

Experimental and numerical investigation on the flow and heat transfer behaviors during a compression-cooling-expansion cycle using a liquid piston for compressed air energy storage Author links open overlay panel El Mehdi Gouda a b, Thibault Neu a c, Mustapha Benaouicha a, Yilin Fan b, Albert Subrenat c, Lingai Luo b

The International Gas Union (IGU) claimed that the global liquefied natural gas (LNG) trade achieved 316.5 million tonnes in 2018 with the annual increasing rate of 9.8% [1].LNG is playing a more and more important role in the global energy market due to its low greenhouse gas emission after combustion, ease of transportation and high energy-density for ...

Seasonal thermal energy storage technology involves storing the natural cold energy from winter air and using it during summer cooling to reduce system operational energy consumption[[19], [20], [21]].Yang et al. [22] proposed a seasonal thermal energy storage system using outdoor fan coil units to store cold energy from winter or transitional seasons into the ...

Realistically, no building air conditioning system operates at 100% capacity for the entire daily cooling cycle. Air conditioning loads peak in the afternoon -- generally from 2 to 4 PM -- when ambient temperatures are highest. Figure 2 represents a typical building air conditioning load profile during a design day.

Interest in energy storage is now increasing, especially for matching intermittent renewable energy with customer demand as well as storing excess nuclear or thermal power during the daily cycle. Compressed air energy storage (CAES) is one of the promising methods for energy storage, with high efficiency and environmental friendliness.

At present, energy storage technologies that can perform long-term, large-capacity and inter-seasonal regulation mainly include seasonal pumped storage [6], compressed air storage [7], hydrogen storage [8], natural gas storage [9], heat/cooling storage [10], etc. Among them, seasonal pumped storage and compressed air storage are the commonly ...

Alirahmi et al. [36] designed a hybrid energy storage system consisting of a compressed air energy storage system, a Brayton cycle, and a hydrogen production unit, ... In the integrated system, the feedwater of the BIGCC system is used to recycle the heat from the compressed air cooling in charging time, while the flue gas of the BIGCC system ...

The energy storage system can release the stored cold energy by power generation or direct cooling when the energy demand increases rapidly. ... Performance enhancement of conventional combined cycle power plant by inlet air cooling, inter-cooling and LNG cold energy utilization. Appl Therm Eng, 30 (14-15) (2010), pp.

2003-2010. View PDF ...

Indirect liquid cooling is a heat dissipation process where the heat sources and liquid coolants contact indirectly. Water-cooled plates are usually welded or coated through thermal conductive silicone grease with the chip packaging shell, thereby taking away the heat generated by the chip through the circulated coolant [5]. Power usage effectiveness (PUE) is ...

Techno-economic analysis of a liquid air energy storage (LAES) for cooling application in hot climates. Energy Procedia, 105 (2017), ... Thermodynamic analysis of a hybrid power system combining kalina cycle with liquid air energy storage. Entropy, 21 (2019), p. 220, 10.3390/e21030220. View in Scopus Google Scholar

The maximum net profit appears when the cooling energy storage is 500 GJ, and it is 82.7 % and 17.0 % higher than the net profit when the cooling energy storage is 200 GJ and 600 GJ, respectively. ... -environmental analysis and multi-objective optimization of an ice thermal energy storage system for gas turbine cycle inlet air cooling ...

Techno-economic analysis of a liquid air energy storage (LAES) for cooling application in hot climates. Energy Procedia, 105 (2017), ... Exergy analysis and optimization of a CCHP system composed of compressed air energy storage system and ORC cycle. Energy Convers Manag, 157 (2018), pp. 111-122, 10.1016/j.enconman.2017.11.055.

An integrated system based on liquid air energy storage, closed Brayton cycle and solar power: Energy, exergy and economic (3E) analysis ... Firstly, the air is pumped (PUMP1) to a higher pressure, concurrently releasing cooling in evaporators (EVAP). Subsequently, the air was heated through a heat exchanger (H1), where the thermal oil from ...

