220 kV transformer in Cairo 500
- A third and a fourth 500 MVA 500/220 kV transformer in Abu Zaabal

- A second, a third and a fourth 500 MVA 500/220 kV transformer in Heliopolis
- A second 500 MVA 500/220 kV transformer in Bassous
- A second 500 MVA 500/220 kV transformer in Tebbin
- A second 500 MVA 500/220 kV transformer in High Dam
- A second 500 MVA 500/220 kV transformer in Kurimat
- Two 500 MVA 500/220 kV transformers in Abu Kir

In Normal situation, taking into account the previous reinforcements, the behaviour of the system was satisfactory. The flows over the lines and through the transformers were below the rating of the equipment. The voltage profile was within the limits.

Due to the number of reinforcement proposed around Cairo, the N-1 situations were analysed on the backbone between High Dam and Cairo, where the interconnection is most likely to be connected.

- The 500 kV line N-1 criteria was satisfied on the network except for the line Samalut - Kurimat, an additional circuit would be needed
- The 500/220 kV transformer N-1 criteria was not satisfied in High Dam and Nag Hammadi, and additional 500/220 kV transformer is necessary in both substation
- The 500/132 kV transformer N-1 criteria was not satisfied in Nag Hammadi and Samalut, and additional 500/132 kV transformer is necessary in both substation
- The 220 kV line N-2 criteria was satisfied between Kurimat and High Dam, except for the lines Nag Hammadi - Qena West, Kurimat - B.Suif East, Kurimat - Fayoum, and Sohag - Sohag East, additional circuit would be needed

The proposed reinforcements described above will be included in the Egyptian transmission system for the study of the interconnection between Ethiopia, Sudan and Egypt.

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APPENDIX

15 November 2007

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1 LOAD FLOW RESULTS PEAK 2015/2016 – NORMAL SITUATION

1.1 POWER FLOW ON THE 500 KV, 220 KV AND 132 KV LINES

From bus	To bus	Un (kV)	P (MW)	Q (Mvar)	S (MVA)	P losses (MW)	Q losses (Mvar)	Rating (A)	Loading (%)
A.Z.500	N.DELTA500	500	-964.1	-231.2	991.5	7.7	20.2	2000	56.5
A.Z.500	N.DELTA500	500	-964.1	-231.2	991.5	7.7	20.2	2000	56.5
A.Z.500	SUEZ500	500	-907.5	-194.0	928.0	8.0	-3.9	2049.6	51.6
A.Z.500	HELIO500	500	724.7	-259.4	769.7	2.5	-17.9	2000	43.9
ABKIR500	NOBAR500	500	825.0	49.6	826.5	5.2	-18.7	2020	45.2
ABKIR500	SKRIR500	500	-576.9	1.3	576.9	1.8	-41.0	2020	31.6
AMOUS500	TABA500	500	8.7	-47.8	48.6	0.1	-248.4	2049.6	2.6
AMOUS500	SUEZ500	500	918.2	49.5	919.5	1.4	-1.1	2049.6	49.3
AUST500	N.H.500	500	305.9	-55.6	310.9	1.6	-176.5	1963	18.1
AUST500	SOHAG500	500	389.8	-6.6	389.9	1.4	-89.1	1960	22.7
BASII500	C.W.500	500	-387.1	-214.9	442.8	0.1	-6.7	2020.7	25.2
BASII500	A.Z.500	500	-416.7	-229.2	475.5	0.5	-21.4	2020.7	27.1
CAIRO500	NOBAR500	500	-1341.4	-40.0	1342.0	14.5	125.4	2020.7	76.1
CAIRO500	NOBAR500	500	-1341.4	-40.0	1342.0	14.5	125.4	2020.7	76.1
CAIRO500	C.W.500	500	-43.9	43.7	61.9	0.0	-15.5	2020.7	3.5
CAIRO500	SAML500	500	780.8	-102.2	787.4	10.9	-59.7	2020.7	44.7
CAIRO500	KRIMA500	500	145.8	-353.6	382.4	1.2	-119.3	1963	22.3
DABAA500	SALOUM500	500	201.9	-91.0	221.4	1.1	-291.4	2000	12.2
DABAA500	SKRIR500	500	438.5	-69.7	444.0	1.7	-90.0	2000	24.5
H.D.500	D2H.D.5	500	349.0	58.9	354.0	0.0	0.0	2049.6	19
H.D.500	D1H.D.5	500	349.0	58.9	354.0	0.0	0.0	2049.6	19
HELIO500	TEB.500	500	286.7	-264.8	390.2	1.0	-88.3	2020	21.8
HELIO500	SUEZ500	500	-1427.3	-30.1	1427.6	15.9	143.1	2020	79.7
N.DELTA500	NOBAR500	500	-322.9	137.2	350.9	1.0	-82.0	2000	19.3
N.H.500	SOHAG500	500	-172.1	-75.5	187.9	0.3	-103.3	1960	11.1
N.H.500	D2H.D.5	500	-346.1	-261.6	433.9	2.9	-202.0	2049.6	24.5
N.H.500	D1H.D.5	500	-346.1	-261.6	433.9	2.9	-202.0	2049.6	24.5
NOBAR500	SKRIR500	500	-937.2	-38.5	938.0	8.9	-5.3	2020.7	52
SALOUM500	TOBROK500	500	101.7	-24.9	104.7	0.2	-156.9	2020	5.9
SAML500	AUST500	500	477.0	-88.5	485.2	2.7	-103.5	1963	28.2
SAML500	AUST500	500	477.0	-88.5	485.2	2.7	-103.5	1963	28.2
SAML500	KRIMA500	500	-942.2	-144.2	953.1	12.0	-1.1	1963	55.5
TEB.500	KRIMA500	500	-602.3	-26.6	602.9	1.7	-40.8	2020.7	32.9
S_AQA400	AKABA400	400	100.0	17.8	101.6	0.0	-5.2	2562	5.7
S_AQA400	AKABA400	400	100.0	17.8	101.6	0.0	-5.2	2562	5.7
S_TAB400	S_AQA400	400	200.4	-44.9	205.3	0.3	-80.5	2562	11.5
TABSW400	S_TAB400	400	200.5	-54.6	207.8	0.1	-9.6	2562	11.7

Table 1.1-1 - Power flow on the 500 kV lines

From bus	To bus	Un (kV)	P (MW)	Q (Mvar)	S (MVA)	P losses (MW)	Q losses (Mvar)	Rating (A)	Loading (%)
10_RAM220	OBOOR	220	-165.5	-80.2	183.9	1.4	3.7	750.5	64.3
10_RAM220	OBOOR	220	-165.5	-80.2	183.9	1.4	3.7	750.5	64.3
6_OCTOBR220	N.OCTOBR	220	130.7	23.5	132.7	0.1	-0.5	1200	28.7
6_OCTOBR220	A.RWASH220	220	-279.9	-109.1	300.4	1.5	7.2	1200	65
6_OCTOBR220	A.RWASH220	220	-279.9	-109.1	300.4	1.5	7.2	1200	65
6_OCTOBR220	N.OCTOBR	220	130.7	23.5	132.7	0.1	-0.5	1200	28.7
6_OCTOBR220	ZAID220	220	193.6	90.9	213.8	0.4	0.9	1209.8	45.9
6_OCTOBR220	ZAID220	220	193.6	90.9	213.8	0.4	0.9	1209.8	45.9
A.MOUSA2	TECH.VA	220	78.3	-47.3	91.5	0.6	-14.1	1200	19.8
A.MOUSA2	TECH.VA	220	78.3	-47.3	91.5	0.6	-14.1	1200	19.8
A.MOUSA2	DUMMY	220	0.0	0.0	0.0	0.0	0.0	2000	0
A.MOUSA2	R.SEDR220	220	-103.1	8.7	103.4	0.4	-4.8	1207.2	22.2
A.MOUSA2	R.SEDR220	220	-103.1	8.7	103.4	0.4	-4.8	1207.2	22.2
A.SOLT.220	SUEZ221	220	-189.7	-34.0	192.7	2.2	1.8	669.2	73.8
A.SOLT.220	SUEZ221	220	-189.7	-34.0	192.7	2.2	1.8	669.2	73.8
A.SOLT.220	10R220.N	220	139.3	64.2	153.4	1.4	-2.6	669.2	58.7
A.SOLT.220	10R220.N	220	139.3	64.2	153.4	1.4	-2.6	669.2	58.7
A.TAR220	BALLAT	220	13.5	-10.6	17.2	0.0	-17.2	1200	3.6
A.TAR220	BALLAT	220	13.5	-10.6	17.2	0.0	-17.2	1200	3.6
A.ZAA220	OBOOR	220	147.4	42.6	153.4	0.9	1.1	750.5	51.7
A.ZAA220	OBOOR	220	147.4	42.6	153.4	0.9	1.1	750.5	51.7
A.ZAA220	NAHDA	220	332.0	101.5	347.1	1.1	6.1	1200	73.2
A.ZAA220	NAHDA	220	332.0	101.5	347.1	1.1	6.1	1200	73.2
A.ZAA220	NAHDA	220	332.0	101.5	347.1	1.1	6.1	1200	73.2
ABIS220	SUIF200	220	-110.3	-53.5	122.6	0.1	-0.5	1207.2	25.8
ABIS220	SUIF200	220	-110.3	-53.5	122.6	0.1	-0.5	1207.2	25.8
ABKIR220	MONTAZH	220	315.7	47.7	319.3	0.3	-32.3	997	81
ABKIR220	MONTAZH	220	315.7	47.7	319.3	0.3	-32.3	997	81
ABKIR220	SEMOHA220	220	76.3	23.9	79.9	0.2	-1.6	1200	16.8
ABKIR220	MONTAZH	220	315.7	47.7	319.3	0.3	-32.3	997	81
ABKIR220	MONTAZH	220	315.7	47.7	319.3	0.3	-32.3	997	81
ABKIR220	SUIF200	220	62.7	16.3	64.8	0.1	-3.3	1207.2	13.6
ABKIR220	SUIF200	220	62.7	16.3	64.8	0.1	-3.3	1207.2	13.6
AIN_SIR220	N.METRO	220	20.2	-46.2	50.5	0.0	-56.0	892	14.3
AIN_SIR220	N.METRO	220	20.2	-46.2	50.5	0.0	-56.0	892	14.3
ALEZZ220	N.W.S.G220	220	-238.8	-68.5	248.5	0.8	5.6	1200	52.7
ALEZZ220	N.W.S.G220	220	-238.8	-68.5	248.5	0.8	5.6	1200	52.7
ALEZZ220	MASRCEM	220	118.6	10.3	119.0	0.2	-0.2	1050	28.9
ALEZZ220	MASRCEM	220	118.6	10.3	119.0	0.2	-0.2	1050	28.9
AMIRA220	K.DWAR220	220	-149.6	-48.2	157.2	1.3	2.5	679.7	60
AMIRA220	K.DWAR220	220	-149.6	-48.2	157.2	1.3	2.5	679.7	60
AMIRA220	GHAZL	220	196.0	-15.0	196.6	3.5	1.1	747.9	68.3
AMIRA220	GHAZL	220	196.0	-15.0	196.6	3.5	1.1	747.9	68.3
AMIRA220	F_ZONE220	220	-9.3	14.9	17.6	0.0	-3.9	569.5	8
AMIRA220	F_ZONE220	220	-9.3	14.9	17.6	0.0	-3.9	569.5	8
AMIRA220	SKRIR220	220	-248.6	-79.4	261.0	1.7	6.4	1207.2	56.1

AMIRA220	SKRIR220	220	-248.6	-79.4	261.0	1.7	6.4	1207.2	56.1
AMRIKIA220	ARCO220	220	-90.5	-43.8	100.5	0.0	-0.1	1207.2	22.8
AMRIKIA220	ARCO220	220	-90.5	-43.8	100.5	0.0	-0.1	1207.2	22.8
ARCO220	EZZ-STEL220	220	-125.2	-60.6	139.1	0.0	0.0	1180.9	32.2
ARCO220	EZZ-STEL220	220	-125.2	-60.6	139.1	0.0	0.0	1180.9	32.2
ASW.I220	ESLAHH	220	37.8	-22.5	44.0	0.3	-40.7	1050	10.6
ASW.I220	ESLAHH	220	37.8	-22.5	44.0	0.3	-40.7	1050	10.6
ASW.I220	H.D.220	220	-263.3	-46.2	267.3	1.4	1.9	1200	56.3
ASW.I220	H.D.220	220	-263.3	-46.2	267.3	1.4	1.9	1200	56.3
ASW.I220	W.NAKRA220	220	131.8	11.0	132.3	2.6	-0.8	1209.8	27.6
ASW.I220	W.NAKRA220	220	131.8	11.0	132.3	2.6	-0.8	1209.8	27.6
ATAKA220	SUEZ221	220	140.8	-26.4	143.3	0.3	-0.8	1207.2	29.6
ATAKA220	SUEZ221	220	140.8	-26.4	143.3	0.3	-0.8	1207.2	29.6
ATAKA220	CEM.SU.	220	53.8	-9.5	54.6	0.2	-9.5	900.1	15.1
ATAKA220	CEM.SU.	220	53.8	-9.5	54.6	0.2	-9.5	900.1	15.1
ATAKA220	SZ.STEEL	220	38.6	7.5	39.3	0.0	-11.2	900.1	10.9
ATAKA220	SZ.STEEL	220	38.6	7.5	39.3	0.0	-11.2	900.1	10.9
ATF220	DAM.G220	220	341.2	60.1	346.4	3.1	13.2	1207.2	71.1
ATF220	DAM.G220	220	341.2	60.1	346.4	3.1	13.2	1207.2	71.1
AUST220	N.ASSP	220	-118.1	-64.4	134.5	0.2	-1.4	1209.8	27.9
AUST220	N.ASSP	220	-118.1	-64.4	134.5	0.2	-1.4	1209.8	27.9
AUST220	N.ASSP	220	-118.1	-64.4	134.5	0.2	-1.4	1209.8	27.9
AUST220	N.ASSP	220	-118.1	-64.4	134.5	0.2	-1.4	1209.8	27.9
AUST220	SAFA	220	82.5	-3.9	82.6	0.3	-9.4	1200	17.3
AUST220	SAFA	220	82.5	-3.9	82.6	0.3	-9.4	1200	17.3
B.ARAB220	SKRIR220	220	-110.9	-88.3	141.7	0.5	-1.1	1207.2	30.4
B.ARAB220	SKRIR220	220	-110.9	-88.3	141.7	0.5	-1.1	1207.2	30.4
B.S.EAST	C.SWD	220	63.0	24.5	67.6	0.1	-6.0	1200	14.4
B.S.EAST	C.SWD	220	63.0	24.5	67.6	0.1	-6.0	1200	14.4
B.SIF.W	MAGHAG.W	220	-33.7	-16.3	37.4	0.0	-7.4	1200	7.9
B.SIF.W	MAGHAG.W	220	-33.7	-16.3	37.4	0.0	-7.4	1200	7.9
BAHTEEM	MOSTOROD	220	208.1	244.0	320.7	0.3	1.7	1050	78.3
BAHTEEM	BASOUS	220	-275.2	-228.7	357.8	0.7	4.0	1209.8	75.8
BAHTEEM	BASOUS	220	-275.2	-228.7	357.8	0.7	4.0	1209.8	75.8
BAHTEEM	BASOUS	220	-275.2	-228.7	357.8	0.7	4.0	1209.8	75.8
BAHTEEM	MOSTOROD	220	208.1	244.0	320.7	0.3	1.7	1050	78.3
BASAT	C.EAST	220	-35.0	23.6	42.2	0.1	-2.0	670	16
BASAT	C.EAST	220	-35.0	23.6	42.2	0.1	-2.0	670	16
BASAT	AIN_SIR220	220	-189.1	-134.3	231.9	0.2	-5.8	824	71.5
BASAT	AIN_SIR220	220	-189.1	-134.3	231.9	0.2	-5.8	824	71.5
BASAT	MOKATEM	220	-16.8	81.4	83.1	0.0	-0.8	1050	20.1
BASAT	MOKATEM	220	-16.8	81.4	83.1	0.0	-0.8	1050	20.1
BASHTEE	BASSOUS	220	-284.5	-149.4	321.4	1.7	8.9	1200	69.9
BASHTEE	BASSOUS	220	-284.5	-149.4	321.4	1.7	8.9	1200	69.9
BASHTEE	MOTMDIA220	220	152.1	85.3	174.4	0.1	0.0	1200	37.9
BASHTEE	MOTMDIA220	220	152.1	85.3	174.4	0.1	0.0	1200	37.9
BASOUS	N.C.NO1	220	-182.5	-232.5	295.6	0.3	-52.3	997	75.1
BASOUS	N.C.NO1	220	-182.5	-232.5	295.6	0.3	-52.3	997	75.1
BASOUS	N.C.NO2	220	-131.3	-71.0	149.3	0.1	-47.1	900	42

