

What is the energy criterion for coal burst proneness?

To evaluate the coal burst proneness more precisely, a new energy criterion namely the residual elastic energy index was proposed. This study begins by performing the single-cyclic loading-unloading uniaxial compression tests with five pre-peak unloading stress levels to explore the energy storage characteristics of coal.

Does residual elastic energy index determine coal burst proneness?

Considering the destruction process and actual failure characteristics of coal specimens, the accuracy of evaluating coal burst proneness based on the residual elastic energy index was examined. The results indicated that the residual elastic energy index enables reliable and precise evaluations of the coal burst proneness.

1. Introduction

What is a low strain rate of coal rock?

When the strain rate is $1 \sim 10^{-5} \text{ s}^{-1}$, the internal elastic strain energy of coal rock accumulates slowly in the rock sample, so the inhibition effect and promotion effect of elastic energy of coal rock are low at low strain rate of $1 \sim 10^{-5} \text{ s}^{-1}$.

What is a peak-strength strain energy storage index?

Gong et al. proposed a peak-strength strain energy storage index W_{ETP} based on the linear energy storage law (i.e. in the rock uniaxial compression test, the elastic strain energy of rock specimen increases linearly with the input energy), which was modified from WET.

How to predict coal burst risk in a coal mine?

The burst proneness of coal is an intrinsic factor in the occurrence of coal burst. Thus, there is a fundamental need to evaluate the burst proneness of coal to predict the coal burst risk in a coal mine. Various criteria have been proposed for evaluating the coal burst proneness using energy, strength, failure time, and elastic modulus.

What is the impact tendency of coal rock?

The impact tendency of coal rock is analyzed by laboratory rock mechanics test. The uniaxial compressive strength of coal rock is 13.33 MPa, the elastic energy index is 6.85, the impact energy index is 5.71, and the dynamic failure time is 649 ms. Therefore, it can be determined that the sample is a strong impact tendency coal rock.

The massive greenhouse gas emissions have led to increasingly serious global warming issues [1]. To address this issue, it is crucial for CO₂ emissions mitigation [2, 3]. As reported by the International Energy Agency, coal-fired power plants are responsible for emitting approximately one billion tons of CO₂ per annum, constituting a predominant source of global ...

Proximate analysis, including ash, volatile matter, moisture, fixed carbon, and calorific value, is a fundamental aspect of fuel testing and serves as the primary method for evaluating coal quality, which is critical for the processing and utilization of coal. The traditional analytical methods involve time-consuming and costly combustion processes, particularly ...

The ratio of energy storage capacity over total demanded ... Accounting for inflation to 2007 using the producer price index ... Y. et al. EROI analysis for direct coal liquefaction without and ...

Conventional rockburst indices based on energy theory include the strain energy storage index, energy release rate, and the bursting efficiency ratio. The strain energy storage index is the simplest rock-burst liability indicator and is defined as the ratio of elastic energy to dissipation energy (U_e / U_d) in the stress level of 80-90% of ...

New energy belongs to green and low-carbon energy, which will become a strong support for clean energy transformation and the realization of "carbon peak and carbon neutrality" [1]. However, at the present stage, problems such as uncertainty, intermittency and uncontrollability of new energy have not been substantively solved [2]. There are still problems ...

The instability index and critical elastic kernel ratio for P-R structures considering the creep effect were presented. ... W. Ngaha Tiedeu, and J. Ambre. 2020. "Preliminary feasibility analysis of a hybrid pumped-hydro energy storage system using abandoned coal mine goafs." Appl. Energy ... C., and Z. Agioutantis. 2019. "Analysis of ...

The bursting liability of coal, referring to the characteristic of coal to accumulate strain energy and produce impact damage, is an important factor influencing the occurrence and extent of rock burst disasters in coal mines. Two indicators-the elastic strain energy storage coefficient and energy release coefficient-are proposed based on the energy evolution ...

The underground reservoir of a coal mine provides an effective technical solution for water shortage in arid and semi-arid mining areas in western China (Song et al. 2020). As shown in Fig. 1, the underground reservoir technology has been implemented in the 2 2 coal gob of Shang-wan Coal Mine, that is, through the connection between the artificial dam ...

The rationality of using strain energy storage index (Wet) for evaluating rockburst proneness was theoretically verified based on linear energy storage (LES) law in this study.

In this study, a modified bursting energy index, which is defined as the ratio of elastic strain energy at the peak strength to the released strain energy d . at the post-peak ...

Highlights 1 o We explore the retrofitting of coal-fired power plants as grid-side energy storage systems 2 o We perform size configuration and minute-scale scheduling co-optimisation of these ...

We estimate the electrical energy return on energy invested ratio of CCS projects, accounting for their operational and infrastructural energy penalties, to range between 6.6:1 ...

In compressed air energy storage systems, throttle valves that are used to stabilize the air storage equipment pressure can cause significant exergy losses, which can be effectively improved by adopting inverter-driven technology. In this paper, a novel scheme for a compressed air energy storage system is proposed to realize pressure regulation by adopting ...

Coalbed methane (CBM) is often stored in coal rocks in an adsorbed state, and because of its extremely high calorific value and the fact that it produces almost no exhaust gas after combustion, it is a clean, unconventional energy source and a strategic national reserve resource [1,2,3,4,5,6,7,8] al rocks are the main reservoir of CBM, and the mechanical ...

