شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم

# بسم الله الرحمن الرحيم

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*MONA MAGHRABY*

Cairo University

# POWER SYSTEM OPERATION IN THE PRESENCE OF FLEXIBLE PROSUMERS CONSIDERING SYSTEM CONGESTION

By

**Mayar Mohsen Mostafa Madboly**

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
**MASTER OF SCIENCE**
**in**
**Electrical Power and Machines Engineering**

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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Under the Supervision of

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**Title of Thesis:**

Power System Operation in the presence of Flexible Prosumers considering System Congestion

**Key Words:**
Optimal power flow, flexible prosumers, optimization, congestion, reactive power

**Summary:**

In this thesis, the optimal operation of the power system is studied using different objective functions: minimum total generation cost, minimum active power losses, minimum specific generation cost, minimum average energy cost. The effect of congestion on the voltage and reactive power output as well as the system performance is analyzed. The system performance is assessed through some key performance indices. Two IEEE benchmark systems which are IEEE 5-bus and 14-bus systems were used to test the formulations and algorithms. The model also includes variable loads and prosumers whose presence proved to be effective in dealing with power system congestion. The use of flexible loads and prosumers benefited the power system by reducing the system costs and losses. Additionally, the voltage profile of the system was enhanced.

# Disclaimer

I hereby declare that this thesis is my own original work and that no part of it has been submitted for a degree qualification at any other university or institute.
I further declare that I have appropriately acknowledged all sources used and have cited them in the references section.

Name: Mayar Mohsen Mostafa Madboly Date: / /2021

Signature:

# Dedication

Foremost, I dedicate all the effort and work done in this thesis to Allah, my creator. I cannot thank Allah enough for everything especially blessing me with the most supporting, empowering, and loving family. To the people who had my back: Fathia El-Toukhy (my grandmother), Samah Adawy (my mother), Mohsen Madboly (my father), and Mohamed Mohsen (my brother).

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