ABSTRACT

Indonesia has 260 million inhabitants, making it the fourth most populous. This boosts up telecom network demand exponentially. Indonesia's leading cellular technology is 4G-Long Term Evolution (LTE). However, the 4G-LTE network is already busy and congested. Therefore, the telecom industry must adapt to the increased demand and consumer mobility. 5G NR with the Non-Stand Alone (NSA) technology is the solution to this and will be deployed in 13 Indonesian cities by 2023, including Jakarta, stated by the Indonesian Ministry of Communication and Information Technology (KOMINFO). Thus, this research aims to formulate the technical and economic planning, which are essential to satisfy the 5G NR NSA connection based on capacity and coverage needs in a dense-urban area of Indonesia.

In this research, Indonesia's large cities will have significant data demands from 2021 to 2026, and the country's 5G network development would have to take that into account. Therefore, Indonesian telecommunications operators must plan carefully to satisfy traffic requirements and identify technical and economic viability elements. The city of Jakarta, with a total surface area of 662.33 km^2 was chosen as the study city for various reasons, including the economic hub, the present capital city, and a city that becomes a role model in the use of new technologies. The approach is via a techno-economic method and network simulation using a network software called Forsk Atoll for 5G NR.

According to the research findings, the total required 5G NR 3.5 GHz gNodeB and generated traffic demand forecast for all municipals in Jakarta city is 919 gNodeB and 17.7 Gbps/km^2, respectively. Furthermore, the mean value of Synchronization Signal-Reference Signal Received Power (SS-RSRP) is -93.27 dBm and is considered good, while the Synchronization Signal-Signal Interference Noise Ratio (SS-SINR) mean value is 8.89 dB and is considered fair. In terms of economic aspects, the obtained total Capital Expenditure (CAPEX) is IDR 147,184,134,855, the total Operational Expenditure (OPEX) is IDR 1,004,463,403,900, Net Present Value (NPV) is IDR 477,532,953,385, Internal Rate of Return (IRR) is 24.7%, Payback Period (PBP) is 3.87 or within three years and ten months, and lastly Profitability Index (PI) of 1.42. Therefore, overall, 5G NR 3.5 GHz deployment in Jakarta city is feasible.

Keywords: 5G, Jakarta city, network deployment, techno-economic, telecom management.