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Private 5G/4G Cellular Networks for Railways: 2024 – 2030

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Abstracts

Private 5G and 4G LTE cellular networks – also referred to as NPNs (Non-Public Networks) in 3GPP terminology – are rapidly gaining popularity across a diverse range of vertical industries. The railways industry is no exception to this trend and will see global spending on private cellular networks grow at a CAGR of 23% over the next three years. Although a full-scale transition from GSM-R and other legacy technologies to FRMCS (Future Railway Mobile Communication System) implementations is not expected until the late 2020s, a number of FRMCS-ready 5G and LTE networks for railway communications are already being deployed, with private cellular projects estimated to account for more than $1.2 Billion in cumulative infrastructure spending between 2024 and 2027. Some notable examples of operational deployments and ongoing initiatives are listed below:

In the United Kingdom, as part of the ECH-R (England's Connected Heartland Railways) project, AWTG, Airspan Networks and other technology partners are preparing to deploy a standalone private 5G network to provide connectivity for operational teams and passengers along a section of the EWR (East West Rail) track between Bicester and Bletchley. The standalone 5G network will be built using outdoor small cells operating in Band n77 (3.8-4.2 GHz) spectrum.

In neighboring France, SGP (Soci?t? du Grand Paris) has deployed a private LTE network – which operates in Band 38 (2.6 GHz) spectrum – to provide indoor and outdoor coverage for operational communications across all Grand Paris Express rapid transit system's stations, lines and depots.

Adif AV is deploying hybrid public and private 5G network infrastructure across its strategic logistics centers across Spain in a bid to boost digitalization,

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process automation and cost reduction in rail freight transport. The private 5G RAN (Radio Access Network) element of the $22 Million project operates in Band n40 (2.3 GHz) spectrum.

Freight railroad operator Norfolk Southern Corporation has deployed a private LTE network using 3.5 GHz CBRS spectrum to enhance wireless connectivity for rail yard workers at its outdoor rail switching facilities. The system is complemented by a dual-SIM solution that allows rail staff devices to seamlessly roam from the private LTE network to public cellular services.

Since the mid-2010s, China's railways sector hosts many 1.8 GHz private LTE networks for CBTC (Communications-Based Train Control), video surveillance, broadband trunking and PIS (Passenger Information System)-related applications. In addition, Shentong Metro, Guangzhou Metro, Shenzhen Metro and several other urban rail transit operators have recently adopted hybrid public-private 5G networks.

South Korea's KR (Korea National Railway) has deployed one of the world's largest LTE-based railway communications networks. Among other related projects in Korea, POSCO is using a private 5G network to link autonomous locomotives and railway control systems at its steelworks plant, while LG Electronics and KORAIL (Korea Railroad Corporation) are planning to trial a private 5G network at a railway station in Seoul.

Japan's Hanshin Electric Railway has installed a local 5G network for improving safety at railroad crossings and platforms along specific sections of the Hanshin Main Line between Nishinomiya, Ashiya and Mikage stations. In addition, Tokyo Metro is trialing both commercial and local 5G networks along a test section in the rapid transit system's Marunouchi Line between Shin-Otsuka and Korakuen stations.

In India, NCRTC (National Capital Region Transport Corporation) is deploying a 700 MHz private LTE network for the Delhi-Meerut RRTS (Regional Rapid Transit System). The purpose-built network supports mission-critical voice and data communications, ETCS (European Train Control System) Level 2 and 3 signaling as well as ATO (Automatic Train Operation).

As part of the multi-year $100 Million RSR (Radio Systems Replacement) program, the PTA (Public Transport Authority of Western Australia) is adopting a

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purpose-built 3GPP network, which includes approximately 160 cell sites, to replace its existing 400 MHz voice-only analog radio system for railway communications. Under implementation since 2023, the network is expected to enter service in phases from 2025.

Within the framework of its wider private cellular connectivity initiative for mining and transport operations, Brazilian mining giant Vale is investing approximately $50 Million over a period of two years to deploy a 76-site private LTE network along the tracks of the Caraj?s Railway, which connects the Brazilian states of Maranh?o and Par?. The network will be fully operational in 2025.

DB (Deutsche Bahn), SNCF (French National Railways), SBB (Swiss Federal Railways), FTIA (Finnish Transport Infrastructure Agency), PKP (Polish State Railways), China State Railway Group and others are actively progressing with their pre-commercial 5G rail connectivity projects prior to operational deployment.

The 'Private 5G/4G Cellular Networks for Railways: 2024 – 2030' research package provides detailed market analysis and forecasts for private 5G and LTE networks across 16 vertical industries, including railways. The package includes the full edition of SNS Telecom & IT's 'Private LTE & 5G Network Ecosystem: 2024 – 2030 – Opportunities, Challenges, Strategies, Industry Verticals & Forecasts' report and a datasheet with additional private 5G/4G infrastructure investment forecasts for the railways sector.

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