BASOUS	N.C.NO2	220	-131.3	-71.0	149.3	0.1	-47.1	900	42
BASOUS	N.C.NO1	220	-182.5	-232.5	295.6	0.3	-52.3	997	75.1
BASOUS	HEL_II_220	220	-28.8	58.7	65.4	0.1	-3.6	1207	13.7
BASSOUS	SH2	220	0.0	-23.5	23.5	0.0	-23.5	890	6.7
BASSOUS	SH2	220	0.0	-23.5	23.5	0.0	-23.5	890	6.7
BASSOUS	SH2	220	0.0	-23.5	23.5	0.0	-23.5	890	6.7
BASSOUS	KALYUB	220	115.6	151.3	190.4	0.7	0.7	1209.8	40.1
BASSOUS	KALYUB	220	115.6	151.3	190.4	0.7	0.7	1209.8	40.1
BEAR-ABD	TAFRA.E	220	-33.8	-18.5	38.5	0.1	-13.3	1200	8.1
BEAR-ABD	TAFRA.E	220	-33.8	-18.5	38.5	0.1	-13.3	1200	8.1
BEAR-ABD	BGHDAD	220	32.4	-7.1	33.1	0.1	-19.6	1207.2	6.9
BEAR-ABD	BGHDAD	220	32.4	-7.1	33.1	0.1	-19.6	1207.2	6.9
BGHDAD	MASSED	220	-1.5	-3.8	4.1	0.0	-12.9	1200	0.9
BGHDAD	MASSED	220	-1.5	-3.8	4.1	0.0	-12.9	1200	0.9
BUSTAN220	NOBARIA220	220	-3.6	-122.6	122.6	0.5	-4.0	1207.2	26.4
BUSTAN220	NOBARIA220	220	-3.6	-122.6	122.6	0.5	-4.0	1207.2	26.4
C.EAST	ZAH.MAD	220	-348.3	92.3	360.4	0.5	-44.1	1200	76.4
C.EAST	MOKATEM	220	146.9	-19.5	148.2	0.1	-0.3	1050	35.9
C.EAST	MOKATEM	220	146.9	-19.5	148.2	0.1	-0.3	1050	35.9
C.EAST	STAD220	220	198.1	50.3	204.4	0.2	-45.6	900.1	57.8
C.EAST	STAD220	220	198.1	50.3	204.4	0.2	-45.6	900.1	57.8
C.EAST	ZAH.MAD	220	-348.3	92.3	360.4	0.5	-44.1	1200	76.4
C.EAST	ZAH.MAD	220	-348.3	92.3	360.4	0.5	-44.1	1200	76.4
C.NORTH	SAPTIA220	220	-159.9	-188.3	247.0	0.2	-36.0	748	83.2
C.NORTH	SAPTIA220	220	-159.9	-188.3	247.0	0.2	-36.0	748	83.2
C.NORTH	N.C.NO1	220	60.8	140.3	152.9	0.0	-13.4	997	38.7
C.NORTH	N.C.NO1	220	60.8	140.3	152.9	0.0	-13.4	997	38.7
C.SOUTH1	AIN_SIR220	220	204.7	22.6	206.0	0.2	-28.0	800.4	65.1
C.SOUTH1	AIN_SIR220	220	204.7	22.6	206.0	0.2	-28.0	800.4	65.1
C.SOUTH1	AIN_SIR220	220	204.7	22.6	206.0	0.2	-28.0	800.4	65.1
C.SOUTH1	W.HAUF	220	-295.7	7.4	295.8	0.5	2.2	847.7	88.3
C.SOUTH1	W.HAUF	220	-295.7	7.4	295.8	0.5	2.2	847.7	88.3
CAI.W II	EMBABA	220	161.4	29.8	164.1	0.1	-29.0	997	42
CAI.W II	EMBABA	220	161.4	29.8	164.1	0.1	-29.0	997	42
CAI.W II	EMBABA	220	161.4	29.8	164.1	0.1	-29.0	997	42
CAI_220	CAIRO_W2	220	-165.3	-66.7	178.3	0.7	1.5	669.2	67.2
CAI_220	CAIRO_W2	220	-165.3	-66.7	178.3	0.7	1.5	669.2	67.2
CAI_220	A.RWASH220	220	280.5	103.8	299.1	0.9	-18.3	1209.8	62.3
CAI_220	A.RWASH220	220	280.5	103.8	299.1	0.9	-18.3	1209.8	62.3
CAI_220	A.RWASH220	220	280.5	103.8	299.1	0.9	-18.3	1209.8	62.3
CAI_221	6_OCTOBR220	220	285.0	56.7	290.5	1.8	8.2	1209.8	61.5
CAI_221	6_OCTOBR220	220	285.0	56.7	290.5	1.8	8.2	1209.8	61.5
CAIRO.N	HEL_II_220	220	-13.5	44.8	46.8	0.1	-2.6	840	14.1
CAIRO.N	N.C.NO2	220	-201.1	-197.4	281.8	0.1	-13.0	997	71.6
CAIRO_WS	CAI.W II	220	484.2	89.8	492.5	0.0	0.5	2000	62.8
CEM.SU.	SOKHNA	220	26.0	-13.3	29.2	0.0	-5.1	900.1	8.1
CEM.SU.	SOKHNA	220	26.0	-13.3	29.2	0.0	-5.1	900.1	8.1
DABAA220	MMATR220	220	29.8	-1.5	29.8	0.1	-18.5	1180.9	6.5
DABAA220	MMATR220	220	29.8	-1.5	29.8	0.1	-18.5	1180.9	6.5

DAM.G220	I.BROUD220	220	379.2	58.7	383.7	10.0	44.5	1207.2	80
DAM.G220	I.BROUD220	220	379.2	58.7	383.7	10.0	44.5	1207.2	80
DAM.G220	I.BROUD220	220	379.2	58.7	383.7	10.0	44.5	1207.2	80
DAM.G220	I.BROUD220	220	379.2	58.7	383.7	10.0	44.5	1207.2	80
DAM.G220	DAMANH220	220	-115.8	18.8	117.3	0.0	-0.1	590.5	50
DAM.G220	DAMANH220	220	-119.0	8.0	119.3	0.0	-0.1	590.5	50.8
DELKHL220	SKRIR220	220	-274.0	-96.6	290.6	2.1	9.0	1207.2	62.7
DELKHL220	SKRIR220	220	-274.0	-96.6	290.6	2.1	9.0	1207.2	62.7
DELKHL220	IRON_STE	220	184.6	82.2	202.0	0.0	-7.1	748	70.4
DELKHL220	AMIRA220	220	-112.1	-79.8	137.6	0.1	-0.3	1207.2	29.7
DELKHL220	AMIRA220	220	-112.1	-79.8	137.6	0.1	-0.3	1207.2	29.7
DOMATIA220	DOMT_GEN220	220	-232.7	-64.9	241.5	0.4	1.2	1207.2	51.3
DOMATIA220	DOMT_GEN220	220	-232.7	-64.9	241.5	0.4	1.2	1207.2	51.3
DOMT_GEN220	N.DELTA220	220	-80.7	-36.0	88.4	0.2	-5.8	1200	18.8
DOMT_GEN220	N.DELTA220	220	-80.7	-36.0	88.4	0.2	-5.8	1200	18.8
DOMT_GEN220	SHERBIN	220	99.0	48.7	110.3	0.7	-7.7	1200	23.4
DOMT_GEN220	SHERBIN	220	99.0	48.7	110.3	0.7	-7.7	1200	23.4
ECONMY	N.W.S.G220	220	-40.0	-41.4	57.5	0.0	-0.8	1207.2	12
ECONMY	N.W.S.G220	220	-40.0	-41.4	57.5	0.0	-0.8	1207.2	12
EL-ARISH	MASSED	220	44.8	10.0	45.9	0.0	-1.8	1200	9.7
EL-ARISH	MASSED	220	44.8	10.0	45.9	0.0	-1.8	1200	9.7
EL-ARISH	BEAR-ABD	220	-41.8	-10.3	43.0	0.1	-10.4	1207.2	9
EL-ARISH	BEAR-ABD	220	-41.8	-10.3	43.0	0.1	-10.4	1207.2	9
EMBABA	GIZA220	220	166.9	51.7	174.8	0.1	-29.1	997	44.8
EMBABA	GIZA220	220	166.9	51.7	174.8	0.1	-29.1	997	44.8
F_ZONE220	B.ARAB220	220	-89.2	-18.6	91.1	0.3	-3.7	1207.2	19.7
F_ZONE220	B.ARAB220	220	-89.2	-18.6	91.1	0.3	-3.7	1207.2	19.7
FAY.W220	B.S.EAST	220	-75.2	14.7	76.6	0.6	-17.9	1049.7	18.5
FAY.W220	B.S.EAST	220	-75.2	14.7	76.6	0.6	-17.9	1049.7	18.5
FAY.W220	MAGHAG.W	220	75.2	-14.7	76.6	0.4	-15.3	1049.7	18.5
FAY.W220	MAGHAG.W	220	75.2	-14.7	76.6	0.4	-15.3	1049.7	18.5
FAYOUM	N.OCTOBR	220	-62.2	0.3	62.2	0.2	-8.8	1050	15.4
FAYOUM	N.OCTOBR	220	-62.2	0.3	62.2	0.2	-8.8	1050	15.4
G.TEB220	S.TEBIEN220	220	217.3	77.4	230.7	0.5	1.9	1200	48
G.TEB220	S.TEBIEN220	220	217.3	77.4	230.7	0.5	1.9	1200	48
G.TEB220	S.TEBIEN220	220	217.3	77.4	230.7	0.5	1.9	1200	48
GHARD220	SAFAGA220	220	269.7	15.9	270.2	3.2	12.6	1154.7	60.6
GHARD220	SAFAGA220	220	269.7	15.9	270.2	3.2	12.6	1154.7	60.6
GHARD220	RAS GHARDIB	220	-316.6	-38.6	319.0	4.2	21.4	1200	68.9
GHARD220	RAS GHARDIB	220	-316.6	-38.6	319.0	4.2	21.4	1200	68.9
GHAZL	TAHR2_220	220	154.0	-34.8	157.8	1.4	2.8	669.2	62.3
GHAZL	TAHR2_220	220	154.0	-34.8	157.8	1.4	2.8	669.2	62.3
GIRGA220	N.H.220	220	-27.0	-15.3	31.1	0.0	-10.9	1209.8	6.4
GIRGA220	N.H.220	220	-27.0	-15.3	31.1	0.0	-10.9	1209.8	6.4
GIRGA220	SOHAG.W	220	-21.8	-8.3	23.3	0.0	-6.6	1210	4.8
GIRGA220	SOHAG.W	220	-21.8	-8.3	23.3	0.0	-6.6	1210	4.8
GIZA_SO	MOTMDIA220	220	-130.0	-63.0	144.4	0.1	-43.3	997	37.9
GIZA_SO	MOTMDIA220	220	-130.0	-63.0	144.4	0.1	-43.3	997	37.9
GLEEM	SUIF200	220	-265.3	-86.2	279.0	0.2	-29.7	997	71.1

