

How to regulate peak demand of nuclear power?

As the use of clean energy such as wind power and nuclear power has been increasing, the base load operation of nuclear power units usually means huge pressure for local power systems in regulating peak demand. In order to use more regulation resources, a multi-area joint optimization model involving peak regulating of nuclear power is proposed.

What is the peak load regulating mode of the nuclear power system?

In Mode 2, the nuclear power system runs in "12-3-6-3" load tracking mode for peak load regulating. The load valley output period is from 3:00 to 9:00, the peak load regulating depth is 50%, and the power of peak shaving is 2000 MW. The valley-to-peak difference is reduced from 9648 MW to 7648 MW, which is reduced by 20.7%.

Why is the demand for nuclear power plants to implement peak shaving?

So far, the nuclear power has been expanding its presence in the regional power grid, and China's nuclear power units in operation usually operate at full power as base load, which creates great challenge for the regional power system in peak load regulation. Therefore, the demand for nuclear power plants to implement peak shaving is increasing.

Is peak regulating of wind power better than tie-line power optimization?

In general, it is observed from the wind curtailment that both peak regulating of nuclear power and tie-line power optimization can better contain the negative peak regulating of wind power output.

The joint operation mode of nuclear power and battery energy storage power station depends on the peak load regulation demand, and the typical daily peak shaving gap curves in 2026 and 2027 are shown in Fig. 2 (a) and (b), respectively. It can be seen that the peak shaving gap in flood and dry seasons in 2026 and 2027 last for 1-2 h each time ...

After quantitatively analysing the peak load regulation cost of nuclear power, the optimal objective is set to minimise the total operation cost including the fuel cost, the start-stop cost, and the peak load regulation cost. ... constraints of the nuclear power unit's daily output performance and power characteristic constraints of the ...

This article proposes a combined optimal dispatch model of nuclear-thermal-energy storage with nuclear power participating in equivalent peak load regulation. By the energy transfer capacity ...

On May 14, 1968, the first PSPS in China was put into operation in Gangnan, Pingshan County, Hebei Province. It is a mixed PSPS. There is a pumped storage unit with the installed capacity of 11 MW. This PSPS

uses Gangnan reservoir as the upper reservoir with the total storage capacity of $1.571 \times 10^9 \text{ m}^3$, and uses the daily regulation pond in eastern Gangnan as the lower ...

To provide flexibilities for peak regulations in power systems while addressing renewable energy uncertainties, this article proposes a two-stage stochastic unit commitment model with peak ...

Based on the peak shaving experience of French nuclear power units, from the aspects of the power regulation rate and peak shaving depth, nuclear power peak shaving has a certain flexibility [24 ...

Downloadable (with restrictions)! Nuclear power peak regulation is an effective means to alleviate the difficult situation of peak regulation, adapt to the high penetration of photovoltaic power, and solve the problem of increasing load peak-to-valley difference. However, the peak regulation cost quantification model of nuclear power is not yet complete, the safety constraints of nuclear ...

At present, the utilization of the pumped storage is the main scheme to solve the problem of nuclear power stability, such as peak shaving, frequency regulation and active power control [7]. [8] has proved that the joint operation of nuclear power station and pumped storage power station can peak shave more flexibly and economically.

In this paper, according to the number of failures and power loss per year in each region, the risk of peak load regulation is calculated comprehensively and quantitatively, and the risk cost ...

Nuclear power plants have to be faced with urgent requirement of participating in peak load regulation of power grid. The peak load regulation performances of nuclear power plant (NPP) such as its power regulation characteristics, its enduring capability of long-term low-power operation and stretch-out operation characteristics were researched. Based on the calculation and analysis ...

Owing to the fact that large-scale peak-load-regulation nuclear power turbine units' thermal signal is greatly influenced by background noise and has non-stationary and nonlinear characteristics ...

After discussion of nuclear power plants' typical operation modes and safety requirements, safety constraints are set. With full consideration of the objective function and constraints, an optimal ...

Nuclear power plants have to be faced with urgent requirement of participating in peak load regulation of power grid. The peak load regulation performances of nuclear power plant (NPP) such as its ...

