

الآية:

{يَرْفَعِ اللَّهُ الَّذِينَ آمَنُوا مِنْكُمْ وَالَّذِينَ أُوتُوا الْعِلْمَ

{دَرَجَاتٍ

{المجادلة: 11}

## DEDICATION

*Gifting expressed to*

*Our mothers and fathers, to all teachers of Sudan  
University for Science and Technology, College of  
Engineering, School of Electrical and Nuclear  
Engineering.*

# **ACKNOWLEDGEMENT**

God thanks first and foremost, a good reconcile, His help, and on w  
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comrades who stood by our side.

## **ABSTRACT**

This project presents an overview of the state of the art in reactive power compensation technologies. The principles of operation, design characteristics and application examples of VAR compensators implemented with thyristors and self-commutated converters are presented. Static VAR Generators are used to improve voltage regulation, stability, and power factor in ac transmission and distribution systems. Examples obtained from relevant applications describing the use of reactive power compensators implemented with new static VAR technologies are also described. A SIM Power toolbox in MATLAB 2016a is used to carry out simulations of the system under study and detailed results are shown to assess the performance of SVC and STATCOM on the voltage of the system .

## مستخلص

تناول هذا البحث التقنيات المستخدمة في تعويض القدرة الردية في انظمة نقل وتوزيع القدرة من حيث نظرية العمل و التصميم و الخصائص التشغيلية و تطبيقاتها .وكذلك اهمية تعويض القدرة الردية ودورالتعويض في تحسين معامل القدرة،واستقرارية الشبكة ,و تنظيم الجهد.

باستخدام برنامج MATLAB تم عمل مقارنة بين أحدث وأكثر التقنيات المستخدمة حالياً (STATCOM&SVC) وذلك بعرض الرسومات التي توضح أداء و تأثير كل منهما.

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## LIST OF SYMBOLS

<b>FACTS</b>	FLEXBLE AC TRANSMISSION SYSTEM	
<b>HVDC</b>	HIGH VOLTAGE DC	
<b>STATIC</b>	SYNCHRONOUS COMPENSATOR	
<b>DVR</b>	DYNAMIC VOLTAGE RESTORS	
<b>MEL</b>	MINIMUM EXCITATION LIMIT	
<b>URA</b>	UNDEREXCITED REACTIVE AMPER	
<b>UPCS</b>	UNIFIED POWER FLOW CONTROLLERS	
<b>TSC</b>	THYRISTOR SWITHED CAPACITORS	
<b>TCR</b>	THYRISTOR CONTROLLED REACTOR	
<b>TCSC</b>	THYRISTOR CONTROLLED AND SERIES CAPACITOR	
<b>SSSC</b>	STATIC SYNCHRONOUS SERIES COMPENSATOR	
<b>SVC</b>	STATIC VAR COMPENSATOR	
<b>FCTCR</b>	FIXED CAPACITOR WITH THYRISTOR CONTROLLED REACTOR	
<b>BIL</b>	BASIC INSULATION LEVEL	
<b>SSR</b>	SUB SYNCHRONOUS RESONANCE	