GLEEM	SUIF200	220	-265.3	-86.2	279.0	0.2	-29.7	997	71.1
GLEEM	SUIF200	220	-265.3	-86.2	279.0	0.2	-29.7	997	71.1
GLEEM	IN.PARK	220	295.6	79.7	306.1	0.3	-29.3	997	78
GLEEM	IN.PARK	220	295.6	79.7	306.1	0.3	-29.3	997	78
H.D.220	TOSHKA	220	98.7	20.3	100.7	2.0	-26.5	1200	21
H.D.220	TOSHKA	220	98.7	20.3	100.7	2.0	-26.5	1200	21
HADABA220	6_OCTOBR220	220	-85.0	-23.2	88.2	0.2	-3.4	1209.8	19
HADABA220	6_OCTOBR220	220	-85.0	-23.0	88.1	0.2	-2.9	1209.8	19
HADABA220	C.SOUTH2	220	-232.0	-73.3	243.3	3.0	11.0	669.2	94.9
HADABA220	C.SOUTH2	220	-232.0	-73.3	243.3	3.0	11.0	669.2	94.9
HADABA220	MOTMDIA220	220	96.4	-10.5	97.0	0.3	-1.8	669.2	37.8
HADABA220	MOTMDIA220	220	96.4	-10.5	97.0	0.3	-1.8	669.2	37.8
HEL_I220	NAHDA	220	-250.6	10.0	250.8	0.6	2.2	1200	53.5
HEL_I220	BASOUS	220	-11.1	-85.7	86.4	0.1	-3.0	1209.8	18.3
HEL_I220	CAIRO.N	220	-16.4	-59.0	61.2	0.1	-2.3	840	18.7
HEL_II_220	NAHDA	220	-181.5	42.4	186.4	0.3	0.2	1200	39.6
I.BROUD220	NOBARIA220	220	-22.7	-401.3	401.9	2.0	12.3	1200	87.7
I.BROUD220	KAFR ZI	220	299.3	90.5	312.7	1.4	9.6	1200	68.2
I.BROUD220	KAFR ZI	220	299.3	90.5	312.7	1.4	9.6	1200	68.2
I.BROUD220	KAFR ZI	220	299.3	90.5	312.7	1.4	9.6	1200	68.2
I.BROUD220	KAFR ZI	220	299.3	90.5	312.7	1.4	9.6	1200	68.2
I.BROUD220	BUSTAN220	220	-3.4	-26.9	27.1	0.0	-10.8	1180.9	6
I.BROUD220	BUSTAN220	220	-3.4	-26.9	27.1	0.0	-10.8	1180.9	6
IN.PARK	KARMOZ220	220	102.4	28.5	106.3	0.0	-21.1	997	27.1
IN.PARK	KARMOZ220	220	102.4	28.5	106.3	0.0	-21.1	997	27.1
IN.PARK	SEMOHA220	220	93.6	32.4	99.0	0.0	-21.1	997	25.3
IN.PARK	SEMOHA220	220	93.6	32.4	99.0	0.0	-21.1	997	25.3
IRON_STE	DELKHL220	220	-183.5	-89.0	204.0	0.0	-7.1	747.9	71.1
IRON_STE	DELKHL220	220	-183.5	-89.0	204.0	0.0	-7.1	747.9	71.1
K.DWAR220	DAMANH220	220	-35.7	-34.9	49.9	0.1	-3.1	669.2	18.9
K.DWAR220	DAMANH220	220	-35.7	-34.9	49.9	0.1	-3.1	669.2	18.9
K.SHIEKH220	SI.SALM	220	-103.6	-45.3	113.1	0.5	-5.2	1200	24.8
K.SHIEKH220	SI.SALM	220	-103.6	-45.3	113.1	0.5	-5.2	1200	24.8
KAFR ZI	SHEIN.K	220	183.3	59.7	192.8	1.2	2.5	1200	42.9
KAFR ZI	SHEIN.K	220	183.3	59.7	192.8	1.2	2.5	1200	42.9
KAFR ZI	TANTA220	220	194.5	30.8	196.9	1.4	3.2	590	89.2
KAFR ZI	TANTA220	220	194.5	30.8	196.9	1.4	3.2	590	89.2
KAFR ZI	TANTA220	220	259.3	57.2	265.5	1.1	5.4	1200	59.1
KANTARA	TECH.VA	220	-77.2	17.8	79.2	0.5	-15.4	1200	16.7
KANTARA	TECH.VA	220	-77.2	17.8	79.2	0.5	-15.4	1200	16.7
KANTARA	BEAR-ABD	220	62.7	-24.8	67.5	0.3	-9.9	1207.2	14.1
KANTARA	BEAR-ABD	220	62.7	-24.8	67.5	0.3	-9.9	1207.2	14.1
KASABIE	SHARKIA220	220	53.3	5.7	53.6	0.5	-11.1	669.2	20.6
KASABIE	SHARKIA220	220	53.3	5.7	53.6	0.5	-11.1	669.2	20.6
KASABIE	DOMT_GEN220	220	-131.2	-31.6	134.9	0.5	-2.7	1207.2	28.8
KASABIE	DOMT_GEN220	220	-131.2	-31.6	134.9	0.5	-2.7	1207.2	28.8
KASABIE	DOMATIA220	220	-78.4	-17.8	80.4	0.2	-4.9	1207.2	17.1
KASABIE	DOMATIA220	220	-78.4	-17.8	80.4	0.2	-4.9	1207.2	17.1
KATAMIA	BASAT	220	-20.1	-47.2	51.3	0.1	-17.9	669.2	19.6

KATAMIA	BASAT	220	-20.1	-47.2	51.3	0.1	-17.9	669.2	19.6
KATAMIA	MASRCEM	220	-84.9	-3.7	85.0	0.4	-9.2	1118	19.5
KATAMIA	MASRCEM	220	-84.9	-3.7	85.0	0.4	-9.2	1118	19.5
KURIM220_1	B.S.EAST	220	257.1	55.3	263.0	1.9	7.1	1207.2	54.6
KURIM220_1	B.S.EAST	220	257.1	55.3	263.0	1.9	7.1	1207.2	54.6
KURIM220_1	FAYOUM	220	271.4	153.3	311.7	2.7	12.9	1207.2	64.7
KURIM220_1	FAYOUM	220	271.4	153.3	311.7	2.7	12.9	1207.2	64.7
KURIM220_1	ZAH.N.C	220	122.3	53.3	133.4	0.9	-5.5	1200	27.9
KURIM220_1	ZAH.N.C	220	122.3	53.3	133.4	0.9	-5.5	1200	27.9
LUX_EAST220	ISNA220	220	46.1	5.9	46.5	0.1	-9.0	1209.8	10.5
LUX_EAST220	ISNA220	220	46.1	5.9	46.5	0.1	-9.0	1209.8	10.5
M.ALAM	W.NAKRA220	220	-13.5	-6.6	15.0	0.0	-29.3	1200	3.2
M.ALAM	W.NAKRA220	220	-13.5	-6.6	15.0	0.0	-29.3	1200	3.2
MAGHAG.W	SAML220	220	-1.5	-29.0	29.0	0.0	-9.6	1207.2	6.1
MAGHAG.W	SAML220	220	-1.5	-29.0	29.0	0.0	-9.6	1207.2	6.1
MAHAL_I220	SAMANOD	220	-40.0	96.2	104.1	0.2	-2.6	1180	23.4
MAHAL_I220	SAMANOD	220	-40.0	96.2	104.1	0.2	-2.6	1180	23.4
MAHAL_I220	SHERBIN	220	-15.5	-28.4	32.3	0.0	-12.1	1200	7.1
MAHAL_I220	SHERBIN	220	-15.5	-28.4	32.3	0.0	-12.1	1200	7.1
MALAWI	MANIA.W	220	-54.7	8.2	55.3	0.1	-8.9	1200	11.6
MALAWI	MANIA.W	220	-54.7	8.2	55.3	0.1	-8.9	1200	11.6
MALAWI	N.ASSP	220	12.2	-28.8	31.2	0.0	-19.5	1209.8	6.5
MALAWI	N.ASSP	220	12.2	-28.8	31.2	0.0	-19.5	1209.8	6.5
MANAYEF220	A.SOLT.220	220	-197.1	-9.7	197.3	2.7	7.6	669.2	76.9
MANAYEF220	A.SOLT.220	220	-197.1	-9.7	197.3	2.7	7.6	669.2	76.9
MANAYEF220	A.SOLT.220	220	-255.1	-27.8	256.6	2.4	10.2	1200	55.8
MANAYEF220	SHARKIA220	220	20.8	15.7	26.1	0.0	-7.9	590.5	11.5
MANAYEF220	SHARKIA220	220	20.8	15.7	26.1	0.0	-7.9	590.5	11.5
MANAYEF220	N.SHARKIA	220	50.3	25.8	56.5	0.1	-7.2	1200	12.3
MANAYEF220	N.SHARKIA	220	50.3	25.8	56.5	0.1	-7.2	1200	12.3
MANAYEF220	SHABAB	220	130.4	-78.8	152.4	1.6	-0.3	1180	33.7
MANAYEF220	SHABAB	220	130.4	-78.8	152.4	1.6	-0.3	1180	33.7
MANAYEF220	N ISMAL	220	7.2	4.8	8.7	0.0	-9.8	670	3.4
MANAYEF220	N ISMAL	220	7.2	4.8	8.7	0.0	-9.8	670	3.4
MANIA.W	SAML220	220	-88.5	0.7	88.5	0.3	-7.5	1200	18.6
MANIA.W	SAML220	220	-88.5	0.7	88.5	0.3	-7.5	1200	18.6
MANSURA220	KASABIE	220	-84.2	-16.9	85.9	0.3	-8.0	1207.2	18.5
MANSURA220	KASABIE	220	-84.2	-16.9	85.9	0.3	-8.0	1207.2	18.5
MANSURA220	MEAT_GHA	220	233.8	50.4	239.2	2.6	9.2	1200	51.8
MANSURA220	MEAT_GHA	220	233.8	50.4	239.2	2.6	9.2	1200	51.8
MAX	SKRIR220	220	-104.8	-50.8	116.4	0.3	-2.1	840	35.7
MAX	SKRIR220	220	-104.8	-50.8	116.4	0.3	-2.1	840	35.7
MEAT_GHA	N.BANHA	220	76.8	-33.5	83.8	0.2	-5.3	1200	18.6
MEAT_GHA	N.BANHA	220	76.8	-33.5	83.8	0.2	-5.3	1200	18.6
MENOUF220	NOBARIA220	220	-263.4	-125.5	291.8	2.8	13.8	1207.2	63.5
MENOUF220	NOBARIA220	220	-263.4	-125.5	291.8	2.8	13.8	1207.2	63.5
MENOUF221	CAI_220	220	-81.1	2.2	81.1	0.7	-5.5	590.5	34.8
MENOUF221	CAI_220	220	-81.1	2.2	81.1	0.7	-5.5	590.5	34.8
MENOUF221	KALYUB	220	81.1	-2.2	81.1	2.2	-5.9	1207.2	17

MENOUF221	KALYUB	220	81.1	-2.2	81.1	2.2	-5.9	1207.2	17
METRO220	N.SAP220	220	39.7	42.1	57.8	0.0	-7.0	750	19.4
MMATR220	SIDI.BA	220	36.8	-17.1	40.6	0.1	-19.3	1200	8.8
MMATR220	SIDI.BA	220	36.8	-17.1	40.6	0.1	-19.3	1200	8.8
MONTAZH	SUIF200	220	372.8	83.5	382.1	0.4	-31.6	997	97
MONTAZH	SUIF200	220	372.8	83.5	382.1	0.4	-31.6	997	97
MONTAZH	SUIF200	220	372.8	83.5	382.1	0.4	-31.6	997	97
MOSTOROD	ZAGZEG220	220	53.3	167.5	175.8	1.4	1.1	1050	43.2
MOSTOROD	ZAGZEG220	220	53.3	167.5	175.8	1.4	1.1	1050	43.2
N ISMAL	PSAID220	220	-75.6	-25.5	79.7	0.8	-6.6	670	31.3
N ISMAL	PSAID220	220	-75.6	-25.5	79.7	0.8	-6.6	670	31.3
N.BANHA	KALYUB	220	-28.2	-79.0	83.9	0.2	-4.9	1200	18.5
N.BANHA	KALYUB	220	-28.2	-79.0	83.9	0.2	-4.9	1200	18.5
N.CAIRO220	N.W.S.G220	220	-48.2	-19.1	51.8	0.2	-21.5	1207.2	10.9
N.CAIRO220	N.W.S.G220	220	-48.2	-19.1	51.8	0.2	-21.5	1207.2	10.9
N.DELTA220	SI.SALM	220	182.7	79.3	199.1	1.3	1.9	1200	41.9
N.DELTA220	SI.SALM	220	182.7	79.3	199.1	1.3	1.9	1200	41.9
N.H.220	A.TAR220	220	36.7	-19.0	41.3	0.6	-37.9	1209.8	8.5
N.H.220	A.TAR220	220	36.7	-19.0	41.3	0.6	-37.9	1209.8	8.5
N.H.220	QENA_W220	220	37.2	100.9	107.5	0.4	-5.5	1209.8	22.2
N.H.220	QENA_W220	220	37.2	100.9	107.5	0.4	-5.5	1209.8	22.2
N.H.220	N.H.PS220	220	-29.9	-18.1	35.0	0.1	-3.4	590.5	14.8
N.H.220	N.H.PS220	220	-29.9	-18.1	35.0	0.1	-3.4	590.5	14.8
N.SAP220	SAPTIA220	220	-99.2	-19.8	101.2	0.0	-2.0	897.5	28.3
N.SAP220	METRO220	220	-39.9	-46.0	60.9	0.0	-10.9	900.1	17
N.SHARKIA	SHARKIA220	220	-65.7	-23.1	69.6	0.1	-3.0	1200	15.3
N.SHARKIA	SHARKIA220	220	-65.7	-23.1	69.6	0.1	-3.0	1200	15.3
NAHDA	OBOOR	220	158.3	109.2	192.4	0.1	0.1	1200	41
NAHDA	OBOOR	220	158.3	109.2	192.4	0.1	0.1	1200	41
NASR.P	SUEZ.T220	220	-48.4	-21.6	52.9	0.0	-1.1	590	22.6
NASR.P	SUEZ.T220	220	-48.4	-21.6	52.9	0.0	-1.1	590	22.6
NASR.P	OLD_SUEZ	220	0.0	-1.8	1.8	0.0	-1.8	590.5	0.8
NASR.P	OLD_SUEZ	220	0.0	-1.8	1.8	0.0	-1.8	590.5	0.8
NEW HEL	SAKR	220	417.3	-29.2	418.3	5.6	33.3	1180	90.1
NEW HEL	SAKR	220	417.3	-29.2	418.3	5.6	33.3	1180	90.1
NEW HEL	SAKR	220	417.3	-29.2	418.3	5.6	33.3	1180	90.1
NEW HEL	SAKR	220	417.3	-29.2	418.3	5.6	33.3	1180	90.1
OMAYED220	B.ARAB220	220	94.8	-21.1	97.1	0.4	-3.9	1207.2	20.8
OMAYED220	B.ARAB220	220	94.8	-21.1	97.1	0.4	-3.9	1207.2	20.8
OMAYED220	DABAA220	220	-127.0	5.5	127.1	1.1	-6.8	1180.9	27.9
OMAYED220	DABAA220	220	-127.0	5.5	127.1	1.1	-6.8	1180.9	27.9
PSAID220	DOMATIA220	220	-27.0	-0.6	27.0	0.0	-10.1	1207.2	5.7
PSAID220	DOMATIA220	220	-27.0	-0.6	27.0	0.0	-10.1	1207.2	5.7
PSAID220	TAFRA.E	220	-132.2	-58.5	144.5	0.9	-4.0	1200	30.9
PSAID220	TAFRA.E	220	-132.2	-58.5	144.5	0.9	-4.0	1200	30.9
QENA220	LUX_EAST220	220	116.2	39.0	122.6	1.6	-0.1	1209.8	26.8
QENA220	LUX_EAST220	220	116.2	39.0	122.6	1.6	-0.1	1209.8	26.8
QENA220	SAFAGA220	220	-229.6	41.8	233.4	8.6	31.4	1207.2	51.2
QENA220	SAFAGA220	220	-229.6	41.8	233.4	8.6	31.4	1207.2	51.2