By increasing the capacity of heat storage device, the peak load regulation can be realized when nuclear power is regarded as the base load in power grid. A joint nuclear-thermal-wind-heat ...

the nuclear power with pumped-storage power can improve the peak load regulating ability of the system;

thereby enhance the nuclear power accommodation level of the system. It is an ideal operation mode. Therefore, research on the integrated operation mode of nuclear power station and pumped-storage power station has important

The status quo and barriers of peak-regulation power in China were reviewed in Ding et al. (2015). Then, the policy recommendations of developing pumped storage and gas-fired generation peaking units are proposed. The peak-regulation problems of wind power integrated power systems were reviewed in Yuan et al. (2011).

Another study by Li et al. [16] proposed the integration of nuclear power plant with a cryogenic-based energy storage technology and secondary power generators. The investigated configuration showed the potential of providing a peak power output that is 2.7 times greater than the baseload power output of 250 MW el. Several other studies ...

Increasing proportion of nuclear power plants (NPPs) and prominent disparity of peak load and valley load in electric power industry has caused great difficulties to peak load ...

Generally, the wind power output is low in the daytime and high in the night, exhibiting obvious "negative peak load regulation" characteristics. The situation of peak load ...

R Risk cost of peak load regulation in NPP CW R Risk cost of wind power abandon-ment CENV
Environmental cost of the system CN PS Peak load regulation cost coef?cient of nuclear power unit CT CE /C
CT

To balance the demand and supply at off-peak hours, nuclear power plants often have to be down-regulated particularly when the installations exceed the base load requirements. Part-load operations not only increase the electricity cost but also impose a detrimental effect on the safety and life-time of the nuclear power plants.

Owing to the fact that large-scale peak-load-regulation nuclear power turbine units" thermal signal is greatly influenced by background noise and has non-stationary and nonlinear characteristics, this paper proposes a new fault diagnosis method for thermal sensors based on an improved independent component analysis (Improved-ICA) algorithm and ...

Base on Nuclear Power Plant (NPP) participating in peak load regulation of power grid, this paper studies the operation mode of hydropower, thermal power and NPP in Combined Peak Load Regulation. The optimization model for Peaking depth of NPP was set up. The case based on actual power grid were calculated and analyzed, results of the research show that in ...

Based on extensive research, introduced the peak load regulation characteristics and capacity of different nuclear power plant (NPP) in this paper. The running mode of NPP participating in peak load regulation of power system, combined operation tactics of NPP with other peaking power source and synergistic scheduling

of an integrated power generation system with wind, ...

See Figure 2 for the schematic diagram of the grid placement of the power units. Nuclear power units participate in peak load regulation operation of power grid according to G mode "15-1-7-1" and ...

Load Following Power Plant Base Load vs Peak Load Power Plants. Nuclear power plants may take many hours, if not days, to startup or change their power output. Modern power plants can and do operate as load-following power plants and alter their output to meet varying demands. But baseload operation is the most economical and technically simple mode of operation.

By analysing operation cost composition of different peak load regulation schemes in Table 4, the result shows that: without participation of nuclear power in the peak load regulation as Scheme 1 described, the start-stop conversion of thermal power units is frequent while the start-stop operation is relatively expensive, resulting in high ...

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After quantitatively analysing the peak load regulation cost of nuclear power, the optimal objective is set to minimise the total operation cost including the fuel cost, the start-stop cost, and ...

Nuclear power peak regulation is an effective means to alleviate the difficult situation of peak regulation, adapt to the high penetration of photovoltaic power, and solve the problem of increasing load peak-to-valley difference. However, the peak regulation cost quantification model of nuclear power is not yet complete, the safety constraints of nuclear ...

J Zhao, D.C. Liu, Q.S. Lei, Analysis of nuclear power plant participating in peak load regulation of power grid and combined operation with pumped storage power plant. Proceedings of the CSEE, vol. 31, issue 7, pp. 1-6, 2011.

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The fast peak-load regulation capability of CFPP is the key. According to the available literature, the lowest load rate of thermal power plants is about 30 % [1] and the fastest load change rate is about 4.5 %/min [2]. However, some components of traditional steam Rankine cycle power plants, such as condensers, have

large thermal inertia due to their large size and ...

Thus, the traditional peak shaving model of fixed gear nuclear power dispatch is improved, and the peak shaving depth is continuous within the safety regulation range of nuclear power. Then, based ...

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