

Bachelor's Thesis

Bachelor's degree in Industrial Technologies and Economic Analysis

Offshore wind park optimization

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ETSEIB

Abstract

Short and must include results.

Keywords: offshore wind power plant, power flow, renewable energy, HVAC, transmission system, optimization, mixed-integer programming, genetic algorithms.

MSC codes: 90C11, 90C15, 90C29, 90C30, 90C59

Resum

Short and must include results.

Paraules clau: parc eòlic marí, flux de potència, energia renovable, HVAC, sistema de transmissió, optimització, programació enter mixta, algoritmes genètics.

Codis MSC: 90C11, 90C15, 90C29, 90C30, 90C59

Resumen

Short and must include results.

Palabras clave: parque eólico marino, flujo de potencia, energía renovable, HVAC, sistema de transmisión, optimización, programación entera mixta, algoritmos genéticos.

Códigos MSC: 90C11, 90C15, 90C29, 90C30, 90C59

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Nomenclature

The next list describes several abbreviations that will be later used within the body of the thesis.

AC Alternating Current

DC Direct Current

HVAC High Voltage Alternating Current

HVDC High Voltage Direct Current

MVRSM Mixed-Variable ReLU-based Surrogate Modelling

N-R Newton-Raphson Method

OPF Optimal Power Flow

OSS Offshore Substation

OWF Offshore Wind Farm

OWPP Offshore Wind Power Plant

PF Power Flow

SCR Short Circuit Ratio

XLPE Cross-Linked Polyethylene

1 Preface

Arguably, climate change is one of the most pressing challenges we are facing today as humanity. That's why I wanted to develop a project revolving around sustainable solutions for the energy system of the future. As an engineering student I wanted to explore how renewable energy sources can be integrated into the grid and what challenges it poses, that's why I contacted Oriol Gomis to explore thesis topics within this field.

He introduced me diverse research areas and also eRoots, a spin-off from the UPC-CITCEA that develops software solutions for modern grid modelling, analysis and optimization. That is how I ended up as an intern at eRoots and developed this thesis in collaboration with them.



Figure 1: Una imatge del logo de l'ETSEIB

Per no repetir informació és millor referir-se a altres apartats [2](#).

I recorda, sempre és important citar a la bibliografia [\[2\]](#).

La bibliografia ha d'estar ordenada, en teneu un exemple a la pàgina [11](#)

2 Introduction

2.1 Motivation

During the industrial engineering studies you get in touch with a wide range of topics that can be applied to different fields. During the last years to get introduced to electrical engineering fundamentals and its applications. I discovered a deep interests for those topics and realized is a key tool for ensuring a future towards energy systems that can inegrate renwable energy sources.

The main driving force behind choosing this topic is the need to develop a sustainable energy system that can ensure a future for the next generations. The energy system is a key player in the fight against climate change. Moreover, the last report on global sustainable development [1] highlights how *Goal 7: Affordable and clean energy* is failing to meet its targets and evenmore notices a backward trend in the 2020-2023 period.

This thesis is my modest and passionate contribution to provide sustainable solutions for our future.

2.2 Scope

hola

2.3 Objectives

2.4 Outline

3 Grid to study and theoretical background

4 Minimization problem

5 Optimization methods

6 Case studies

7 Conclusions

7.1 Outcome

7.2 Future work

8 Planning and viability studies

8.1 Time Planning

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8.3 Environmental assessment

8.4 Social and gender equality assessment

Acknowledgements

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Gràcies als meus amics de la uni sobretot, papa, mama i Mire.

Bibliografia

- [1] *Global Sustainable Development Report (GSDR) 2023*, United nations, 2023. [Online]. Available: [Global Sustainable Development Report \(GSDR\) 2023](#)
- [2] AUTORS DEL TEXT, *Títol de l'obra*, EDITORIAL i publicació
Consultat *quotiens necesse est*