Solar energy combined with cold energy power generation

In modern times, worldwide requirements to curb greenhouse gas emissions, and increment in energy demand due to the progress of humanity, have become a serious concern. In such scenarios, the effective and efficient utilization of the liquified natural gas (LNG) regasification cold energy (RCE), in the economically and environmentally viable methods, ...

Solar energy is concentrated by solar concentrators and then divided into two parts through spectral beam-splitting film. The high-grade solar energy is utilized for photovoltaic power generation. The low-grade solar energy is converted into thermal energy, providing heat for DRM reactions, and producing grey hydrogen.

This study presents the optimal design of a dual-stage combined power generation cycle for LNG cold energy recovery with ORC, BC, and SC-CO 2 as basic cycles utilizing serial and parallel configuration methods. According to the characteristic of heat and cold sources, 12 dual-stage combined cycles are proposed, and their crucial design ...

The improved system integrates a precooler and solar collectors into a double-loop combined cycle system. A comparative analysis between the proposed system and conventional systems is done under the same optimization criteria. ... Therefore, in this paper, to increase the cold and pressure energy utilization ratio of LNG, an improved power ...

This integration of radiative cooling and PV power generation signals a transformative shift toward optimizing energy conservation without sacrificing the benefits of ...

A novel combined power cycle utilizing solar energy and LNG cold energy is proposed. ... Angelino and Invernizzi [18] also compared the performances of different CO 2 power generation cycles with LNG cold energy recovery. Liu and Guo [19] construct a novel cryogenic cycle with seawater as the heat source and LNG as the heat sink, which has ...

Several utilization ways of how to use LNG cold energy in power generation are discussed. Among them, LNG and gas turbine combined with CO 2 recovery cycle is recommeded. It is comprehensive usage of LNG cold energy recovery, power generation and carbon dioxide emission reduction.

Solar energy is concentrated by solar concentrators and then divided into two parts through spectral beam-splitting film. The high-grade solar energy is utilized for photovoltaic power generation. The low-grade solar energy is converted into thermal energy, providing heat for DRM reactions, and producing grey hydrogen. After

Solar energy combined with cold energy power generation

Request PDF | On Jul 1, 2023, Ehsanolah Assareh and others published A transient study on a solar-assisted combined gas power cycle for sustainable multi-generation in hot and cold climates: Case ...

A transient study on a solar-assisted combined gas power cycle for sustainable multi-generation in hot and cold climates: Case studies of Dubai and Toronto. Ehsanolah Assareh *, ... emissions by using solar energy and diminishing the consumption of fossil fuels (CH 4) in the combustion chamber. The proposed system was implemented in hot and ...

The present paper proposes a novel LAES system coupled with LNG cold energy, solar energy, and hydrate based desalination (HBD) to bridge the research gap at the intersection of electricity and freshwater production. ... Nabat et al. [22] put forward a clean LAES system combined with concentrated solar power to raise the turbine inlet ...

The combined power generation of geothermal energy and solar energy is divided into two cases: (i) solar-based combined power generation and (ii) geothermal energy-based combined power generation. In the solar combined power generation system, geothermal water is used to heat the working medium entering the solar collector to increase the ...

PV power generation can integrate hydrogen as a clean and high-energy fuel into the existing gas supply network to realise the complementary conversion of electricity to gas. It can also be ...

Harnessing the cold energy inherent in LNG transportation processes can significantly mitigate energy wastage. Employing an innovative incremental analysis methodology, this study scrutinizes six LNG cold energy power generation systems, featuring a newly proposed parallel and cascade combined cycle (PAC) system.

The DC method involves pressurising LNG with seawater to facilitate its regasification, subsequently driving an expansion turbine for power generation [21], as shown in Fig. 1.This method boasts a simple process and low initial investment, but it suffers from a low cold energy utilisation rate and limited power generation capacity.

For the residential consumers, electricity is the most important energy demand in most parts of the world. With regards to the generation of electricity, Fig. 1 presents a vision for satisfying the global electricity demand in 2050 with various energy sources [16] this vision, the solar energy based systems are predicted to occupy the highest share by the year 2050.

Furthermore, this power generation cycle is the most economical of 12 combined cycles with the lowest LCOE of 0.11 $/kWh. Therefore, S-RR is the optimal dual-stage combined power generation cycle to utilize LNG cold energy and low-temperature waste thermal energy. The effects of evaporation and condensation

pressure of the

LNG-solar combined cycle power systems are always one of the important components in the utilization of LNG cold energy and solar energy [11].The cryogenic power cycles that use LNG cold energy include the direct expansion cycle [12], Organic Rankine cycle (ORC) [13], Brayton cycle [14], and Kalina cycle [15] nsidering the low evaporation and ...

countries all over the world. Wind power generation and PV power generation are the main forms of renewable energy utilisation. Their rapid and large-scale development makes it difficult for the power grid to absorb the electricity. To develop PV power generation more widely, two major problems need to be solved.

The proposed system was implemented in hot and cold climates. o Gas-fired power plants across numerous countries widely employ the Brayton cycle. ... optimized a cogeneration system of geothermal and solar energy for clean power generation and hydrogen production. The system consisted of a Rankine cycle, an electrolyzer, and a thermoelectric ...

Among the many ways of using LNG cold energy, power generation is the most effective and suitable one for large-scale applications. ... compared the combined cycle based on solar energy and LNG ...

A large amount of cold energy is discarded without being utilized during natural gas transmission process. In this chapter, available cold energy in LNG and LNG cold energy application areas are analyzed. LNG cold energy can be used for power generation, air...

Combined heat and power (CHP), also known as cogeneration, is: The concurrent production of electricity or mechanical power and useful thermal energy (heating and/or cooling) from a single source of energy.. A type of distributed generation, which, unlike central station generation, is located at or near the point of consumption.. A suite of technologies that can use a variety of ...

Building a third more wind and solar energy generation capacity than required for demand will help to reduce energy storage needs and optimise delivery costs of electricity.

To illustrate the use of our thermodynamics framework, a typical commercial scale combined cycle gas turbines plant with a nominal primary energy input of 2000 MW is examined.

Solar energy combined with cold energy power generation