QENA220	QENA_W220	220	-16.2	-101.9	103.2	0.4	-5.4	1200	22.8
QENA220	QENA_W220	220	-16.2	-101.9	103.2	0.4	-5.4	1200	22.8
QUISIR	W.NAKRA220	220	-20.2	-9.8	22.5	0.1	-29.0	1200	4.9
QUISIR	W.NAKRA220	220	-20.2	-9.8	22.5	0.1	-29.0	1200	4.9
QWESNA220	SHEIN.K	220	-93.8	-16.0	95.1	0.1	-1.6	1200	21.7
QWESNA220	SHEIN.K	220	-93.8	-16.0	95.1	0.1	-1.6	1200	21.7
R.SEDR220	TOUR	220	-120.0	5.4	120.1	1.6	-12.7	1200	26
R.SEDR220	TOUR	220	-120.0	5.4	120.1	1.6	-12.7	1200	26
RAS GHARDIB	ZAFAR220	220	-198.4	-19.2	199.3	1.6	1.5	1200	41.9
RAS GHARDIB	ZAFAR220	220	-198.4	-19.2	199.3	1.6	1.5	1200	41.9
REVA220	SAFA	220	-61.8	-6.1	62.1	0.2	-10.4	1200	13.1
REVA220	SAFA	220	-61.8	-6.1	62.1	0.2	-10.4	1200	13.1
S.TEBIEN220	TEB.220	220	-217.8	118.1	247.7	0.8	2.8	669.2	92.9
S.TEBIEN220	TEB.220	220	-217.8	118.1	247.7	0.8	2.8	669.2	92.9
S.TEBIEN220	TEB.220	220	-217.8	118.1	247.7	0.8	2.8	669.2	92.9
SADAT220	CAI_221	220	-216.3	-115.6	245.2	3.4	13.8	1200	55.6
SADAT220	CAI_221	220	-164.5	-75.0	180.8	3.7	9.2	669.2	73.4
SADAT220	CAI_221	220	-164.5	-75.0	180.8	3.7	9.2	669.2	73.4
SADAT220	EZZ-STEL220	220	199.9	97.6	222.5	0.3	1.0	1180.9	51.2
SADAT220	EZZ-STEL220	220	199.9	97.6	222.5	0.3	1.0	1180.9	51.2
SAKR	N.CAIRO220	220	51.1	24.3	56.6	0.0	-4.7	1209.8	11.9
SAKR	N.CAIRO220	220	51.1	24.3	56.6	0.0	-4.7	1209.8	11.9
SAKR	ZAH.MAD	220	399.1	-155.7	428.3	0.7	-43.3	1200	91
SAKR	ZAH.MAD	220	399.1	-155.7	428.3	0.7	-43.3	1200	91
SAKR	ZAH.MAD	220	399.1	-155.7	428.3	0.7	-43.3	1200	91
SALOUM220	TOBROK220	220	49.6	-13.7	51.5	0.4	-28.6	1207.2	11
SALOUM220	TOBROK220	220	49.6	-13.7	51.5	0.4	-28.6	1207.2	11
SALOUM220	SIDI.BA	220	-4.4	-6.8	8.2	0.0	-20.3	1200	1.8
SALOUM220	SIDI.BA	220	-4.4	-6.8	8.2	0.0	-20.3	1200	1.8
SAMANOD	TANTA220	220	-122.9	58.6	136.2	0.4	-1.2	1180	31.1
SAMANOD	TANTA220	220	-122.9	58.6	136.2	0.4	-1.2	1180	31.1
SAPTIA220	SOB.KA2	220	-296.8	-172.9	343.5	0.5	-55.4	900.1	95.8
SAPTIA220	SOB.KA2	220	-296.8	-172.9	343.5	0.5	-55.4	900.1	95.8
SAPTIA220	SOB.KA2	220	-296.5	-174.3	343.9	0.5	-55.4	900.1	95.9
SAPTIA220	N.SAP220	220	99.2	17.8	100.8	0.0	-2.0	897.5	28.2
SEMOHA220	ABKIR220	220	-89.8	-38.5	97.7	0.3	-22.7	569.5	43.7
SHABAB	ZAGZEG220	220	257.7	-157.0	301.8	30.5	15.5	1180	67
SHARKIA220	TAFRA.E	220	-157.7	-59.8	168.7	2.3	-1.8	1200	36.9
SHARKIA220	TAFRA.E	220	-157.7	-59.8	168.7	2.3	-1.8	1200	36.9
SHARM220	TOUR	220	140.3	-19.1	141.6	2.2	-9.0	1200	30.4
SHARM220	TOUR	220	140.3	-19.1	141.6	2.2	-9.0	1200	30.4
SHARM220	NUWEB220	220	129.0	-11.7	129.5	0.3	-9.6	1207.2	27.6
SHARM220	NUWEB220	220	129.0	-11.7	129.5	0.3	-9.6	1207.2	27.6
SILWA220	ISNA220	220	19.9	27.0	33.5	0.1	-14.9	1049.7	8.6
SILWA220	ISNA220	220	19.9	27.0	33.5	0.1	-14.9	1049.7	8.6
SILWA220	W.NAKRA220	220	-47.1	-40.2	61.9	0.6	-9.6	1209.8	13.8
SILWA220	W.NAKRA220	220	-47.1	-40.2	61.9	0.6	-9.6	1209.8	13.8
SOB.KA2	METRO220	220	205.1	57.0	212.8	0.3	-80.8	900.1	59.1
SOHAG220	SOHAG.E	220	52.3	34.4	62.6	0.1	-5.9	1200	13

SOHAG220	SOHAG.E	220	52.3	34.4	62.6	0.1	-5.9	1200	13
SOHAG220	SOHAG.W	220	55.7	12.0	57.0	0.1	-6.1	1200	11.9
SOHAG220	SOHAG.W	220	55.7	12.0	57.0	0.1	-6.1	1200	11.9
SOKHNA	ZAFAR220	220	0.0	-20.9	20.9	0.0	-9.7	1180.9	4.4
SOKHNA	ZAFAR220	220	0.0	-20.9	20.9	0.0	-9.7	1180.9	4.4
SOMID220	F_ZONE220	220	-22.0	-10.6	24.4	0.0	-1.2	669.2	9.5
SOMID220	F_ZONE220	220	-22.0	-10.6	24.4	0.0	-1.2	669.2	9.5
SUEZ.T220	ATAKA220	220	-121.0	-89.0	150.2	0.3	-0.6	590.5	63.9
SUEZ.T220	ATAKA220	220	-121.0	-89.0	150.2	0.3	-0.6	590.5	63.9
SUEZ.T220	SUEZ220	220	-71.7	-1.4	71.7	0.0	-0.7	1207.2	14.9
SUEZ.T220	SUEZ220	220	-71.7	-1.4	71.7	0.0	-0.7	1207.2	14.9
TABA220	NUWEB220	220	-96.0	6.3	96.2	1.0	-11.3	1207.2	20.5
TABA220	NUWEB220	220	-96.0	6.3	96.2	1.0	-11.3	1207.2	20.5
TAH_1_220	MENOUF220	220	-102.3	-48.6	113.2	1.1	-0.6	590.5	51.8
TAH_1_220	MENOUF220	220	-102.3	-48.6	113.2	1.1	-0.6	590.5	51.8
TAHR2_220	BUSTAN220	220	86.4	-69.6	110.9	0.5	-4.8	669.2	43.7
TAHR2_220	BUSTAN220	220	86.4	-69.6	110.9	0.5	-4.8	669.2	43.7
TALKHA220	MANSURA220	220	318.8	18.1	319.3	1.0	5.2	1207.2	68.4
TALKHA220	MANSURA220	220	318.8	18.1	319.3	1.0	5.2	1207.2	68.4
TALKHA220	K.SHIEKH220	220	49.4	22.3	54.2	0.3	-6.4	669.2	20.9
TALKHA220	K.SHIEKH220	220	49.4	22.3	54.2	0.3	-6.4	669.2	20.9
TALKHA220	MAHAL_I220	220	108.8	147.6	183.4	0.7	0.7	1207.2	39.3
TALKHA220	MAHAL_I220	220	108.8	147.6	183.4	0.7	0.7	1207.2	39.3
TANTA220	QWESNA220	220	2.7	24.2	24.4	0.0	-6.5	1207.2	5.5
TANTA220	QWESNA220	220	2.7	24.2	24.4	0.0	-6.5	1207.2	5.5
TANTA220	TAH_1_220	220	-13.4	-12.4	18.3	0.0	-6.9	1207.2	4.1
TANTA220	TAH_1_220	220	-13.4	-12.4	18.3	0.0	-6.9	1207.2	4.1
TEB.220	ECONMY	220	43.1	-12.5	44.8	0.3	-11.2	669.2	16.9
TEB.220	ECONMY	220	43.1	-12.5	44.8	0.3	-11.2	669.2	16.9
TEMA220	REVA220	220	-47.4	1.7	47.4	0.3	1.0	1209.8	10
TEMA220	REVA220	220	-47.4	1.7	47.4	0.3	1.0	1209.8	10
TEMA220	SOHAG.E	220	-18.3	-33.5	38.2	0.1	-9.5	1209.8	8
TEMA220	SOHAG.E	220	-18.3	-33.5	38.2	0.1	-9.5	1209.8	8
W.HAUF	S.TEBIEN220	220	-202.0	17.4	202.7	2.0	5.8	669.2	76.6
W.HAUF	S.TEBIEN220	220	-202.0	17.4	202.7	2.0	5.8	669.2	76.6
W.HAUF	S.TEBIEN220	220	-279.6	6.0	279.6	1.9	7.9	1200	58.9
W.HAUF	S.TEBIEN220	220	-279.6	6.0	279.6	1.9	7.9	1200	58.9
W.NATRON	ZAID220	220	-71.7	-34.8	79.7	0.1	-3.5	1200	17.5
W.NATRON	ZAID220	220	-71.7	-34.8	79.7	0.1	-3.5	1200	17.5

Table 1.1-2 - Power flow on the 220 kV lines

From bus	To bus	Un (kV)	P (MW)	Q (Mvar)	S (MVA)	P losses (MW)	Q losses (Mvar)	Rating (A)	Loading (%)
ASSIUT132	C.ASS2_132	132	-49.0	-18.4	52.4	0.9	0.4	503	45.5
ASSIUT132	C.ASS1_132	132	-41.4	-14.4	43.8	0.7	-0.1	369.6	51.8
ASSIUT132	C.ASS1_132	132	-41.4	-14.4	43.8	0.7	-0.1	369.6	51.8
ASU132	MALAW1_132	132	22.1	29.8	37.1	1.5	-0.9	369.6	42.6
ASU132	MALAW1_132	132	22.1	29.8	37.1	1.5	-0.9	369.6	42.6

ASWANPS	KIMA132	132	70.0	34.6	78.1	0.4	0.8	581.7	56.8
ASWANPS	KIMA132	132	70.0	34.6	78.1	0.4	0.8	581.7	56.8
ASWANPS	KIMA132	132	77.0	38.1	85.9	0.4	1.0	581.7	62.5
ASWANPS	KIMA132	132	77.0	38.1	85.9	0.4	1.0	581.7	62.5
ASWANPS	FERRO132	132	58.8	11.5	59.9	3.1	4.0	581.7	43.6
ASWANPS	IDFO132	132	70.9	17.1	73.0	3.3	7.2	581.7	53.1
ASWANPS	K.OMB132	132	90.8	32.1	96.3	2.9	8.5	581.7	70.1
ASWANPS	K.OMB132	132	90.8	32.1	96.3	2.9	8.5	581.7	70.1
ASWANPS	H.D.132I	132	-64.2	-14.7	65.9	0.3	0.4	581.7	47.9
ASWANPS	H.D.132I	132	-64.2	-14.7	65.9	0.3	0.4	581.7	47.9
ASWANPS	H.D.132II	132	-40.3	-5.8	40.7	0.1	-0.2	581.7	29.6
ASWANPS	H.D.132II	132	-40.3	-5.8	40.7	0.1	-0.2	581.7	29.6
BNSIF132	FYOM132	132	-67.4	-13.2	68.7	0.8	1.9	669.2	44.4
BNSIF132	FYOM132	132	-67.4	-13.2	68.7	0.8	1.9	669.2	44.4
C.ASS1_132	C.ASS2_132	132	2.5	-16.3	16.4	0.0	-0.1	369.6	19
C.ASS1_132	ASU132	132	-79.2	-23.5	82.6	0.3	0.3	669.2	52.6
C.ASS1_132	ASU132	132	-79.2	-23.5	82.6	0.3	0.3	669.2	52.6
C.ASS2_132	ASU132	132	-65.1	-37.5	75.1	0.1	0.3	503	63.7
C.ASS2_132	ASU132	132	-65.1	-37.5	75.1	0.1	0.3	503	63.7
H.D.132II	SIEL132	132	32.8	15.4	36.2	0.1	-0.4	500	30.5
H.D.132II	SIEL132	132	32.8	15.4	36.2	0.1	-0.4	500	30.5
IDFO132	FERRO132	132	23.5	28.2	36.7	0.0	0.0	581.7	28.9
IDFO132	FERRO132	132	23.5	28.2	36.7	0.0	0.0	581.7	28.9
IDFO132	ISNA132	132	14.2	-31.8	34.8	0.4	-1.0	581.7	27.4
IDFO132	ISNA132	132	14.2	-31.8	34.8	0.4	-1.0	581.7	27.4
ISNA132	QENA132	132	-14.8	6.3	16.1	0.2	-4.5	581.7	12.2
ISNA132	ISNA.P132	132	-36.0	-22.2	42.3	0.0	0.0	581.7	32.2
ISNA132	ISNA.P132	132	-36.0	-22.2	42.3	0.0	0.0	581.7	32.2
ISNA132	LUXOR132	132	44.4	35.5	56.9	1.3	2.1	581.7	43.3
K.OMB132	FERRO132	132	30.3	-1.8	30.4	0.6	-1.9	581.7	23.6
K.OMB132	IDFO132	132	42.0	-1.1	42.0	0.7	-0.2	581.7	32.6
LUXOR132	QENA132	132	-82.7	-22.5	85.7	2.6	7.8	581.7	70.3
MALAW1_132	MINIA132	132	-35.9	3.3	36.1	0.9	-0.4	369.6	44.6
MALAW1_132	MINIA132	132	-35.9	3.3	36.1	0.9	-0.4	369.6	44.6
MGHA132	BNSIF132	132	-0.5	-4.3	4.3	0.0	-2.9	369.6	5
MGHA132	BNSIF132	132	-0.5	-4.3	4.3	0.0	-2.9	369.6	5
MINIA132	SAML132	132	-83.6	-17.4	85.1	4.9	5.6	369.6	98.5
MINIA132	SAML132	132	-83.6	-17.4	85.1	4.9	5.6	369.6	98.5
N.H2_132	SOHAG132	132	26.1	7.7	27.2	1.8	-2.8	369.6	31.3
N.H2_132	SOHAG132	132	26.1	7.7	27.2	1.8	-2.8	369.6	31.3
QENA132	N.H2_132	132	-60.0	-32.9	68.5	1.4	2.8	546.7	56.2
QENA132	N.H2_132	132	-60.0	-32.9	68.5	1.4	2.8	546.7	56.2
SAML132	MGHA132	132	35.7	11.7	37.5	1.1	-1.0	369.6	42.2
SAML132	MGHA132	132	35.7	11.7	37.5	1.1	-1.0	369.6	42.2
SAML132	BHAR132	132	11.5	-4.3	12.3	0.4	-9.7	369.6	13.8
SAML132	BHAR132	132	11.5	-4.3	12.3	0.4	-9.7	369.6	13.8
SOHAG132	ASSIUT132	132	-27.3	-7.3	28.3	1.2	-2.2	369.6	35.4
SOHAG132	ASSIUT132	132	-27.3	-7.3	28.3	1.2	-2.2	369.6	35.4

