

## **PDEOZE PowerContainer**

# **Fourth generation mobile communication green base station**



## Overview

---

As its major contribution, this study highlights the uses of renewable energy in cellular communication by: (i) investigating the system model and the potential of renewable energy solutions for cellular BSs; (ii) identifying the potential geographical locations for renewable-energy-powered BSs; (iii) performing case studies on renewable-energy-powered cellular BSs and suggesting future research directions based on our findings; (iv) examining the present deployment of sustainable and green BSs; and (v) studying the barriers that prevent the widespread use of renewable-energy-powered BSs and providing recommendations for future work. Are green cellular base stations sustainable?

This study presents an overview of sustainable and green cellular base stations (BSs), which account for most of the energy consumed in cellular networks. We review the architecture of the BS and the power consumption model, and then summarize the trends in green cellular network research over the past decade.

Are 5G base stations sustainable?

However, due to their high radio frequency and limited coverage, the construction and operation of 5G base stations can lead to significant energy consumption and greenhouse gas emissions. To address this challenge, scholars have focused on developing sustainable 5G base stations.

Is energy-efficient base station operation a problem in 4G cellular networks?

Energy-efficient base station operation is a problem for energy-efficient base station operation in 4G cellular networks. The objective is to minimize the total power consumption of all base stations while the data requirement of every user is satisfied. We prove that this problem is NP-hard and cannot be approximated in polynomial time.

What is 5G base station equipment architecture?

The 5G base station equipment architecture mainly adopts the BBU + AAU method. The BBU is the baseband part and can be further divided into two

logical network elements, CU and DU. The CU handles the protocol stack functions above the PDCP layer of the wireless network, while the DU handles radio protocol functions below the PDCP layer.

How much carbon does a 5G base station produce?

Previous research has estimated that a single 5G base station will produce approximately 30.2 ~ 33.5 tCO<sub>2</sub> eq throughout its life cycle (Ding et al., 2022; Guo et al., 2022a). Consequently, the carbon emissions from 5G base stations in China in 2021 amounted to approximately 49.2 MtCO<sub>2</sub> eq.

How to reduce energy consumption of next-generation mobile systems?

Even with no data transmission/reception, over 90% of its energy is still consumed. Based on the observations, dynamically switching the operation mode of base stations to “on” or “off” is one of the effective ways to minimize total energy consumption of next-generation mobile systems. It

## Fourth generation mobile communication green base station

---

This study presents an overview of sustainable and green cellular base stations (BSs), which account for most of the energy consumed in cellular networks. We review the architecture of the BS and the power consumption model, and then summarize the trends in green cellular network research over the past decade.

However, due to their high radio frequency and limited coverage, the construction and operation of 5G base stations can lead to significant energy consumption and greenhouse gas emissions. To address this challenge, scholars have focused on developing sustainable 5G base stations.

ation problem for energy-efficient base station operation in 4G cellular networks. The objective is to minimize the total power consumption of all base stations while the data requirement of every user is satisfied. We prove that this problem is NP-hard and cannot be approximated in polynomial time

The 5G base station equipment architecture mainly adopts the BBU + AAU method. The BBU is the baseband part and can be further divided into two logical network elements, CU and DU. The CU handles the protocol stack functions above the PDCP layer of the wireless network, while the DU handles radio protocol functions below the PDCP layer.

Previous research has estimated that a single 5G base station will produce approximately 30.2 ~ 33.5 tCO<sub>2</sub> eq throughout its life cycle (Ding et al., 2022; Guo et al., 2022a). Consequently, the carbon emissions from 5G base stations in China in 2021 amounted to approximately 49.2 MtCO<sub>2</sub> eq.

Whether or no data transmission/reception, over 90% of its energy is still consumed. Based on the observations, dynamically switching the operation mode of base stations to "on" or

"off" is one of the effective ways to minimize total energy consumption of next-generation mobile systems. It

Apr 9, 2019 · Energy efficiency and renewable energy are the main pillars of sustainability and environmental compatibility. This study presents an overview of sustainable and green cellular ...

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

Dec 15, 2023 · The article 35 of the Regulations stipulates that "for the establishment of large-scale wireless radio stations (stations) and ground public mobile communication BS, their ...

Jul 13, 2022 · I. INTRODUCTION The explosive growth of mobile subscribers are pushing fourth generation (4G) network operators to densely deploy base stations in geographical regions ...

Sep 8, 2025 · The fully-decoupled radio access network (FD-RAN) is an innovative architecture designed for next-generation mobile communication networks, featuring decoupled control and ...

Nov 19, 2024 · In Xiong'an New Region, China Mobile's low-carbon initiatives like cooling cubes and outdoor base stations are saving hundreds of thousands of kWh annually, making a big ...

Aug 1, 2024 · However, the design of a green mobile network requires the dimensioning of the energy harvesting and storage systems through the estimation of the network's energy ...

Feb 1, 2008 · After 2005, the third-generation BTS, represented by distributed BTSs,

pushed forward mobile operators' networking modes by leaps and bounds. In 2008, as fierce ...

Nov 10, 2022 · The task of achieving carbon neutrality is short and challenging. As an important infrastructure for digital transformation, the mobile communication network focuses on three ...

May 4, 2024 · Goncalves et al. (2020) explored carbon neutrality evaluation of 5G base stations from the perspective of network structure and carbon sequestration. Despite the growing ...

## Contact Us

---

For catalog requests, pricing, or partnerships, please visit:  
<https://www.pdeozepv.pl>