

Analysis of China's 5G base station energy-saving path





Overview

How many 5G base stations are built in China?

As 5G serves as the foundation for the construction of new infrastructure, China, as the world leader in 5G base station construction, has already built over 1.4 million 5G base stations in 2021 alone. In the same year, 5G base stations in China produced approximately 49.2 million tons of CO₂ eq.

How does a 5G base station consume energy?

In terms of energy consumption, 5G base stations require continuous operation and stability, which leads to significant electricity consumption (Guo et al., 2022a). This power is mainly supplied by transmission equipment and auxiliary equipment, such as transformers, UPS power supplies, and cooling equipment.

How much CO₂ will China's 5G network produce?

Under the model predicted 5G base stations, China's 5G network could yield 0.15–0.29 GtCO₂ /yr emissions subject to the nation's BDDL from 40 to 80 % by 2030. Both 5G base stations and CO₂ emissions are significantly lower than the previous estimates.

Does China have a 5G network?

Given that China currently has the largest 5G network in the world (~1.53 million base stations by the end of 2021, Table S1) and that base station number was projected by up to 6–8 million by 2030 (CCID Consulting, 2020), concerns are being expressed regarding 5G mobile networks' environmental effects and sustainability.



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The carbon footprint response to projected base stations of China's 5G

Apr 20, 2023 · Both 5G base stations and CO₂ emissions are significantly lower than the previous estimates. We decomposed the CO₂ footprint of China's 5G networks and assessed ...

Renewable energy powered sustainable 5G network ...

Feb 1, 2021 · This survey specifically covers a variety of energy efficiency techniques, the utilization of renewable energy sources, interaction with the smart grid (SG), and the ...

China Mobile - Renewable energy and green base station ...

Aug 7, 2025 · Through these interventions, China Mobile added 467,000 5G base stations while achieving a 2% reduction in overall base station energy consumption in 2024, demonstrating ...

Final draft of deliverable D.WG3-02-Smart Energy Saving ...

May 7, 2021 · Change Log This document contains Version 1.0 of the ITU-T Technical Report on "Smart Energy Saving of 5G Base Station: Based on AI and other emerging technologies to ...

Carbon Reduction Path Analysis of 5G Base Stations in the

Jun 30, 2022 · Therefore, for the 5G base station carbon reduction path, participating in the common construction and sharing of communication infrastructure to reduce the base station ...

5G Base Station Energy Saving Market Research Report 2033

According to our latest research, the global 5G Base Station Energy Saving market size reached USD 2.14 billion in 2024, driven by the increasing deployment of 5G infrastructure and the ...

Base station power control strategy in ultra-dense networks ...

Aug 1, 2025 · Moreover, UDNs systems frequently experience substantial energy consumption challenges, with base stations representing over 80% of the overall energy expenditure in ...

Powering green digitalization: Evidence from 5G network ...

Jul 1, 2022 · While digitalization is changing the world, its impact on energy demand and carbon emission has been multi-faceted. This study analyzes the sustainability challenges brought ...

Application of AI technology 5G base station

Dec 9, 2020 · The intelligent energy-saving of base station using AI technology should be divided into different types of problems, study the characteristics of telecommunication analysis and ...

Collaborative Optimization Scheduling of 5G Base Station

Dec 31, 2021 · Then, it proposed a 5G energy storage charge and discharge scheduling



strategy. It also established a model for 5G base station energy storage to participate in coordinated ...

Power Saving Techniques for 5G and Beyond

Sep 8, 2022 · It provides the 5G evolution path of the power saving techniques from the first release of 5G standard to the future beyond-5G releases. In addition to the existing ...

Energy-saving Scheme of 5G Base Station Based on ...

Nov 17, 2022 · Abstract. As China's new infrastructure, 5G has received national and social attention. 5G promotes economic to grow rapidly. But, the high energy consumption caused by ...

Modelling the 5G Energy Consumption Using Real-world ...

Sep 15, 2025 · Accurate energy consumption modeling is essential for developing energy-efficient strategies, enabling operators to optimize resource utilization while maintaining network ...

Evaluation of the power-saving effect of 5G base station ...

May 29, 2025 · The Energy-consuming Analysis and Energy-saving Evaluation of Communication Base Station in South Region of China [J]. Journal of Xihua University (Natural Science ...

Energy Saving of 5G Base Stations Based on Symbol ...

Jun 12, 2025 · The rapid development of 5G technology leads to increasing energy consumption in base stations (BSs). For the vision of green and sustainable communications, we propose a ...

Energy-efficient 5G for a greener future

Apr 22, 2020 · Compared to earlier generations of communication networks, the 5G network will require more antennas, much larger bandwidths and a higher density of base stations. As a ...

Low-Carbon Sustainable Development of 5G Base Stations in China

May 4, 2024 · As 5G serves as the foundation for the construction of new infrastructure, China, as the world leader in 5G base station construction, has already built over 1.4 million 5G base ...

Green 5G White Paper

To achieve this goal, we need to explore all-round energy-saving and carbon-reduction methods. continuous improvement of 5G/5.5G air interfaces, 6G air interfaces, THz ultra-bandwidth New ...

Optimal energy-saving operation strategy of 5G base station ...

Dec 1, 2025 · To further explore the energy-saving potential of 5G base stations, this paper proposes an energy-saving operation model for 5G base stations that incorporates ...



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