

Power & Construction

# Eliminating Disruptions. Enabling Productivity.

Powering Connectivity at NTPC  
Ramagundam Power Plant with  
Wi-Fi 6 Upgrade



# Background

NTPC Limited (National Thermal Power Corporation Limited) is India's largest integrated power company and a leading global energy player. Among NTPC's significant assets is the Ramagundam Super Thermal Power Station, a massive coal-fired power generation facility located in Ramagundam, Peddapalli district of Telangana, approximately 200 km from Hyderabad. Operational since 1983, the Ramagundam plant is a behemoth in terms of installed capacity, boasting 2,600 MW of power generation across its 7 operational units. It is one of NTPC's highest energy generating units. The Ramagundam Super Thermal Power Station represents a critical node in the Southern regional grid, catering to the power requirements of the states of Telangana, Andhra Pradesh, Karnataka, Tamil Nadu, and parts of Maharashtra.

The Ramagundam plant's round-the-clock operations are vital for ensuring uninterrupted power supply to millions of households, businesses, and industries across these regions. The power plant complex covers a vast area and includes facilities such as a Coal Handling Plant, multiple Boiler Units, Turbine Generators, a Cooling Water System, an Ash Handling Plant, and a high-voltage Switchyard.

As with other major NTPC plants, Ramagundam has implemented various environmental measures to reduce its impact, including Electrostatic Precipitators, Flue Gas Desulfurization systems, Ash Pond Management, and Greenbelt Development areas around the plant.

The electricity generated at the Ramagundam Super Thermal Power Station is fed into the Southern regional grid through high-voltage transmission lines, playing a pivotal role in meeting the ever-increasing power demands of the region. With its immense scale of operations and criticality to the grid, the Ramagundam plant is a vital asset for NTPC and contributes significantly to the company's mission of providing reliable and affordable power across India.

NTPC Limited received 9th PSU IT Award under organization category on 16.02.2023 at New Delhi. This award has been given to NTPC under Digital PSU Category for its Digital Transformation Strategy to be a Digital Enterprise.<sup>1</sup>

NTPC operates from 70 locations in India, one location in Sri Lanka and two locations in Bangladesh. In India, it has eight regional headquarters.<sup>2</sup>

# Overview

Wireless networking technology is playing an increasingly vital role in modern thermal power plants. Beyond just enabling basic internet connectivity, robust wireless networks composed of strategically placed Access Points are being deployed across plant facilities. These wireless infrastructures serve a multitude of critical applications that enhance operations, maintenance, safety, and efficiency. At their core, wireless networks allow plant personnel to gain convenient access to data and information from virtually any location within the facility via mobile handheld devices. This mobility empowers operators, maintenance teams, IT staff, and management to interact with remote equipment, monitor processes, and retrieve valuable insights that were previously difficult or impossible to obtain.

Wireless solutions are unlocking new levels of visibility into operational blindspots such as remote tanks, pipes, conveyor systems, and equipment like turbines and coal mills. By enabling real-time data collection and monitoring from these areas, plants can optimize performance, preempt failures, and drive improved reliability. Critical parameters like water quality, corrosion levels, equipment health, and production metrics can now be tracked continuously without the limitations of wired infrastructure. Moreover, wireless networking is facilitating the modernization of aging plant systems and the adoption of new technologies. For instance, converting legacy coal conveyor controls to modern variable frequency drives (VFDs) can be achieved cost-effectively using wireless communications.

This allows seamless integration while realizing significant energy savings from more granular speed control capabilities.

Beyond operational enhancements, wireless networking is also strengthening physical security and safety capabilities through deployments like wireless video surveillance and access control systems. With secure wireless connectivity, these solutions can be rapidly provisioned to monitor critical plant areas and processes. As thermal power plants strive to improve operational intelligence, agility, and sustainable performance, robust wireless networking is emerging as a foundational technology enabler. By eliminating the constraints of wired infrastructure, wireless empowers plants to optimize processes, accelerate digitalization, and drive new levels of operational excellence.

**The country's power consumption grew by over 16% to 151.66 billion units in August 2023 compared to that of the same month last year.<sup>3</sup>**

**NTPC Group's total installed capacity touches 75,418 MW.<sup>4</sup>**

We have successfully resolved the connectivity issues at NTPC Ramagundam by deploying our access solution. With strategically placed Access Points and a centralized WLAN Controller, we eliminated dead zones and provided seamless connectivity across the vast plant premises. Our phased approach ensured a smooth transition. We are proud to have equipped NTPC Ramagundam's employees with reliable connectivity, enabling them to work efficiently and drive productivity.

**Bhuvnesh Sachdeva**  
(Senior Vice President, Communication)

# Challenge

NTPC Ramagundam faced a significant challenge with their existing wireless network infrastructure. The primary issue was the lack of consistent and reliable connectivity across the vast 4,500 square meter plant premises. Despite having a wireless network in place, NTPC employees experienced frequent connectivity disruptions, hindering their ability to work efficiently and access essential resources seamlessly throughout the facility.

# Solution

To address the connectivity issues and provide seamless wireless coverage across the vast 4,500 square meter plant premises, HFCL implemented a robust Wi-Fi 6 solution consisting of 190 advanced Wi-Fi 6 Access Points (APs) and a centralized WLAN Controller. A detailed survey of the entire premises was done by the team to figure out the hotspot areas to install the Access Points.

These APs were strategically placed to eliminate dead zones and provide reliable connectivity in every corner of the facility. With the latest Wi-Fi 6 technology, the deployed Access Points offered significantly higher data rates, increased capacity, and improved performance, even in the high-density environment of the plant with numerous concurrent users.

