

POLYTECHNIC OF TURIN
MASTER's Degree in DATA SCIENCE AND
ENGINEERING



**Politecnico
di Torino**

MASTER's Degree Thesis

TITLE

Supervisors

Prof. LUCA CAGLIERO

Prof. DAMIEN ERNST

Candidate

MAURIZIO VASSALLO

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Abstract

Abstract (italian version)

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*“HI”
Goofy, Google by Google*

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Acronyms

AI

artificial intelligence

Chapter 1

Introduction

The increasing of global temperature and the worsening of the air quality are posing a real problem for the environment. The changes observed in Earth's climate are primarily driven by human activities, particularly fossil fuel burning. This fossil fuels are used to produce the energy, consumed for everyday purposes, but during the process they also produce CO_2 (carbon dioxide).

In order to improve the situation, countries are asked to go through a process of decarbonization: the reduction of carbon dioxide emissions through the use of low carbon power sources. These low carbon power sources usually are renewable energy such as sun, wind, geothermal heat.

The 2015 Paris Agreement set an ambition to limit global warming to well below 2°C above pre-industrial levels and pursue efforts to limit it to 1.5°C - in part by pursuing net carbon neutrality by 2050. The substantial reduction of global greenhouse gas emissions (including CO_2) will limit the increase of global temperature [1].

The emerging trend of decarbonization is introducing more and more renewable power energy devices inside the distribution networks. These devices introduce some complications for the distribution of power and voltage in the networks, indeed the nets are moving from unidirectional power flow (from the distribution system to the consumers) to a bidirectional power flow (in this case the consumers and also producers and the exceed energy can be transported from the consumers to the distribution system).

Active voltage control (local and global problem, constrained optimization problem)

Voltage control has been studied for years but only comes under spotlight due to the increasing penetration of distributed resources. Moving from unidirectional power flow to bidirectional power flow: Active Distribution Network (definition?)

Optimal power flow

Low observability of the network/grid

Chapter 2

Related work

OLTC for regulating the voltage, but they are installed in substations (far from the end of the line)

State-of-the-art voltage control strategies: -reactive power dispatch base on optima power flow, -droop control based on local voltage and power measurements

Appendix A

Galileo

```
1 import os
2 os.system("echo 1")
```

$\mathcal{O}(n \log n)$
numpy

Bibliography

- [1] United Nations Framework Convention on Climate Change (UNFCCC). *THE PARIS AGREEMENT*. 2015 (cit. on p. 1).