

الآية

يَرْحَمِ اللَّهُ الَّذِينَ آمَنُوا وَعَمِلُوا الصَّالِحَاتِ لَعَلَّهُمْ يَرْجِعُونَ
وَالَّذِينَ آمَنُوا وَعَمِلُوا الصَّالِحَاتِ لَنُدْخِلَنَّهُمْ
بِإِذْنِ اللَّهِ فِي دَرَجَاتٍ مُّتَبَعِينَ
وَنَجْعَلُ لَهُمُ اللَّهُ أَسْمَاءً حَسَنًا
مُّتَّبِعَةً لِلَّذِينَ يَدْعُونَ
تَدْعُوهُ لَعَلَّهُمْ
يَرْجِعُونَ

التوبة (105)

DEDICATION

To

My Dearest Parents who are the part of my soul and whose love, affection and confidence enabled me to achieve this goal.

TO

my brothers Khidir, Yousif and Mohammed and to my sister Alzahraa for their help and patience, for every period I was away.

TO

the soul of my grandmother (Fatima), may Allah forgive her and grant her his highest paradise (Ameen).

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Abstract

The Static VAR Compensator provides reactive power and voltage support to the transmission system by switching local SVC capacitors and controlled reactor. The SVCs are needed the most during network disturbances. At these occasions they may make the difference between a network collapse and successful continued operation, The basic task of the SVC fault clearance system is to detect a specified class of power system faults and abnormalities and to disconnect the associated item of plant from the rest of the power system, The fault clearance system shall perform with high reliability, speed, selectivity and sensitivity.

This thesis will focus on the control based over/under-current and thermal overload protection for the SVC and also on the relay-based protection included in the SVC installation will also be discussed.

The simulation will focus on applying different types of faults which may accrue in LOCALMARKET SVC substation and how they can be detected and cleared by the protection system of the SVC. The analysis is carried out using MATLAB SIMULINK software.

المستخلص

معوذات القدرة الرد فعلية الساكنة تقوم بدعم نظام الجهد والقدرة الرد فعلية بالنسبة لمنظومة نقل القدرة الكهربائية. هذه المعوذات يجب توفرها في حالة حدوث مشكلة في منظومة القدرة الكهربائية عند هذه اللحظات قد يمثل وجود هذه المعوذات الحد الفاصل بين استمرار واستقرارية النظام وبين الانهيار التام. المهمة الأساسية لمنظومة الحماية الكهربائية لهذه الوحدات هي ان تقوم باكتشاف الاعطال داخل هذه المنظومات وعزل الاجزاء المتضررة عن بقية المنظومة. يجب ان يتصف نظام الحماية بالاعتمادية و الحساسية و الاستقرار و السرعة عند فصل الاعطال.

في هذا البحث يتم التعرض لطرق حماية وحدات معوذات القدرة الرد فعلية الساكنة المبنية في منظومة التحكم و كذلك تلك المخصصة لحماية كل مكون من مكونات منظومة معوذات القدرة الرد فعلية.

نمذجة النظام التي سوف تتم بواسطة برنامج MATLAB SIMULINK ستوضح كيف ان لنظام الحماية القدرة علي ان يكتشف و ان يعزل عدد من الاعطال التي تم يمكن ان تحدث لمعوذات القدرة الرد فعلية الساكنة الموجودة في محطة السوق المحلي التحويلية.

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LIST OF SYMBOLS

| | |
|----------|----------------------------|
| α | Thyristor firing angle |
| i | Current [A] |
| L | Inductance [H] |
| v | Voltage [V] |
| X | reactance of reactor |
| P | Active power [W] |
| Q | Reactive power [VAr] |
| S | Apparent power [VA] |
| ω | Synchronous speed |
| X | Reactance [Ω] |
| R | Resistance |
| R_s | stabilizing resistor |
| I_n | Rated CT Secondary Current |
| R_{ct} | CT resistance |

| | |
|-------|---------------------------------|
| R_l | Pilot wire resistance |
| 87V | Voltage Differential protection |

LIST OF ABBREVIATIONS

| | |
|------------|--|
| FACTS | Flexible Alternating Current Transmission System |
| SVC | Static Var Compensator |
| TCR | Thyristor Controlled Reactor |
| CT | Current Transformer |
| DC | Direct Current |
| AC | Alternating Current |
| CB | Circuit Breaker |
| FC-TCR | Fixed Capacitors & Thyristor Controlled Reactor |
| TSC-TCR | Thyristor Switched Capacitors & Thyristor Controlled Reactor |
| IDMT | Inverse Definite Minimum Time |
| SI | Standard Inverse |
| VI | Very Inverse |
| EI | Extremely Inverse |
| DT | Definite Time |
| <i>TMS</i> | Time Multiplier Setting |
| I_s | relay setting current |
| TD | Time Dial setting |
| SCB | Shunt Capacitor Bank |
| MV | Medium voltage |
| HV | High voltage |
| LV | Low voltage |