Table 1.1-3 - Power flow on the 132 kV lines

1.2 FLOWS THROUGH THE 500/220 KV TRANSFORMERS

Node 1	Node 2	Sn (MVA)	P (MW)	Q (Mvar)	S (MVA)	Loading (%)
A.Z.500	TR1_A.Z.1	500	430.21	150.87	455.9	91.2
A.ZAA220	TR1_A.Z.1	500	-430.21	-94.01	440.36	88.1
A.Z.500	TR2_A.Z.1	500	430.21	150.87	455.9	91.2
A.ZAA220	TR2_A.Z.1	500	-430.21	-94.01	440.36	88.1
A.Z.500	TR3_A.Z.1	500	403.2	255.51	477.34	95.5
A.ZAA_220	TR3_A.Z.1	500	-403.2	-195.3	448.01	89.6
A.Z.500	TR4_A.Z.1	500	430.21	150.87	455.9	91.2
A.ZAA220	TR4_A.Z.1	500	-430.21	-94.01	440.36	88.1
ABKIR500	ABKIR220	500	428.02	48.35	430.74	86.1
ABKIR500	ABKIR220	500	428.02	48.35	430.74	86.1
AMOUS500	A.MOUSA2	500	11.14	-47.48	48.77	9.8
AUST500	AUST220	375	126.45	46.09	134.58	35.9
AUST500	AUST220	375	126.45	46.09	134.58	35.9
BASII500	TR_BASI1_1	500	401.87	222.08	459.15	91.8
BASSOUS	TR_BASI1_1	500	-401.87	-168.33	435.71	87.1
BASII500	TR_BASI2_1	500	401.87	222.08	459.15	91.8
BASSOUS	TR_BASI2_1	500	-401.87	-168.33	435.71	87.1
CAIRO500	TR1_CAR1	500	337.16	48.79	340.67	68.1
CAI_220	TR1_CAR1	500	-337.16	-27.19	338.25	67.7
CAIRO500	TR2_CAR1	500	337.16	48.79	340.67	68.1
CAI_220	TR2_CAR1	500	-337.16	-27.19	338.25	67.7
CAIRO500	TR3_CAR1	500	375.29	131.52	397.67	79.5
CAI_221	TR3_CAR1	500	-375.29	-102.08	388.93	77.8
CAIRO500	TR4_CAR1	500	375.29	131.52	397.67	79.5
CAI_221	TR4_CAR1	500	-375.29	-102.08	388.93	77.8
CAIRO500	TR5_CAR1	500	375.29	131.52	397.67	79.5
CAI_221	TR5_CAR1	500	-375.29	-102.08	388.93	77.8
C.W.500	CAIRO_WS	375	284.97	112.23	306.27	81.7
C.W.500	CAIRO_WS	375	284.97	112.23	306.27	81.7
C.W.500	CAIRO_WS	375	284.97	112.23	306.27	81.7
DABAA500	DABAA220	500	179.8	7.71	179.96	36
DABAA500	DABAA220	500	179.8	7.71	179.96	36
H.D.500	H.D.220	500	363.35	93.33	375.15	75
H.D.500	H.D.220	500	363.35	93.33	375.15	75
HELIO500	NEW HEL	500	465.7	13.36	465.89	93.2
HELIO500	NEW HEL	500	465.7	13.36	465.89	93.2
HELIO500	NEW HEL	500	465.7	13.36	465.89	93.2
HELIO500	NEW HEL	500	465.7	13.36	465.89	93.2
KRIMA500	KURIM220_1	500	230.25	67.78	240.02	48
KRIMA500	KURIM220_1	500	230.25	67.78	240.02	48
N.DELTA500	N.DELTA220	500	263.64	135.88	296.6	59.3
N.DELTA500	N.DELTA220	500	263.64	135.88	296.6	59.3
N.H.500	N.H.220	750	472.95	330.8	577.16	77
NOBAR500	NOBARIA220	500	188.37	348.11	395.81	79.2

NOBAR500	NOBARIA220	500	188.37	348.11	395.81	79.2
NOBAR500	NOBARIA220	500	188.37	348.11	395.81	79.2
SALOUM500	SALOUM220	500	99.1	17.83	100.69	20.1
SAML500	SAML220	750	380.61	138.59	405.06	54
SKRIR500	SKRIR220	500	215.97	280.52	354.02	70.8
SOHAG500	SOHAG220	500	215.99	110.36	242.55	48.5
SUEZ500	TR_SUEZ1_1	500	192.4	141.1	238.7	47.7
SUEZ220	TR_SUEZ1_1	500	-192.4	-125.6	228.8	46
TABA500	TR_TAB500_1	750	200.48	72	213.02	28.4
TABSW400	TR_TAB500_1	750	-200.48	-45.58	205.6	27.4
TABA500	TABA220	500	-191.93	23.18	193.32	38.7
TEB.500	TR_TEB500_1	500	443.97	-74.95	450.25	90.1
TEB.220	TR_TEB500_2	500	-443.97	150.15	468.67	93.7
TEB.500	TR_TEB500_2	500	443.97	-74.95	450.25	90.1
TEB.220	TR_TEB500_2	500	-443.97	150.15	468.67	93.7

Table 1.2-1 - Flows through the 500/220 kV transformers

Node 1	Node 2	Sn (MVA)	P (MW)	Q (Mvar)	S (MVA)	Loading (%)
H.D.500	H.D.132I	320	128.94	34.98	133.6	41.7
H.D.500	H.D.132II	320	146.26	48.34	154.05	48.1
N.H.500	N.H2_132	285	173.91	97.21	199.24	69.9
N.H.500	N.H2_132	285	173.91	97.21	199.24	69.9
N.H.500	N.H2_132	570	347.82	194.43	398.47	69.9
SAML500	SAML132	285	188.71	70.08	201.3	70.6
SAML500	SAML132	285	188.71	70.08	201.3	70.6

Table 1.2-2 - Flows through the 500/132 kV transformers

Node 1	Node 2	Sn (MVA)	P (MW)	Q (Mvar)	S (MVA)	Loading (%)
ASW.I220	ASWANPS	150	-43.9	-13.06	45.8	30.5
ASW.I220	ASWANPS	150	-43.9	-13.06	45.8	30.5
ASW.I220	ASWANPS	150	-43.9	-13.06	45.8	30.5
AUST220	ASU132	150	108.4	66.35	127.09	84.7
AUST220	ASU132	150	108.4	66.35	127.09	84.7
AUST220	ASU132	150	108.4	66.35	127.09	84.7
AUST220	ASU132	150	108.4	66.35	127.09	84.7
C.SOUTH1	C.S1_66	125	-44.65	-14.95	47.09	37.7
C.SOUTH1	C.S1_66	125	-44.65	-14.95	47.09	37.7
C.SOUTH1	C.S2_66	125	-92	-22.01	94.6	75.7
FAYOUM	FYOM132	150	136.34	25.6	138.72	92.5
ISNA220	ISNA132	150	31.86	65.35	72.7	48.5
QENA220	QENA132	100	49.79	-17.44	52.76	52.8
QENA220	QENA132	100	49.79	-17.44	52.76	52.8

Table 1.2-3 - Flows through the 220/132 kV transformers

1.3 500 KV, 220 KV AND 132 KV VOLTAGE PROFILE

Bus Name	Vn (kV)	Solution (pu)
A.Z.500	500	1.013
ABKIR500	500	1.044
AMOUS500	500	1.050
AUST500	500	1.011
BASII500	500	1.004
C.W.500	500	1.006
CAIRO500	500	1.007
D1H.D.5	500	1.05
D2H.D.5	500	1.05
DABAA500	500	1.046
H.D.500	500	1.050
HELIO500	500	1.024
KRIMA500	500	1.05
N.DELTA500	500	1.049
N.H.500	500	0.998
NOBAR500	500	1.031
SALOUM500	500	1.019
SAML500	500	1.011
SKRIR500	500	1.046
SOHAG500	500	1.003
SUEZ500	500	1.048
TABA500	500	1.027
TEB.500	500	1.047
TOBROK500	500	1.007
AKABA400	400	1
S_AQA400	400	1
S_TAB400	400	1.002
TABSW400	400	1.001
TOBROK400	400	1

Table 1.3-1 - 500 kV voltage Profile

Bus Name	Vn (kV)	Solution (pu)
10_RAM220	220	1
10R220.N	220	0.987
6_OCTOBR220	220	1.011
A.MOUSA2	220	1.011
A.RWASH220	220	1.029
A.SOLT.220	220	1.024
A.TAR220	220	1.032
A.ZAA_220	220	1.025
A.ZAA220	220	1.037
ABIS220	220	1.031
ABKIR220	220	1.038
AIN_SIR220	220	1.035
ALEZZ220	220	1.03
AMIRA220	220	1.011
AMRIKIA220	220	0.96
ARCO220	220	0.96
ASW.I220	220	1.038
ATAKA220	220	1.050
ATF220	220	1.06
AUST220	220	1.046
B.ARAB220	220	1.013
B.S.EAST	220	1.028
B.SIF.W	220	1.032
BAHTEEM	220	1.024
BALLAT	220	1.032
BASAT	220	1.034
BASHTEE	220	1.006
BASOUS	220	1.035
BASSOUS	220	1.03
BEAR-ABD	220	1.042
BGHDAD	220	1.038
BUSTAN220	220	1.011
C.EAST	220	1.031
C.NORTH	220	1.041
C.SOUTH1	220	1.037
C.SOUTH2	220	1.037
C.SWD	220	1.02
CAI.W II	220	1.029
CAI_220	220	1.041
CAI_221	220	1.025
CAIRO.N	220	1.035
CAIRO_W2	220	1.052
CAIRO_WS	220	1.029
CEM.SU.	220	1.049
DABAA220	220	1.017
DAM.G220	220	1.043
DAMANH220	220	1.043
DELKHL220	220	1.007
DOMATIA220	220	1.024
DOMT_GEN220	220	1.029
DUMMY	220	1.011
ECONMY	220	1.039
EL-ARISH	220	1.037
EMBABA	220	1.026

ESLAHH	220	1.034	N.BANHA	220	0.99
EZZ-STEL220	220	0.96	N.C.NO1	220	1.04
F_ZONE220	220	1.007	N.C.NO2	220	1.037
FAY.W220	220	1.038	N.CAIRO220	220	1.029
FAYOUM	220	1.008	N.DELTA220	220	1.039
G.TEB220	220	1.050	N.H.220	220	1.049
GHARD220	220	1.013	N.H.PS220	220	1.053
GHAZL	220	0.994	N.METRO	220	1.036
GIRGA220	220	1.045	N.OCTOBR	220	1.009
GIZA_SO	220	1.003	N.SAP220	220	1.045
GIZA220	220	1.024	N.SHARKIA	220	0.996
GLEEM	220	1.033	N.W.S.G220	220	1.04
H.D.220	220	1.048	NAHDA	220	1.027
HADABA220	220	1.006	NASR.P	220	1.042
HEL_I220	220	1.025	NEW HEL	220	1.032
HEL_II_220	220	1.028	NOBARIA220	220	1.041
I.BROUD220	220	1.003	NUWEB220	220	1.024
IN.PARK	220	1.031	OBOOR	220	1.024
IRON_STE	220	1.007	OLD_SUEZ	220	1.042
ISNA220	220	0.953	OMAYED220	220	1.013
K.DWAR220	220	1.034	PSAID220	220	1.024
K.SHIEKH220	220	0.996	QENA_W220	220	1.02
KAFR ZI	220	0.982	QENA220	220	0.992
KALYUB	220	1.007	QUISIR	220	1.012
KANTARA	220	1.038	QWESNA220	220	0.961
KARMOZ220	220	1.03	R.SEDR220	220	1.012
KASABIE	220	1.019	RAS GHARDIB	220	1.041
KATAMIA	220	1.024	REVA220	220	1.038
KURIM220_1	220	1.047	S.TEBIEN220	220	1.045
LUX_EAST220	220	0.959	SADAT220	220	0.965
M.ALAM	220	1.016	SAFA	220	1.041
MAGHAG.W	220	1.036	SAFAGA220	220	0.998
MAHAL_I220	220	0.989	SAKR	220	1.03
MALAWI	220	1.043	SALOUM220	220	1.013
MANAYEF220	220	1.006	SAMANOD	220	0.975
MANIA.W	220	1.041	SAML220	220	1.043
MANSURA220	220	1.01	SAPTIA220	220	1.045
MASRCEM	220	1.028	SEMOHA220	220	1.03
MASSED	220	1.036	SH2	220	1.03
MAX	220	1.02	SHABAB	220	1.001
MEAT_GHA	220	0.985	SHARKIA220	220	1
MENOUF220	220	0.999	SHARM220	220	1.019
MENOUF221	220	1.035	SHEIN.K	220	0.963
METRO220	220	1.046	SHERBIN	220	1
MMATR220	220	1.01	SI.SALM	220	1.014
MOKATEM	220	1.031	SIDI.BA	220	1.011
MONTAZH	220	1.036	SILWA220	220	0.976
MOSTOROD	220	1.017	SKRIR220	220	1.03
MOTMDIA220	220	1.004	SOB.KA2	220	1.05
N ISMAL	220	0.999	SOHAG.E	220	1.042
N.ASSP	220	1.051	SOHAG.W	220	1.046

