

A-Core Container

Thermal Power Plant Wind Power Storage



Overview

Wind power curtailment becomes a major problem in many countries. The wind accommodation mechanisms and energy saving potentials for the combined heat and power plant with thermal energy storage, electric heat pump and both should be evaluated more systematically and accurately to accommodate more wind power. Heat-power peak shaving capacities for thermal energy storage, electric heat pump and both are analyzed using a graphical method, while the operation strategy is proposed to maximize wind accommodation. A simulation model for wind power accommodation considering the energy balances and constraints of all production units is developed based on EnergyPRO. A regional energy supply system in Jilin Province, China is selected as the case study, where the influences of

- Heat-power decoupling by thermal energy storage and electric heat pump are studied.
- A dynamic optimization model to maximize wind accommodation is developed.
- An operation strategy to accommodate wind power is proposed.
- The selection of peak shaving devices on wind power accommodation is studied.

Heat-power decoupling Peak shaving Wind power accommodation Wind curtailment.

Abbreviation AGC

Automatic generation control

CHP

Combined heat and power

COP

Coefficient of performance of a heat pump

DH

District heating

EB□

Electric boiler

EHP□

Electric heat pump

GA□

Genetic algorithm

GWEC□

Global Wind Energy Council

HB□

Heat boiler

HP□

Heat pump

IEA□

International energy agency

IHPP□

The thermal power peak shaving integrated system

NDRC□

National Development and Reform Commission

NEA□

National Environment Agency

P2H□

Power to heat

TES

Thermal energy storage

VRE

Variable renewable energy

Coal.

Recently, shares of renewable energies in most countries rise steadily, and it can be seen that more and more renewable energies will be exploited in the near future in order to decarbonize the energy sector and combat the climate change. Under this background, hybrid renewable microgrids have been studied and optimized to evaluate variable renewable energy (VRE) energy transition [1]. Among different VREs, global installed wind power capacity at the end of 2021 was 837GW and 40.4% of capacity was installed in China [2]. International energy agency (IEA) reported that the predicted wind power production would be 7932.5 TWh in 2030, which is about 3.2 times more than that in 2021 [3], with an average annual growth rate of about 19%. In addition, the predicted share of wind power is still higher than solar in.

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