This was made possible through advanced features like Orthogonal Frequency Division Multiple Access (OFDMA), which efficiently shared the wireless channel among multiple devices simultaneously, and Multi-User Multiple-Input Multiple-Output (MU-MIMO), which allowed the APs to communicate with multiple devices concurrently using optimized spatial streams. Additionally, the support for wider channel bandwidths of up to 160 MHz and higher-order modulation schemes like 1024 Quadrature Amplitude Modulation (QAM) contributed to enhanced data rates and spectral efficiency.

Power-saving mechanisms, such as Target Wake Time (TWT), spatial reuse, and dynamic fragmentation, not only improved battery life for client devices but also reduced interference, further boosting overall network efficiency in this high-density deployment.

The WLAN Controller acted as the central management platform for the entire network infrastructure. It enabled centralized configuration, monitoring, and troubleshooting of all deployed APs, simplifying network administration and ensuring optimal performance. To streamline network access and improve user experience, we implemented a single SSID (Service Set Identifier) across the entire wireless network.

This allowed NTPC employees to seamlessly connect to the network without the need to manually switch between multiple SSIDs as they moved around the plant.

We integrated a robust AAA (Authentication, Authorization, and Accounting) solution to ensure secure and controlled access to the wireless network. NTPC's IT team can easily manage user accounts by entering employee phone numbers, enabling them to grant or revoke access as needed. Furthermore, an OTP (One-Time Password) based authentication mechanism was implemented, requiring NTPC employees to authenticate using a secure and dynamic password for added security. To ensure minimal disruption to ongoing operations, the Wi-Fi 6 solution was deployed in three phases.

The first phase involved the deployment of 30 APs, followed by 50 APs in the second phase, and finally, 110 APs in the third phase. This phased approach allowed for a smooth transition from the legacy wireless infrastructure to the new Wi-Fi 6 solution, ensuring continuity of services throughout the deployment process.

# Solution Deployed



## Indoor Wi-Fi

Wi-Fi 6 Access Points



## WLAN Controller

Centralized Control for APs

- Carrier-Grade Wi-Fi 6 Access Points
- Implemented a single SSID across the entire wireless network.
- Integrated AAA solution to ensure secure and controlled access.
- WLAN Controller acted as the central management platform for the entire network infrastructure.
- OTP (One-Time Password) based authentication mechanism was implemented.

# Result

- 01** Comprehensive and seamless wireless coverage across the vast 4,500 square meter plant premises, eliminating dead zones and connectivity issues.
- 02** Increased network capacity, and improved overall performance, even in high-density environments with numerous concurrent users.
- 03** Centralized management and monitoring of the entire wireless network infrastructure through the WLAN Controller, simplifying administration and troubleshooting.
- 04** Streamlined network access and enhanced user experience with a single SSID across the plant premises, eliminating the need for manual SSID switching.
- 05** Robust network security and controlled access through the implementation of an AAA solution and OTP-based authentication.
- 06** Minimal disruption to ongoing operations through a phased deployment approach, ensuring a smooth transition from the legacy wireless infrastructure.
- 07** Increased mobility and flexibility for NTPC employees, enabling them to access critical resources and information from anywhere within the plant.

# Conclusion

The deployment of HFCL's robust Wi-Fi 6 solution, consisting of 190 advanced Access Points and a centralized WLAN Controller, successfully addressed the connectivity challenges faced by NTPC Ramagundam. The single SSID and robust AAA solution further enhanced the user experience and network security, ensuring seamless and secure access for NTPC employees throughout their daily operations. Overall, the Wi-Fi 6 access solution enabled a robust and modern wireless network at NTPC Ramagundam, facilitating increased operational intelligence, agility, and the adoption of new technologies to drive sustainable performance and operational excellence.



# References

1. <https://ntpc.co.in/awards/company-ranking/ntpc-awarded-digital-transformation>
2. [https://en.wikipedia.org/wiki/NTPC\\_Limited#:~:text=1%2C66%2C249.34%20crore.-,Operations,eight%20regional%20headquarters%20\(HQ\)%3A](https://en.wikipedia.org/wiki/NTPC_Limited#:~:text=1%2C66%2C249.34%20crore.-,Operations,eight%20regional%20headquarters%20(HQ)%3A)
3. <https://www.thehindu.com/business/Economy/indias-power-consumption-grows-by-over-16-to-15166-billion-units-in-august/article67269908.ece>
4. <https://ntpc.co.in/installed-capacity>

# Disclaimer

Copyright © 2024 HFCL Limited. All rights reserved. No part of this content may be reproduced in any form or by any means or used to make any derivative work (such as translation, transformation, or adaptation) without written permission from HFCL Limited ("HFCL"). HFCL reserves the right to revise or change this content from time to time without obligation on the part of HFCL to provide notification of such revision or change.

Not all offerings are available in every country in which HFCL operates. The data used in this report may be derived from third-party sources and HFCL does not independently verify, validate, or audit such data. The information in this document is provided "as is" without any warranty, express or implied, including without any warranties of merchantability, fitness for a particular purpose and any warranty or condition of noninfringement. This report is intended for general guidance only. It is not intended to be a substitute for detailed research or the exercise of professional judgment. HFCL shall not be responsible for any loss whatsoever sustained by any organization or person who relies on this publication.



For further information about this document,  
contact our sales team [iosales@hfcl.com](mailto:iosales@hfcl.com)

visit our website: [io.hfcl.com](http://io.hfcl.com) | [hfcl.com](http://hfcl.com)