SOHAG220	220	1.051
SOKHNA	220	1.049
SOMID220	220	1.006
STAD220	220	1.029
SUEZ.T220	220	1.044
SUEZ220	220	1.049
SUIF200	220	1.034
SZ.STEEL	220	1.050
TABA220	220	1.021
TAFRA.E	220	1.049
TAH_1_220	220	0.971
TAHR2_220	220	0.995
TALKHA220	220	1.015
TANTA220	220	0.968
TEB.220	220	1.04
TECH.VA	220	1.029
TEMA220	220	1.032
TOBROK220	220	1.005
TOSHKA	220	0.983
TOUR	220	1.016
W.HAUF	220	1.039
W.NAKRA220	220	1.01
W.NATRON	220	0.997
ZAFAR220	220	1.055
ZAGZEG220	220	0.959
ZAH.MAD	220	1.031
ZAH.N.C	220	1.019
ZAID220	220	1.004

Table 1.3-2 - 220 kV voltage Profile

Node name	**Vn (KV)**	**V sol (pu)**
ASSIUT132	132	1.001
ASU132	132	1.031
ASWANPS	132	1.033
BHAR132	132	1.013
BNSIF132	132	1.012
C.ASS1_132	132	1.025
C.ASS2_132	132	1.026
FERRO132	132	0.952
FYOM132	132	1.034
H.D.132I	132	1.041
H.D.132II	132	1.037
IDFO132	132	0.954
ISNA.P132	132	0.988
ISNA132	132	0.987
K.OMB132	132	0.968
KIMA132	132	1.021
LUXOR132	132	0.928
MALAW1_132	132	0.957
MGHA132	132	1.008
MINIA132	132	0.977
N.H2_132	132	1.028
QENA132	132	0.975
SAML132	132	1.050
SIEL132	132	1.029
SOHAG132	132	0.948

Table 1.3-3 - 132 kV voltage Profile

C.S1_66	66	1.043
C.S2_66	66	0.989
N.TEB166	66	0.987
N.TEB266	66	0.987
SIUF2_66	66	1.028

Table 1.3-4 - 66 kV voltage Profile

1.4 GENERATION

Nom de barre	Sn [MVA]	P [MW]	Q [MVAR]	S MVA]	Q max. [MVAR]	Q min. [MVAR]
G.A.K1	187	144	79.78	164.62	100	0
G.A.K2	187	144	79.78	164.62	100	0
G.A.K3	187	144	79.78	164.62	100	0
G.A.K4	187	144	79.78	164.62	100	0
G.A.K5	410	288	148.08	323.84	180	0
G.A.KIR1	765	490.13	129.34	506.91	400	0
G.A.KIR2	765	614	142.7	630.37	400	0
G.A.MOUS1	400	310	19.64	310.62	210	0
G.A.MOUS2	400	310	19.64	310.62	210	0
G.A.MOUS3	425	318	20.55	318.66	210	0
G.A.SOL1	193	139	46.37	146.53	93	0
G.A.SOL2	193	139	46.37	146.53	93	0
G.A.SOL3	193	139	46.37	146.53	93	0
G.A.SOL4	193	139	46.37	146.53	93	0
G.ARISH1	38	31.7	15	35.07	15	15
G.ARISH2	38	31.7	15	35.07	15	15
G.ASS1	425	241	160	289.28	160	160
G.ASS2	425	208	160	262.42	160	160
G.ASUIT	37.5	25.5	15	29.58	15	15
G.ASUIT	37.5	25.5	15	29.58	15	15
G.ASUIT	37.5	25.5	15	29.58	15	15
G.ASW1.1	49.5	40	22	45.65	22	22
G.ASW1.2	49.5	40	22	45.65	22	22
G.ASW1.3	49.5	40	22	45.65	22	22
G.ASW1.4	49.5	40	22	45.65	22	22
G.ASW1.5	49.5	40	22	45.65	22	22
G.ASW1.6	49.5	40	22	45.65	22	22
G.ASW1.7	49.5	40	22	45.65	22	22
G.ASW2.8	88	62	35	71.2	35	35
G.ASW2.8_	88	62	35	71.2	35	35
G.ASW2.9	88	62	35	71.2	35	35
G.ASW2.9_	88	62	35	71.2	35	35
G.ATF1	62	45	20	49.24	20	20
G.ATF2	62	45	20	49.24	20	20
G.ATF21	300	230	75.35	242.03	170	0
G.ATF22	300	230	75.35	242.03	170	0
G.ATF23	300	230	75.35	242.03	170	0
G.ATF3	62	45	20	49.24	20	20
G.ATF5	32	20	8	21.54	8	8
G.ATF5	32	20	8	21.54	8	8
G.ATF6	32	20	8	21.54	8	8
G.ATF6	32	20	8	21.54	8	8
G.ATF7	32	20	8	21.54	8	8
G.ATF7	32	20	8	21.54	8	8
G.ATF8	32	20	8	21.54	8	8
G.ATF8	32	20	8	21.54	8	8

G.ATKA2	187	139	36.71	143.77	85	-26
G.ATKA3	387.5	285	71.5	293.83	195	-54
G.ATKA4	387.5	285	71.5	293.83	195	-54
G.C.S_1	75	50	25	55.9	25	25
G.C.S_2	75	50	25	55.9	25	25
G.C.S_3	75	50	25	55.9	25	25
G.C.S_4	75	50	25	55.9	25	25
G.C.S1	140	105	50.9	116.68	72	0
G.C.S2	140	105	50.9	116.68	72	0
G.C.S3	140	105	50.9	116.68	72	0
G.C.S4	140	105	50.9	116.68	72	0
G.C.S5	75	50	25	55.9	25	25
G.C.W.1	100	83	45	94.41	45	45
G.C.W.2	100	83	45	94.41	45	45
G.C.W.3	100	83	45	94.41	45	45
G.C.W.4	100	83	45	94.41	45	45
G.CAI.W1	410	326	164.62	365.21	190	0
G.CAI.W2	410	326	164.62	365.21	190	0
G.CW.1	446	317	170.93	360.15	195	0
G.CW.2	446	317	170.93	360.15	195	0
G.DABA	1175	1000	92.65	1004.28	600	0
G.DAM.G1	81	56	20	59.46	20	20
G.DAM.G2	81	56	20	59.46	20	20
G.DAM.G3	81	56	20	59.46	20	20
G.DAM.S4	62.6	50	25	55.9	25	25
G.DAM.S4	62.6	50	25	55.9	25	25
G.DAM.S4	62.6	50	25	55.9	25	25
G.DAM_ST1	530	422	144.08	445.92	270	0
G.DAMH4	421.9	288	105.71	306.79	180	-100
G.DAN	133.3	48	-6	48.37	-6	-6
G.DAN1	33.3	12	-6	13.42	-6	-6
G.DAN2	33.3	12	-6	13.42	-6	-6
G.FARSK1	140	115	49.64	125.26	80	0
G.FARSK2	140	115	49.64	125.26	80	0
G.FARSK3	140	115	49.64	125.26	80	0
G.FARSK4	140	115	49.64	125.26	81	0
G.FARSK5	140	115	49.64	125.26	81	0
G.FARSK6_1	140	100	48.33	111.07	81	0
G.FARSK6_2	140	115	49.64	125.26	85	0
G.FARSK6_3	140	115	49.64	125.26	85	0
G.FARSK6_4	140	115	49.64	125.26	85	0
G.H.D.1	206	170	41.14	174.91	105	-50
G.H.D.2	206	170	58.56	179.8	105	-50
G.H.D.2	206	170	58.56	179.8	105	-50
G.H.D.2	206	170	58.56	179.8	105	-50
G.H.D.3	206	170	58.56	179.8	105	-50
G.H.D.3	206	170	58.56	179.8	105	-50
G.H.D.3	206	170	58.56	179.8	105	-50
G.H.D.4	206	170	58.56	179.8	105	-50
G.H.D.4	206	170	58.56	179.8	105	-50
G.H.D.4	206	170	58.56	179.8	105	-50

G.ISNA.P	18.7	12	8	14.42	8	8
G.ISNA.P	18.7	12	8	14.42	8	8
G.ISNA.P	18.7	12	8	14.42	8	8
G.ISNA.P	18.7	12	8	14.42	8	8
G.ISNA.P	18.7	12	8	14.42	8	8
G.ISNA.P	18.7	12	8	14.42	8	8
G.K.D1	140	105	37.94	111.65	55	0
G.K.D2	140	93	36.72	99.99	55	0
G.K.D3	140	93	36.72	99.99	55	0
G.K.D4	140	93	36.72	99.99	55	0
G.KOUR11	300	230	140	269.26	140	140
G.KOUR12	300	230	140	269.26	140	140
G.KOUR13	300	230	140	269.26	140	140
G.KOUR21	300	230	108.13	254.15	170	0
G.KOUR22	300	230	108.13	254.15	170	0
G.KOUR23	300	230	108.13	254.15	170	0
G.KUR.SOL1	50	41.5	20	46.07	20	20
G.KUR.SOL2	50	41.5	20	46.07	20	20
G.KUR.SOL3	85	68	30	74.32	30	30
G.KURIM_1	705	592	177.51	618.04	360	0
G.KURIM_2	705	592	177.51	618.04	360	0
G.N.C.NO11	300	232	142.12	272.07	170	0
G.N.C.NO12	300	232	142.12	272.07	170	0
G.N.C.NO13	300	232	142.12	272.07	170	0
G.N.C.NO21	300	232	136.72	269.29	150	0
G.N.C.NO22	300	232	136.72	269.29	150	0
G.N.DELT1	300	230	134.34	266.36	190	0
G.N.DELT2	300	230	134.34	266.36	190	0
G.N.DELT3	300	230	134.34	266.36	190	0
G.N.DELT4	300	230	134.34	266.36	190	0
G.N.DELT7	765	614	334.48	699.2	400	0
G.N.DELT8	765	614	334.48	699.2	400	0
G.N.H.PS1	20	15	9	17.49	9	9
G.N.H.PS2	20	15	9	17.49	9	9
G.N.H.PS3	20	15	9	17.49	9	9
G.N.H.PS4	20	15	9	17.49	9	9
G.NOBA11	300	230	153.46	276.49	170	0
G.NOBA12	300	230	153.46	276.49	170	0
G.NOBA13	300	230	153.46	276.49	170	0
G.NOBA21	300	230	153.46	276.49	170	0
G.NOBA22	300	230	153.46	276.49	170	0
G.NOBA31	300	232	153.6	278.24	170	0
G.NOBA32	300	232	153.6	278.24	170	0
G.NOBA33	300	230	153.46	276.49	170	0
G.S.KR1	376.5	307	142.78	338.58	195	0
G.S.KR2	376.5	307	142.78	338.58	195	0
G.S.KR3	400	328	145.18	358.69	195	0
G.S.KR4	400	328	145.18	358.69	195	0
G.S.KRIR1	300	230	70.68	240.62	170	0
G.S.KRIR2	300	230	70.68	240.62	170	0
G.S.KRIR3	300	230	70.68	240.62	170	0

G.S.KRIR4	765	614	151.56	632.43	400	0
G.SH.KH1	437	302	153.89	338.95	225	0
G.SH.KH2	437	302	153.89	338.95	225	0
G.SH.KH3	437	302	153.89	338.95	225	0
G.SH.KH4	437	302	153.89	338.95	225	0
G.SHRMS1	300	231	24.95	232.34	150	-100
G.SHRMS2	300	231	24.95	232.34	150	-100
G.SHRMS3	300	231	24.95	232.34	150	-100
G.SUEZ_1	530	422	163.85	452.69	270	0
G.SUEZ_2	530	422	163.85	452.69	270	0
G.SUEZ_3	530	422	163.85	452.69	270	0
G.SUEZ_4	530	422	163.85	452.69	270	0
G.TALH	258	199	116.4	230.54	152	0
G.TALH_	258	203	116.66	234.13	152	0
G.TALKH1	30.4	21	8	22.47	8	8
G.TALKH1	30.4	21	8	22.47	8	8
G.TALKH2	30.4	21.5	8	22.94	8	8
G.TALKH2	30.4	21.5	8	22.94	8	8
G.TALKH3	30.4	21	11	23.71	11	11
G.TALKH3	30.4	21	11	23.71	11	11
G.TALKH4	30.4	21	11	23.71	11	11
G.TALKH4	30.4	21	11	23.71	11	11
G.TALKH5	62	35	20	40.31	20	20
G.TALKH6	62	35	20	40.31	20	20
G.TALKH7	37.5	21	11	23.71	11	11
G.TALKH8	37.5	21	11	23.71	11	11
G.TALKHA.1	300	230	108.46	254.29	170	0
G.TALKHA.2	300	230	108.46	254.29	170	0
G.TALKHA.3	300	230	108.46	254.29	170	0
G.TEB1	437	326	159	362.71	225	0
G.TEB2	437	326	159	362.71	225	0
GERM1	36.6	14	-6	15.23	-6	-6
GERM2	52.2	19	-6	19.92	-6	-6
GERM4	88.88	28	-6	28.64	-6	-6
JAPAN	133.3	48	-6	48.37	-6	-6
MMATR220	36	29	2	29.07	2	2
MMATR220	36	29	2	29.07	2	2
N.W.S.G	425	328	165.71	367.48	210	0
N.W.S.G1	425	328	165.71	367.48	210	0
P.S.E.G1	425	327	154.7	361.75	195	0
P.S.E.G2	425	327	154.7	361.75	195	0
RAS GHARDIB	852	283	100	300.15	100	-50
ZAFAR220	852	283	100	300.15	100	-50
TOTAL	-	31995	-	-	-	-

Table 1.4-1 - Generation

2 LOAD FLOW RESULTS PEAK 2015/2016 - N-1 SITUATIONS

2.1 ANALYSIS OF THE 500/220 KV TRANSFORMATION

2.1.1 TRIPPING OF ONE OF HIGH DAM TRANSFORMERS

The tripping of one of the two 500/220 kV transformers (500 MVA, loaded at 75 %) in High Dam substation left the remaining one with 32 % of overload. The N-1 criteria is not fulfilled.
An additional third transformer is necessary to face the N-1 situation.