Adiabatic compressed air energy storage cycle efficiency with respect to storage temperature [92]. ... There is cooling of the air as it flows via the thermal energy storage device, followed by an after-cooler. From this stage, there is compression of the air until required pressure is achieved. This means that the temperature of the air is ...

Thermo-economic analysis of a pumped thermal energy storage combining cooling, heating and power system coupled with photovoltaic thermal collector: Exploration of low-grade thermal energy storage ... Alsagri [25] presented an air Brayton cycle PTES system for heat supply (hot water or space heating) or cooling (an absorption machine) and power ...

Furthermore, the energy storage mechanism of these two technologies heavily relies on the area's topography [10] pared to alternative energy storage technologies, LAES offers numerous notable benefits, including freedom from geographical and environmental constraints, a high energy storage density, and a quick response time [11]. To be more precise, during off ...

Using discharged air as cooling energy can improve the total energy efficiency of the system by 20-30%, achieving ... Off-design performances of gas turbine-based CCHP combined with solar and compressed air energy storage with organic Rankine cycle. *Energy Convers Manag*, 156 (2018), pp. 626-638, 10.1016/j.enconman.2017.11.082. [View PDF](#) [View ...](#)

Feasibility study of the application of a cooling energy storage system in a chiller plant of an office building located in Santiago, Chile. *Int. J. Refrig.*, 102 (2019) ... Life cycle assessment of a solar absorption air-conditioning system. *J. Clean. Prod.*, 240 (2019), Article 118206. [View PDF](#) [View article](#) [View in Scopus](#) [Google Scholar](#)

Review of innovative design and application of hydraulic compressed air energy storage technology. Author links open ... Long construction cycle. 3. Limited site selection. 4. ... and solar energies consumption. It primarily comprises a compressor, a turbine, a motor/generator, thermal storage, cooling storage, and an underwater flexible energy ...

Liquid air energy storage (LAES) can be a solution to the volatility and intermittency of renewable energy sources due to its high energy density, flexibility of placement, and non-geographical constraints [6]. The LAES is the process of liquefying air with off-peak or renewable electricity, then storing the electricity in the form of liquid air, pumping the liquid.

Liquid air energy storage (LAES) technology has received significant attention in the field of energy storage due to its high energy storage density and independence from geographical constraints. ... Due to the relatively small scale of the plant, significant losses in the cooling energy cycle resulted in a round-trip efficiency of only 8 % ...

A novel water cycle compressed air energy storage system (WC-CAES) is proposed to improve the energy storage density (ESD) and round trip efficiency (RTE) of A-CAES. The new system decreases electricity consumption by recovering and reusing the hydraulic pressure of water. The thermodynamic characteristics of WC-CAES are evaluated by energy ...

To reduce dependence on fossil fuels, the AA-CAES system has been proposed [9, 10]. This system stores thermal energy generated during the compression process and utilizes it to heat air during expansion process [11]. To optimize the utilization of heat produced by compressors, Sammy et al. [12] proposed a high-temperature hybrid CAES ...

The development of renewable energy is widely considered as the main way to solve the global energy crisis and environmental pollution problems caused by social development, and many countries have strongly advocated for the development of renewable energy [1], [2]. The International Energy Agency predicts that the renewable energy will ...

Energy storage air cooling cycle

The adiabatic compressed air energy storage (A-CAES) system can realize the triple supply of cooling, heat, and electricity output. With the aim of maximizing the cooling generation and electricity production with seasonal variations, this paper proposed three advanced A-CAES refrigeration systems characterized by chilled water supply, cold air supply, ...

The specific conclusions are as follows: (1) The cooling capacity of liquid air-based cooling system is non-monotonic to the liquid-air pump head, and there exists an optimal pump head when maximizing the cooling capacity; (2) For a 10 MW data center, the average net power output is 0.76 MW for liquid air-based cooling system, with the maximum ...

A novel integrated system for heating, cooling, and compressed-air energy storage (CAES) is analysed from a thermodynamic perspective. The system is based on asynchronous air compression and expansion to take advantage of daily ambient temperature oscillations, electricity pricing variations, and the discontinuous availability of renewable sources.

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