The effective elastic energy release rate index KET, which can comprehensively consider the coal strength, the energy evolution and the failure time, was proposed to evaluate the coal ...

China's energy consumption will continue to grow. The coal-based energy resource endowment and the stage of economic and social development determine that China's development will still be inseparable from coal for a long time in the future (Xie et al. 2021; Xie 2022; Peng 2017; Lai and Fang 2022). With the increasing mining depth and production ...

The relationship between the residual elastic energy ratio and cyclic index shown in Fig. ... which are between 68 and 71%. The residual elastic energy ratio of coal samples is similar; however, there are certain differences in the failure form and stress intensity. ... Ju Y, Gao F, Xie HP, Wang P (2014) Energy analysis on damage of coal under ...

Coal analysis techniques are specific analytical methods designed ... Aside from physical or chemical analyses to determine the handling and pollutant profile of a coal, the energy output of a coal is determined using a bomb calorimeter ... The simplest test to evaluate whether a coal is suitable for production of coke is the free swelling ...

Kidybi?ski [9] and Singh [10] thought that the elastic strain energy stored in coal is closely associated with the occurrence of coal or rock bursts, and introduced the strain energy storage index (W ET), which is defined as the ratio of the elastic strain energy to the dissipated strain energy at a stress level equal to 80-90% of the ...

CO₂ is one of the main gases causing the greenhouse effect. With the increased amount of resources such as oil and coal consumed, the global warming problem gets worse (Liu et al. 2018). To solve the sharp increase in

carbon dioxide emissions, the technology of carbon capture, utilization, and storage (CCUS) has attracted much attention in the energy ...

Based on the coupling of the three-stage compression and four-stage expansion LAES system with an energy storage/release pressure of 18/7.2 MPa and the coal-fired power unit, the coupling point analysis of the energy storage and energy release processes of the coupling system is carried out under 30%THA and 100%THA conditions of the coal-fired ...

Currently, methanol production is a high carbon intensity process, which is mainly from natural gas or coal. Compared with natural gas to methanol, coal to methanol (CTM) has higher carbon emissions, producing 2.2-4.3 t-CO₂/t-methanol [2], [4], [5], [6], about 2.5-4.9 times [7] than the former. In the CTM process, carbon redundancy and high carbon emissions ...

The government aims to minimize GHG emissions in the power generation sector, one of which is the phase-out of coal power plants and replacing them with integrated photovoltaic (PV) power plants with battery energy storage systems (BESS). A cost-benefit analysis compared two development scenarios for 2023-2060.

As mentioned before, the proximate analysis measuring the coal physical structure. This analysis approximately determines the weight of FC, volatile matters, coal moisture content and ash of the coal. According to Qian Zhu (2014) the FC is indicating the coal energy which is present in heating value of the coal during combustion.

where l_g is the energy quality coefficient of gas. $T_{burn,g}$ is the theoretical combustion temperature of the gas. The theoretical combustion temperature of the gas in the gas equipment is generally 1,300°C (1,573.15 K), so the theoretical combustion temperature of the gas in this article is 1,300°C, which accord with the reality and technical level of China.

Studying the evolution of characteristics associated with the energy of gas-bearing coal is essential for exploring the mechanism of coal and gas outbursts and disaster prevention. In this paper, uniaxial compression and acoustic emission (AE) localization experiments were conducted using coal under different gas pressures. The mechanical ...

A coal burst is a sudden dynamic disaster that produces deformation and damage in a coal and rock mass while violently releasing energy. With the gradual expansion of coal mining into deeper and more geologically complex areas, coal bursts have become increasingly prominent, seriously limiting safe and efficient production in coal mines (Dai et al. ...

The strain energy storage index WET was widely used to evaluate coal burst liability, but the scientific evidence for selecting the unloading stress level interval (around 80% ...

The heat from solar energy can be stored by sensible energy storage materials (i.e., thermal oil) [87] and thermochemical energy storage materials (i.e., $\text{CO}_3\text{O}_4/\text{CoO}$) [88] for heating the inlet air of turbines during the discharging cycle of LAES, while the heat from solar energy was directly utilized for heating air in the work of [89].

This index, called the effective elastic strain energy release rate (EESERR) index, fully reflects the evolution of the energy in the coal samples during the sequence of ...

1 INTRODUCTION. As a primary energy source in China, coal plays a crucial role in the national economy. 1-3 The shallow underground coal seams are gradually being exhausted, and therefore, mining deep coal seams is imperative. 4-6 As the mining depth increases, the geological and technical conditions for mining coal become progressively complex, and the ...

Bursting liability index of coal based on nonlinear storage and release characteristics of elastic energy: LU Zhiguo^{1,2,3}, JU Wenjun^{1,2,3}, GAO Fuqiang^{1,2,3}, YI Kang^{1,4}, SUN Zhuoyue^{1,2} (1. Coal Mining and Designing Branch, China Coal Research Institute, Beijing 100013, China; 2.

This review collates energy assessment data for the most common electricity generation methods and evaluates five Energy Ratios. The considered ratios are Energy Return on Investment (EROI) - standard and external, Energy Payback Time (EPT), Primary Energy Factor (PEF), and Resource Utilisation Factor (RUF). A common energy analysis framework, ...

Similarly, data from power plants in Germany and Austria [14, 15] show that transferring steam energy to molten salt and water can achieve storage capacities of up to 1000 MWH, much higher than the working capacity and operating time of steam energy storage. Further, several scholars have investigated different strategies for extracting steam ...

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