2.1.2 TRIPPING OF NAG HAMMADI TRANSFORMER

The tripping of the single 500/220 kV transformer (750 MVA, loaded at 77 %) in Nag Hammadi induced a 33 % overload on the 500/220 kV transformer in Sohag substation (435 MW + 509 Mvar). The voltage in Nag Hammadi 220 kV substation dropped to 0.84 pu. The N-1 criteria is not fulfilled.
An additional 750 MVA transformer (a 500 MVA transformer would be 6 % overloaded in case of tripping of the 750 MVA transformer) would enable the N-1 situation, but does not lift the overload in case of tripping of the 500/220 kV transformer in High Dam (29 % overload on the remaining transformer instead of 32 %).
The loading of the 2 transformers would be reduced from 77 to 40 % (268 MW + 137 Mvar each).

2.1.3 TRIPPING OF SOHAG TRANSFORMER

The tripping of the single 500/220 kV 500 MVA transformer (initial flow of 216 MW, 49 % of rating) in Sohag did not entailed overload on the network, nor under voltage. The N-1 criteria is fulfilled.

2.1.4 TRIPPING OF ONE OF ASSIUT TRANSFORMERS

The tripping of one of the two 500/220 kV transformer (375 MVA) in Sohag did not entailed overload on the network, nor under voltage. The load on the remaining transformer increased from 36 to 58 %. The N-1 criteria is fulfilled.

2.1.5 TRIPPING OF SAMALUT TRANSFORMER

The transformer was initially loaded at 381 MW (54 % of rating).
The tripping of the single 500/220 kV transformer (750 MVA) in Samalut did not entailed overload on the network, nor under voltage. The voltage drop in Samalut reached 11 % (from 1.043 to 0.955 pu).
The loading of the 500/220 kV transformers in Assuit increased from 36 to 63.4 %, and the loading of Kurimat 500/220 kV transformers increased from 48 to 64.6 %. The N-1 criteria is fulfilled.

2.1.6 TRIPPING OF ONE OF KURIMAT TRANSFORMERS

The tripping of one the two 500/220 kV transformer (500 MVA) in Kurimat did not entailed overload on the network, nor under voltage. The load of the remaining transformer increased from 48 to 79 %. The N-1 criteria is fulfilled.

2.2 ANALYSIS OF THE 500/132 KV TRANSFORMATION

2.2.1 TRIPPING OF ONE OF HIGH DAM TRANSFORMERS

The tripping of one of the two 500/132 kV transformers (320 MVA, loaded at 42 and 48 %) in High Dam substation complied with the N-1 criteria.

The tripping of the transformer to H.D.132 I (initial flow : 129 MW) : the flow on the remaining one increased from 146 to 210 MW (rating from 48 to 72 %). The flow on the 500/220 kV increased from 341 to 386 MW (rating from 75 to 80 %).

The tripping of the transformer to H.D.132 II (initial flow : 146 MW) : the flow on the remaining one increased from 129 to 201 MW (rating from 42 to 67 %). The flow on the 500/220 kV increased from 341 to 391 MW (rating from 75 to 81 %).

2.2.2 TRIPPING OF ONE OF NAG HAMMADI TRANSFORMERS

The tripping of one of the two 500/220 kV 375 MVA transformer (loaded at 70 %) complied with the N-1 criteria. The flow on the remaining transformers increased from 174 to 224 MW (rating from 70 to 94 %) for the 375 MVA, and from 348 to 449 MW (rating from 70 to 94 %) for the 570 MVA. The voltage profile is not significantly affected.

The tripping of the 500/220 kV 570 MVA transformer (loaded at 70 %) entailed an 38 % overload on the remaining transformers. The flow on the remaining transformers increased from 174 to 319 MW (rating from 70 to 138 %). The voltage profile is not significantly affected.
An additional 375 MVA transformer would enable the N-1 situation.

2.2.3 TRIPPING OF ONE OF SAMALUT TRANSFORMERS

The tripping of one of the two 500/132 kV transformer (285 MVA, loaded at 71 %) entailed an 35 % overload on the remaining one. The flow on the remaining transformer increased from 189 to 343 MW (rating from 71 to 135 %).
An additional transformer would enable the N-1 criteria.

2.3 ANALYSIS OF THE TRIPPING OF THE 500 KV LINES

2.3.1 TRIPPING OF ONE CIRCUIT OF THE 500 KV DOUBLE CIRCUIT LINE HIGH DAM - NAG HAMMADI

In normal situation, 346 MW (24.5 % of rating) flowed over each of the two circuits from High Dam to Nag Hammadi. The flow on the remaining circuit reached 611 MW (43 % of rating).

The voltage in Nag Hammadi dropped by 5 % from 0.998 to 0.942 pu. The lowest voltage on the network is reached in Isna 220 kV at 0.927 pu, but remained within the limits. No overload occurred.

Following the tripping, the behaviour of the transmission system was acceptable.

2.3.2 TRIPPING OF THE 500 KV CIRCUIT LINE NAG HAMMADI - SOHAG

The flow over the circuit between Assiut to Nag Hammadi increased from 306 to 421 MW (from 18 to 24 % of rating). The flow over the circuit between Assiut to Sohag decreased from 390 to 271 MW (from 23 to 16 % of rating).

The voltage profile is not significantly affected since it dropped by 1 % in Nag Hammadi (from 0.998 to 0.986 pu), Sohag (from 1.00 to 0.992) and Assiut (from 1.011 to 1.003 pu). No overload occurred.

Following the tripping, the behaviour of the transmission system was acceptable.

2.3.3 TRIPPING OF THE 500 KV CIRCUIT LINE SOHAG - ASSIUT

The flow over the circuit between Assiut to Nag Hammadi increased from 306 to 602 MW (from 18 to 35.5 % of rating). The flow over the circuit between Sohag to Nag Hammadi inverted from 172 to -127 MW (from 11 to 8 % of rating).

The voltage profile is locally slightly affected since it dropped by 3.5 % in Sohag (from 1.00 to 0.966 pu), by 2 % in Nag Hammadi (from 0.998 to 0.977 pu), and by 1.5 % in Assiut (from 1.01 to 0.997 pu). No overload occurred.

Following the tripping, the behaviour of the transmission system was acceptable.

2.3.4 TRIPPING OF THE 500 KV CIRCUIT LINE NAG HAMMADI - ASSIUT

The flow over the remaining circuit between Assiut to Nag Hammadi increased:

- on Assiut - Sohag from 390 to 641 MW (from 18 to 36 % of rating)
- on Sohag - Nag Hammadi from 172 to 394 MW (from 11 to 24 % of rating)

The voltage profile is locally slightly affected since it dropped by 3 % in Sohag (from 1.00 to 0.973 pu), by 2.5 % in Nag Hammadi (from 0.998 to 0.973 pu), and by 1.2 % in Assiut (from 1.01 to 0.989 pu). No overload occurred.

Following the tripping, the behaviour of the transmission system was acceptable.

2.3.5 TRIPPING OF ONE CIRCUIT OF THE 500 KV DOUBLE CIRCUIT LINE ASSIUT - SAMALUT

In normal situation, 477 MW (28 % of rating) flowed over each of the two circuits from Samalut to Assiut. The flow on the remaining circuit reached 815 MW (48 % of rating).

The voltage profile is slightly affected since it dropped by 2 % in Assiut (from 1.011 to 0.99 pu), Samalut (from 1.011 to 0.993 pu) and Sohag (from 1.00 to 0.984 pu). No overload occurred.

Following the tripping, the behaviour of the transmission system was acceptable.

2.3.6 TRIPPING OF THE 500 KV CIRCUIT LINE KURIMAT - CAIRO 500

The initial flow on Cairo 500 to Kurimat reached 146 MW (11 % of rating).
The flow over the remaining circuits :

- on Kurimat - Samalut from 942 to 910 MW (from 55 to 54 % of rating)

- on Cairo 500 – Samalut from 781 to 814 MW (from 45 to 47.6 % of rating)

No overload occurred.

The voltage profile is not significantly affected since it dropped by 1 % in Cairo (from 1.007 to 0.997 pu).

Following the tripping, the behaviour of the transmission system was acceptable.

2.3.7 TRIPPING OF THE 500 KV CIRCUIT LINE SAMALUT - CAIRO 500

The initial flow on Cairo 500 to Samalut reached 781 MW (45 % of rating).
The flow over the remaining circuits increased:

- on Kurimat - Samalut from 942 to 1435 MW (from 55 to 86 % of rating)
- on Cairo 500 - Kurimat from 146 to 504 MW (from 11 to 35 % of rating)

No overload occurred.

The voltage profile is slightly affected since it dropped by 2 % in Samalut (from 1.01 to 0.983 pu), 1 % in Kurimat (from 1.05 to 1.04 pu) and Assiut (from 1.01 to 0.988 pu).

Following the tripping, the behaviour of the transmission system was acceptable.

2.3.8 TRIPPING OF THE 500 KV CIRCUIT LINE SAMALUT - KURIMAT

The initial flow on the system was :

- Kurimat to Samalut : 942 MW (55.5 % of rating)
- Cairo 500 to Samalut : 781 MW (45 % of rating)
- Cairo 500 to Krima : 146 MW (11 % of rating)

No solution was found by the software.
As first analysis, contrary to the previous case, the voltage is not kept anymore between Cairo and Samalut. The flow from Cairo to Samalut would reached around 1400 MW, (rating around 85 %), which is not convenient to keep the voltage on the backbone between Cairo and High Dam.

The N-1 is not satisfied in case of tripping of the line between Kurimat and Samalut.

2.3.9 TRIPPING OF THE 500 KV CIRCUIT LINE KURIMAT - TEBBIN 500

The initial flow from Kurimat to Tebin 500 reached 602 MW (33 % of rating).
The flow over the remaining circuits increased :

- from Abu Zabaal to Heliopolis from 725 to 1125 MW (from 43 to 65 % of rating)
- from Suez to Heliopolis from 1427 to 1563 MW (from 80 to 88 % of rating)
- from Heliopolis to Tebbin from 287 to 721 MW (from 22 to 43 % of rating)
- from Cairo 500 to Kurimat from 146 to 182 MW (from 11 to 21 % of rating)

No overload occurred.

The voltage profile is not significantly affected since it dropped by 1 % in Tebbin (from 1.047 to 1.038 pu) and Heliopolis (from 1.024 to 1.013 pu).

Following the tripping, the behaviour of the transmission system was acceptable.

2.4 ANALYSIS OF THE TRIPPING OF THE 220 KV LINES

2.4.1 TRIPPING OF THE DOUBLE 220 kV LINE NAG HAMMADI - QENA WEST

In normal situation, 37 MW and 101 Mvar (22 % of rating) flowed over each of the two circuits from Nag Hammadi to Qena West.

The tripping of the double circuit led to a severe undervoltage on the 220 kV backbone from Qena West towards High Dam, the lowest voltage being reached in Qena West and Luxor East at 0.78 pu. The voltage profile is increasing as the substation is closer to High Dam. No overload occurred.
The N-2 on the 220 kV network is not satisfied with the tripping of Nag Hammadi - Qena West.
In N-1, the flow on the remaining circuit increased from 37 MW and 101 Mvar to 93 MW and 159 MVAr (from 22 to 39 % of rating).
A third circuit would be necessary to face the N-2 criteria.

2.4.2 TRIPPING OF THE DOUBLE 220 kV LINE NAG HAMMADI - GIRGA

In normal situation, 27 MW and 15 Mvar (6 % of rating) flowed over each of the two circuits from Nag Hammadi to Girga.

The voltage at Girga substation decreased by 2.5 % (from 1.045 to 1.021 pu). No overload occurred. The N-2 on the 220 kV network is satisfied. The implementation of Sohag 500/220 kV substation improved the situation.

2.4.3 TRIPPING OF THE DOUBLE 220 kV LINE SOHAG WEST - SOHAG

In normal situation, 56 MW and 12 Mvar (12 % of rating) flowed over each of the two circuits from Sohag to Sohag West.
The voltage profile is not significantly affected, and no overload occurred.

2.4.4 TRIPPING OF THE DOUBLE 220 kV LINE SOHAG - SOHAG EAST

In normal situation, 52 MW and 34 Mvar (13 % of rating) flowed over each of the two circuits from Sohag to Sohag East.
No overload occurred, the voltage profile was affected on the line between Assiut and Sohag East (15 % of voltage drop from the controlled end to the other end), since the voltage in Sohag East was close to the voltage limit : 0.89 pu, the voltage in Assiut 220 kV remaining at 1.038 pu.

2.4.5 TRIPPING OF THE DOUBLE 220 kV LINE SAFA - ASSIUT

In normal situation, 83 MW and -4 Mvar (17 % of rating) flowed over each of the two circuits from Assiut to Safa.
No overload occurred and the voltage profile was not significantly affected, the voltage in Safa reaching 0.989 pu.

2.4.6 TRIPPING OF TWO OF THE FOUR 220 KV LINE NEW ASSIUT - ASSIUT

In normal situation, 118 MW and 14 Mvar (28 % of rating) flowed over each of the four circuits from New Assiut to Assiut. The flow on the remaining circuit increased from 118 to 236 MW (from 28 to 55 % of rating).
No overload occurred and the voltage profile was not significantly affected.

2.4.7 TRIPPING OF THE DOUBLE 220 KV LINE SAMALUT - MANIA WEST

In normal situation, 88 MW and -1 Mvar (19 % of rating) flowed over each of the two circuits from Samalut to Mania West.
No overload occurred and the voltage profile was not significantly affected, the voltage in Mania West reaching 1.017 pu.

2.4.8 TRIPPING OF THE DOUBLE 220 KV LINE SAMALUT - MAGHAGHA

In normal situation, only 1.5 MW and 3 Mvar flowed over each of the two circuits from Samalut to Maghagha. The N-2 is therefore satisfied.

2.4.9 TRIPPING OF THE DOUBLE 220 KV LINE KURIMAT – B.SUIF EAST

In normal situation, 257 MW and 55 Mvar (rating of 55 %) flowed over each of the two circuits from Kurimat to B.Suif East.
In case of tripping of the 2 circuits, no solution was found by the software. The N-2 is therefore not satisfied.
In N-1, the flow on the remaining circuit increased from 257 to 479 MW (from 55 to 103 % of rating). The voltage profile is not affected. The N-1 is satisfied
A third circuit is requested to face the N-2 criteria.

