



Measuring the Impact of Energy Efficiency Efforts

China Mobile has built a three-layer framework encompassing governance, platforms and solutions to support carbon reduction measures

Highlights

- China Mobile has set ambitious targets to reduce energy consumption and carbon emissions
- The progress of the operator's "3 Energy" action plan, covering energy conservation, clean energy, and empowerment, is tracked by six indexes.
- China Mobile and Huawei have developed a digital platform to implement the 3 Energy plan
- Promising preliminary results from Shandong, Sichuan and Jiangsu provinces and Zhulan iron mine.
- In other industries, the solution could help reduce carbon emissions by 8.4 times its own emissions.
- China Mobile could save 6.68 billion kWh of electricity and 3.83 million tons of carbon emissions annually.

The challenge - dramatically lowering energy usage and emissions

To help curb climate change, China Mobile has set itself two key targets - it is aiming to reach its peak carbon dioxide emissions before 2030 and become fully carbon neutral by 2060. To achieve these "30-60

decarbonisation" goals, China Mobile's intermediate target is to control carbon emissions at 56 million tons by 2025 and save 40 billion kilowatt-hours of electricity between 2021 and 2025.

At the same time, China Mobile is looking to provide solutions that will enable different vertical sectors, such as the power, mining and cargo terminal industries, to reduce their carbon emissions by 1.6 billion tons from 2021 to 2025.



To help meet these ambitious goals, China Mobile has developed the “3 Energy” action plan, encompassing energy conservation, clean energy, and empowerment. To govern, plan and execute the 3 Energy plan, the mobile operator needed to systematically implement appropriate green indexes.

Wherever possible, China Mobile is looking to use a standardised unified metrics and platform to measure, analyse and optimise carbon emissions for both the telecoms industry and the sectors it serves. In particular, it needs metrics and indexes that take into account network traffic volume and service quality when the energy conservation solution is implemented.

Solution - energy-saving and carbon-reduction framework system

China Mobile's 3 Energy action plan encompasses the following mechanisms:

- Energy conservation solutions at the equipment, site and network levels, together with equipment upgrades with new materials, craftwork and components. Cross-domain site reconstruction, precise equipment room cooling and other technologies are also being used to improve site energy efficiency, while network level energy efficiency is being improved through “centralised RAN architecture reconstruction” and “multi-layer network AI dynamic shutdown”.
- Clean energy solutions, including solar, wind, hydro, and energy storage, based on different geographical and climate information of different sites and provinces. At the same time, coordination between power supply, storage, and distribution is being developed to maximize the use of green electricity.
- The identification and calculation of the carbon emission baselines for energy-intensive industries, the design and implementation of ICT solutions, and the measurement and tracking of

carbon emissions after the implementation of these solutions.

To assess the progress of the plan, China Mobile employs six indexes. They are the Network Carbon Intensity Energy (NCIE), the Energy Efficiency Index for network level (NEE), site level (SEE) and equipment level (TEE), the Renewable Energy Ratio (RER), and the Vertical Enablement Index (VEI). The NCIE measures the carbon intensity of data transmission across networks, while the NEE, SEE, TEE measure the efficiency of energy usage at the network, site level, and equipment level. RER is used to measure the use of renewable energy, such as solar, wind, hydro and so on. VEI is the ratio of the enablement carbon emission reduction to the carbon emissions of the enabling carbon reduction solution, reflecting the carbon emission reduction degree for other industries enabled by ICT.

China Mobile and Huawei have developed a platform to help plan, implement and continuously improve the 3 Energy action plan and boost sustainability. The platform provides a centralised hub for monitoring, coordinating, and optimising energy efficiency initiatives within a telecoms operator. It can obtain key data, such as traffic, service quality and energy consumption information, from the network and related equipment, enabling the operator to manage its energy efficiency operations.

