

الآية

قال تعالى :

﴿وَقُلِ اعْمَلُوا فَسَيَرَى اللَّهُ عَمَلَكُمْ وَرَسُولُهُ وَالْمُؤْمِنُونَ

وَسَتُرَدُّونَ إِلَىٰ عَالَمِ الْغَيْبِ وَالشَّهَادَةِ فَيُنبِّئُكُمْ بِمَا كُنْتُمْ

تَعْمَلُونَ﴾

التوبة (105)

DEDICATION

To

Endless love

Our mothers

To

Men who teach me to be men

Our fathers

To

Our teachers & our colleagues

ACKNOWLEDGMENT

First we need to thank fully our god (Allah) that without his blessing this work will not complete.

Then all thank for our supervisor Dr.Elfadil Zakaria to his patience with us and countless hours and valuable efforts to guide and advise us to complete the work in his fair way.

And until not forget the deep thank for staff of national dispatch center engineers to their main participate in success this work.

Lastly we need to thank our teachers in electrical and nuclear engineering school to their efforts in helping and support.

Abstract

The management of power systems has become more difficult than earlier because power systems are operated closer to security limits, environmental constraints restrict the expansion of transmission network, the need for long distance power transfers has increased and fewer operators are engaged in supervision and operation of power systems. And because the main objective of operating electrical power systems is to serve the energy with acceptable voltage and frequency in addition to, factors of reliability and security of the service all this make these systems during this difficult situation can effect by several and serious problems.

One of serious problems in power systems that can threaten the concept of power systems reliability and security is voltage instability therefore In the recent years, the analysis of voltage stability has assumed importance, mainly due to several documented incidents of voltage collapse In many countries rather in, Sudan national grid.

In this project voltage stability analysis was performed on simplified Sudan national grid to identifying weakest buses in this grid from point view of voltage stability using voltage changing index that is first applied to IEEE 14-bus benchmark to ensure his successes ,then ranking for these buses to arrange her from weakest to strongest was achieved to avoid intensive loading for weakest buses and to solve reactive power problem that has significant effected on voltage in these buses, all this to prevent voltage instability in this grid that is lead directly to total blackout and it's worst consequence.

المستخلص

أصبحت إدارة نظم القدرة صعبة جدا من ذي قبل وذلك لأن هذه الانظمة اصبحت تعمل عند حدود الأمان وفي بيئة تعيق من توسع شبكات النقل بالإضافة الى أن نقل القدرة لمسافات طويلة إزدادت الحاجة اليه مع قلة عدد المشغلين والمشرفين على إدارة هذه الأنظمة. ولأن الهدف الرئيسي من عمل أنظمة القدرة الكهربائية هو أن تعطى الطاقة الكهربائية عند جهد وتردد مقبولين, بالإضافة إلى عاملي الموثوقية والامان في الخدمة كل هذا يجعل هذه الأنظمة خلال هذه الاوضاع الصعبة تتأثر بمشاكل متعددة وخطرة.

واحدة من اخطر المشاكل في انظمة القدرة الكهربائية والتي يمكن ان يمكن ان تهدد مفهوم أمن وموثوقية نظم القدرة الكهربائية هي عدم استقرارية أنظمة الجهد الكهربائية ، لذلك وفي السنوات الاخيرة أخذ تحليل الاستقرارية أهمية خاصة وذلك بسبب الحوادث الكثيرة التي تم التوثيق لها في إنهار نظام الجهد في العديد من البلدان ولاسيما في شبكة السودان.

في هذا العمل تم اجراء تحليل استقرارية نظام الجهد لجزء من الشبكة القومية للكهرباء في السودان وذلك للوقوف على قضبان التوزيع الضعيفة في الشبكة باستخدام مؤشر تغير الفولتية الذي تم تطبيقه اولا على شبكة (IEEE 14-bus) وذلك للتحقق من صحة نتائجه. ثم تطبيق هذا الاختبار على جزء من شبكة السودان لتحديد قضبان التوزيع الضعيفة بترتيبها تنازليا من الاقل استقرارية وحتى الأعلى استقرارية وذلك لتجنب التحميل الزائد على قضبان التوزيع الضعيفة وحل مشكلة القدرة المتفاعلة التي لها اثر واضح على الجهد في هذه القضبان, كل هذا لمنع حدوث عدم استقرارية الجهد الذي يقود مباشرة الي الانقطاع التام للجهد ونتائجه السيئة على الشبكة.

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LIST OF ABBREVIATIONS

MWP	MARWI POWER PLANT
GAR	GARI 11KV
ROS	ROSSERIES
KHN	KHARTOUM NORTH
SNP	SENNAR POWER PLANT 11KV
MWP	MARWI POWER PLANT 500KV
MRK	MRKHIAT500KV
KAB	KABASHI 500KV
ATB	ATBARA 500KV
GAR	GARI 220KV
ROS	ROSSERIES 220KV
MWP	MARWI POWER PLANT 220KV
KAB	KABASHI 220KV
SNJ	SENNAR JUNCTION 220KV
MAR	MARINJAN 220KV
GAD	GIAD 220KV
KLX	KILO X 220KV
JAS	JABEL AWLIASTATION 220KV
IBA	IED BABIKER 220KV
FRZ	FREE ZONE 220KV
SHN	SHANDI 220KV
ATB	ATBARA 220KV
MSH	MASHKOUR 220KV
MHD	MAHDIA 220KV
RBK	RABAK 220KV
MRK	MRKHIAT220KV

PORT	PORTSUDAN 220KV
MWT	MARWI TOWN 220KV
DEB	DEBA 220KV
DON	DONGOLA 220KV
KHN	KHARTOUM NORTH 110KV
SNP	SENNAR POWER PLANT 110KV
KUK	KUKU 110KV
KLX	KILO X 110KV
FAR	FAROUG 110KV
LOM	LOCAL MARKET 110KV
IBA	IED BABIKER 110KV'
IZG	IZERGAB 110KV
MHD	MAHDIA 110KV
OMD	OMDURMAN 110KV
MUG	MUGRAN 110KV
SHG	SHAGRA 110KV
JAS	JABEL AWLIA STATION 110KV
GAD	GIAD 110KV
BAG	BAGAIR 110KV
HAS	HASSAHIESA 110KV
HAG	HAG ABDALLAH 110KV
MAR	MARINJAN 110KV
SNJ	SENNAR JUNCTION 110KV
MIN	MINA ALSHAREF
BNT	BANAT
IZB	IZBA
IZG	IZERGAB

KHE	KHARTOUM EAST
GAM	GAMOEIA
GER	GERBA
SHD	SHIHIDI
GRB	GRBA
GDF	GADAREF
SNG	SENGA
FAO	FAOW
RNK	RANK
KSL	KASALA
SHK	SHOWAK
HWT	HAWATA
ORBK	OLD RABK
TND	TANDALTY
UMR	UM RWABA
MAN	MANAGEL
OBD	OBIED
GND	GENAD
NHAS	NEW HASAHESA
FUL	FULA
WWA	WAWA
VCI	Voltage Change Index
IEEE	Institute of Electrical and Electronic Engineers

LIST OF SYMBOLS

α	Acceleration factor
a	Increasing in bus MW
b	Increase in bus MVar
δ	Power Angle