2.4.10 TRIPPING OF THE DOUBLE 220 KV LINE KURIMAT - FAYOUM

In normal situation, only 271 MW and 153 Mvar (rating of 65 %) flowed over each of the two circuits from Kurimat to Fayoum.
In case of tripping of the 2 circuits, the voltage in Fayoum dropped by 10 %, from 1.008 to 0.907 pu, but remained within the limits. The load of the 3 transformers 500/220 kV in Cairo 500 increased from 375 to 448 MW (from 80 to 102 % of rating). The N-2 is considered as satisfied.
In N-1, the flow on the remaining circuit increased from 271 to 455 MW (from 55 to 110 % of rating). The voltage profile is not affected (voltage drop of 2 % in Fayoum). The N-1 is not satisfied.
A double 220 kV circuit reinforcement would be necessary.

3 SHORT-CIRCUIT RESULTS PEAK 2015/2016

Bus name	Voltage (kV) (Mult. = 1.10)	LLL		LG	
		I [A]	S [MVA]	I [A]	S [MVA]
A.Z.500	550	36795	35051	31556	30061
ABKIR500	550	22370	21310	19908	18964
AMOUS500	550	21211	20206	21316	20306
AUST500	550	13309	12678	11911	11346
BASII500	550	33960	32351	30810	29350
C.W.500	550	35380	33704	32721	31171
CAIRO500	550	36883	35135	34055	32441
D1H.D.5	550	13568	12925	13958	13297
D2H.D.5	550	13568	12925	13958	13297
DABAA500	550	12199	11621	12614	12016
H.D.500	550	13579	12935	13972	13310
HELIO500	550	25008	23823	18331	17462
KRIMA500	550	27139	25853	26339	25091
N.DELTA500	550	30582	29133	26732	25465
N.H.500	550	11273	10738	10126	9646
NOBAR500	550	39318	37455	37071	35315
SALOUM500	550	3667	3493	3285	3129
SAML500	550	15475	14742	13762	13110
SKRIR500	550	24416	23258	24668	23499
SOHAG500	550	9068	8638	6853	6528
SUEZ500	550	27108	25823	28899	27529
TABA500	550	5233	4984	4854	4624
TEB.500	550	18734	17846	16170	15404
TOBROK500	550	2762	2631	2820	2686
AKABA400	440	4725	3600	5033	3835
S_AQA400	440	4687	3571	4970	3787
S_TAB400	440	4436	3380	4572	3484
TABSW400	440	4344	3310	4430	3376
TOBROK400	440	3059	2331	3705	2823

Table 3-1 – 500 kV Short circuit results

Bus name	Voltage (kV) (Mult. = 1.10)	LLL		LG	
		I [A]	S [MVA]	I [A]	S [MVA]
10_RAM220	242	14587	6114	12370	5184
10R220.N	242	8309	3482	7315	3066
6_OCTOBR220	242	38653	16201	33607	14086
A.MOUSA2	242	15014	6293	14095	5908
A.RWASH220	242	34280	14368	30163	12643
A.SOLT.220	242	22707	9517	20976	8792
A.TAR220	242	2011	842	1736	727
A.ZAA_220	242	8625	3615	8480	3554
A.ZAA220	242	34794	14584	31195	13075
ABIS220	242	17860	7486	17265	7236
ABKIR220	242	21587	9048	21901	9179

AIN_SIR220	242	27503	11527	23507	9853
ALEZZ220	242	16398	6873	14101	5910
AMIRA220	242	31498	13202	30249	12679
AMRIKIA220	242	11193	4691	9544	4000
ARCO220	242	11275	4725	9613	4029
ASW.I220	242	16210	6794	15137	6344
ATAKA220	242	24813	10400	24881	10428
ATF220	242	28613	11993	28852	12093
AUST220	242	25597	10729	23376	9798
B.ARAB220	242	23502	9850	22135	9277
B.S.EAST	242	16438	6889	14984	6280
B.SIF.W	242	7655	3208	5710	2393
BAHTEEM	242	33643	14101	31382	13154
BALLAT	242	1680	704	1344	563
BASAT	242	27586	11562	23487	9844
BASHTEE	242	24887	10431	21422	8979
BASOUS	242	39061	16372	37358	15658
BASSOUS	242	29551	12386	26809	11237
BEAR-ABD	242	11185	4688	9672	4054
BGHDAD	242	6497	2723	5752	2411
BUSTAN220	242	25462	10672	22982	9632
C.EAST	242	27443	11503	22043	9239
C.NORTH	242	38433	16109	37405	15678
C.SOUTH1	242	27422	11494	23615	9898
C.SOUTH2	242	16501	6916	15504	6498
C.SWD	242	9886	4143	7358	3083
CAI.W II	242	22761	9540	22016	9228
CAI_220	242	36811	15429	33998	14250
CAI_221	242	38061	15953	35775	14995
CAIRO.N	242	35532	14893	32837	13763
CAIRO_W2	242	22821	9565	21042	8819
CAIRO_WS	242	23138	9698	22609	9476
CEM.SU.	242	13780	5776	13130	5503
DABAA220	242	16414	6880	16142	6765
DAM.G220	242	40115	16814	40837	17117
DAMANH220	242	39474	16545	40235	16864
DELKHL220	242	28812	12076	27511	11531
DOMATIA220	242	33118	13881	29960	12557
DOMT_GEN220	242	37191	15589	34233	14349
DUMMY	242	14899	6245	13140	5507
ECONMY	242	18038	7560	16870	7071
EL-ARISH	242	7526	3154	7644	3204
EMBABA	242	20691	8672	18821	7888
ESLAHH	242	3318	1390	2141	897
EZZ-STEL220	242	11344	4754	9672	4054
F_ZONE220	242	19298	8089	17775	7450
FAY.W220	242	9350	3919	8221	3445
FAYOUM	242	23032	9654	19612	8220
G.TEB220	242	26401	11066	23783	9968
GHARD220	242	8148	3415	7104	2977
GHAZL	242	25617	10737	23738	9949

GIRGA220	242	10905	4570	9264	3883
GIZA_SO	242	22828	9568	18891	7918
GIZA220	242	18887	7916	16393	6871
GLEEM	242	20101	8425	19519	8181
H.D.220	242	18143	7604	18140	7603
HADABA220	242	28372	11892	25147	10540
HEL_I220	242	28201	11820	23689	9929
HEL_II_220	242	27939	11710	21575	9043
I.BROUD220	242	36911	15471	32241	13514
IN.PARK	242	19496	8171	18600	7796
IRON_STE	242	28552	11967	27210	11405
ISNA220	242	7524	3153	6717	2815
K.DWAR220	242	27761	11636	26519	11115
K.SHIEKH220	242	14960	6270	11931	5000
KAFR ZI	242	28912	12118	21835	9152
KALYUB	242	23938	10033	20594	8632
KANTARA	242	8536	3577	6931	2905
KARMOZ220	242	18667	7824	17262	7235
KASABIE	242	30365	12727	27379	11475
KATAMIA	242	16505	6918	14231	5964
KURIM220_1	242	31654	13267	31312	13124
LUX_EAST220	242	7958	3335	6908	2895
M.ALAM	242	3178	1332	2197	920
MAGHAG.W	242	11488	4815	10204	4277
MAHAL_I220	242	29185	12233	24553	10291
MALAWI	242	11461	4803	9243	3874
MANAYEF220	242	22698	9514	18515	7760
MANIA.W	242	12316	5162	9333	3911
MANSURA220	242	33342	13975	30394	12740
MASRCEM	242	16174	6779	13758	5766
MASSED	242	7211	3022	6947	2911
MAX	242	17465	7320	11899	4987
MEAT_GHA	242	17960	7528	12290	5151
MENOUF220	242	18376	7702	16126	6759
MENOUF221	242	15384	6448	13382	5609
METRO220	242	35675	14953	34284	14370
MMATR220	242	8397	3519	7691	3223
MOKATEM	242	26795	11231	20368	8537
MONTAZH	242	21095	8842	21073	8832
MOSTOROD	242	30190	12654	21433	8983
MOTMDIA220	242	24673	10341	21229	8898
N ISMAL	242	11007	4613	7151	2997
N.ASSP	242	24705	10355	22642	9490
N.BANHA	242	17986	7539	12711	5328
N.C.NO1	242	38970	16334	38140	15986
N.C.NO2	242	37134	15564	35612	14926
N.CAIRO220	242	26533	11121	21536	9026
N.DELTA220	242	28716	12036	24632	10324
N.H.220	242	16613	6963	15129	6341
N.H.PS220	242	11796	4944	9521	3990
N.METRO	242	25171	10550	6058	2539

N.OCTOBR	242	32666	13692	25863	10840
N.SAP220	242	36446	15276	35233	14768
N.SHARKIA	242	17293	7248	12618	5289
N.W.S.G220	242	18869	7909	17770	7448
NAHDA	242	33740	14142	28840	12088
NASR.P	242	18049	7565	15168	6357
NEW HEL	242	29815	12497	24885	10430
NOBARIA220	242	38281	16045	35394	14835
NUWEB220	242	6901	2892	6516	2731
OBOOR	242	30550	12805	25614	10736
OLD_SUEZ	242	13320	5582	10029	4203
OMAYED220	242	16128	6760	14806	6205
PSAID220	242	19968	8369	16416	6880
QENA_W220	242	12237	5129	9281	3890
QENA220	242	11630	4874	9665	4051
QUISIR	242	3178	1332	2197	920
QWESNA220	242	17741	7436	13383	5609
R.SEDR220	242	10737	4500	9458	3964
RAS GHARDIB	242	9890	4145	10536	4416
REVA220	242	7893	3308	5628	2359
S.TEBIEN220	242	29463	12349	26991	11313
SADAT220	242	12252	5135	10442	4376
SAFA	242	11024	4620	7835	3284
SAFAGA220	242	7543	3161	6519	2732
SAKR	242	27755	11633	22393	9386
SALOUM220	242	6555	2747	6120	2565
SAMANOD	242	24587	10305	17815	7467
SAML220	242	17999	7544	16513	6921
SAPTIA220	242	36609	15344	35407	14841
SEMOHA220	242	18925	7932	17824	7471
SH2	242	28738	12045	25643	10748
SHABAB	242	20003	8384	14925	6255
SHARKIA220	242	20157	8448	16238	6806
SHARM220	242	12711	5327	15082	6321
SHEIN.K	242	18156	7610	13058	5473
SHERBIN	242	17047	7145	11451	4799
SI.SALM	242	16972	7114	12147	5091
SIDI.BA	242	6224	2608	4879	2045
SILWA220	242	6263	2625	5530	2318
SKRIR220	242	33800	14167	33883	14202
SOB.KA2	242	35790	15001	34838	14602
SOHAG.E	242	8761	3672	6690	2804
SOHAG.W	242	10351	4338	8256	3460
SOHAG220	242	10852	4548	9087	3809
SOKHNA	242	12468	5225	12128	5083
SOMID220	242	15265	6398	13844	5802
STAD220	242	25176	10552	20323	8518
SUEZ.T220	242	23908	10021	23619	9900
SUEZ220	242	25273	10593	25094	10518
SUIF200	242	20569	8621	20279	8500
SZ.STEEL	242	24124	10111	24076	10091

TABA220	242	7472	3131	7104	2977
TAFRA.E	242	21126	8855	19099	8005
TAH_1_220	242	16687	6994	13850	5805
TAHR2_220	242	19297	8088	17280	7242
TALKHA220	242	39134	16403	37381	15668
TANTA220	242	26424	11075	19844	8317
TEB.220	242	28293	11859	26084	10933
TECH.VA	242	8614	3610	6194	2596
TEMA220	242	7261	3043	5639	2363
TOBROK220	242	4697	1968	5022	2105
TOSHKA	242	3392	1421	2195	919
TOUR	242	7830	3282	5594	2344
W.HAUF	242	27042	11334	23502	9851
W.NAKRA220	242	7132	2989	6316	2647
W.NATRON	242	15721	6589	11226	4705
ZAFAR220	242	12811	5369	14073	5898
ZAGZEG220	242	14797	6202	9286	3892
ZAH.MAD	242	27562	11552	22157	9287
ZAH.N.C	242	9863	4134	6393	2679
ZAID220	242	27509	11530	23817	9983

Table 3-2 – 220 kV Short circuit results

Bus name	Voltage (kV) (Mult. = 1.10)	LLL		LG	
		I [A]	S [MVA]	I [A]	S [MVA]
ASSIUT132	145.2	12986	3265	11896	2991
ASU132	145.2	21473	5400	20431	5138
ASWANPS	145.2	33380	8394	33032	8307
BHAR132	145.2	1547	389	1335	335
BNSIF132	145.2	6188	1556	5630	1415
C.ASS1_132	145.2	19589	4926	18458	4642
C.ASS2_132	145.2	19239	4838	18098	4551
FERRO132	145.2	8847	2224	7932	1994
FYOM132	145.2	7495	1884	7119	1790
H.D.132I	145.2	24623	6192	23959	6025
H.D.132II	145.2	24623	6192	23959	6025
IDFO132	145.2	9127	2295	8202	2062
ISNA.P132	145.2	10286	2586	9822	2470
ISNA132	145.2	10564	2656	10069	2532
K.OMB132	145.2	8502	2138	7532	1894
KIMA132	145.2	23660	5950	22397	5632
LUXOR132	145.2	5080	1277	4455	1120
MALAW1_132	145.2	7302	1836	6378	1604
MGHA132	145.2	7079	1780	6273	1577
MINIA132	145.2	8531	2145	7502	1886
N.H2_132	145.2	26312	6617	24599	6186
QENA132	145.2	13185	3316	11881	2987
SAML132	145.2	21232	5339	20181	5075
SIEL132	145.2	12735	3202	9275	2332
SOHAG132	145.2	5338	1342	4637	1166

Table 3-3 – 132 kV Short circuit results

Bus name	Voltage (kV) (Mult. = 1.10)	LLL		LG	
		I [A]	S [MVA]	I [A]	S [MVA]
C.S1_66	72.6	16500	2074	16602	2087
C.S2_66	72.6	10634	1337	10878	1367
N.TEB166	72.6	12371	1555	12230	1537
N.TEB266	72.6	6601	830	6560	824
SIUF2_66	72.6	12998	1634	12963	1630

Table 3-4 – 66 kV Short circuit results