The platform prototype and demo system is now collecting operational data and baselines from 10 provinces, with preliminary results from three of them. Furthermore, a vertical industry system (in the mining sector) is now connected to the platform, enabling China Mobile to gauge the environmental and energy impact of a 5G-enabled solution on an iron ore mine owned by the Pangang group.

Impact - major energy and emissions savings forecast

In Shandong province, China Mobile has used the new platform to identify radio units (RRU) with low-energy efficiency and high-energy consumption sites. As a result, it has replaced 300 single-band

RRUs with multi-band RRUs in the province, thereby saving 263 kWh of electricity every year, which amounts to a power saving of about 21%.

In Shandong, China Mobile has also reconstructed 402 sites and 1,437 SDHs (synchronous digital hierarchies). Indoor sites have been replaced with outdoor sites, enabling air conditioners to be removed from equipment rooms. The operator anticipates these reconstruction initiatives will save 10.63 million kWh and eliminate 3,720 tons of carbon emissions every year, and will generate a return on the investment in about two years.

Meanwhile, in Sichuan province, the platform's energy efficiency algorithm has reduced power consumption from 315,573 kWh to 276,090 kWh by optimising consumption at multiple levels (network level, site level, equipment level) and across multiple domains (time domain, frequency domain, spatial domain, power domain), according to China Mobile.

In Jiangsu province, China Mobile's 27 base stations in coastal areas are all using wind power. The new platform enables the operator to dynamically adjust power supply and storage, based on the wind power availability and service traffic. The solution has saved 0.86 million kWh of electricity and reduced 720 tons of carbon, China Mobile says.

In aggregate, China Mobile forecasts that the implementation of the 3 Energy solutions will help it save 6.68 billion kWh of electricity and 3,830,000 tons of carbon emissions annually. It estimates that:

- Energy conservation at the equipment level will save 876 kWh per RRU per year and at the site level will save 23,535 kWh per site per year.
- Energy conservation at the network level will save 1,656 kWh per year per site, through a 60% reduction of power consumption at idle time and an average energy consumption reduction of 12%.
- Adoption of clean energy will reduce the carbon emissions per year per site by 27 tons.

The operator also anticipates cost savings of 2.7 million RMB on microwave investment and 3.92 million RMB on site tower rental.

A pilot in the mining sector suggests the vertical industry enablement index could be 8.4 times. China Mobile is using 5G to enable the Zhulan 5G unmanned iron mine of the Pangang group to operate 24 hours a day, which has increased mining efficiency by over 10%. The solution uses 5G IoT connectivity, edge data centres and BeiDou high-precision satellite technologies to monitor and manage six mine trucks, three mine drills and three electric forklifts.

China Mobile estimates that the solution has reduced carbon emissions by 718 tons (of which 381 tons relate to human resources reduction and 337 tons through mechanical efficiency improvement). The estimated emissions of the solution itself is 76 tons, indicating the enabling index is 8.4.

Wider implications - helping to achieve public policy goals

To achieve its ambitious goals to control carbon emissions at 56 million tons by 2025 and save 40 billion kilowatt-hours of electricity from 2021 to 2025, China Mobile needs to take a systemic approach. It believes its 3 Energy plan can provide an overall framework that can effectively govern, plan and execute all the necessary energy efficiency commitments and initiatives, and that this holistic approach and solution can also be employed by any mobile operator that has similar ambitions.

Furthermore, the platform developed by China Mobile and Huawei can be interconnected with carbon emission regulators, trading institutions, and vertical industries to support regulatory requirements and help achieve digital transformation and carbon emission reductions in the wider economy.



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About China Mobile

China Mobile Limited is the leading ICT services provider in the mainland of China, the Group provides communications and information services in all 31 provinces, autonomous regions and directly-administered municipalities throughout the mainland of China and in Hong Kong SAR, and boasts a world-class telecommunications and information operator with the world's largest network and customer base, a leading position in profitability, brand value and market value ranking. Its businesses primarily consist of voice, data, broadband, dedicated lines, IDC, cloud computing, IoT and other services in the Customer, Home, Business and New ("CHBN") markets.

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