6G DEPLOYMENT TIMEFRAME CONSIDERATIONS –

An Operator View

V1.0

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6G DEPLOYMENT TIMEFRAME CONSIDERATIONS – AN OPERATOR VIEW

by NGMN Alliance

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6G DEPLOYMENT TIMEFRAME CONSIDERATIONS – AN OPERATOR VIEW

This document provides a consolidated view on the constraints on the introduction of 6G from a timing perspective. This view comes from leading operators representing different global regions, in order to serve as useful information to the industry and the wider public.

The content of this document simply collects the view of the NGMN Operator Members. The participants also acknowledge there may be different timing for introduction of the 6G technology in different regions and different countries.

Operators' expectations from 6G

6G is the next step in the evolution of mobile network technologies, enabling to revisit some design choices of 5G and 5G-Advanced in the light of recent technical progress and new needs. As such, it represents an opportunity for introducing new added-value services to customers and society, and enhancing network efficiency.

The operators` motivations to deploy 6G will most likely include delivering enhanced services for Human Communications (e.g. immersive experience, telepresence & multimodal interaction) and Machine Communications (e.g. for supporting collaborative robotics), as well as enabling new network services such as high accuracy location, mapping, or sensing. In addition, a key motivation for 6G from operator perspective is to evolve network core technologies towards enhanced network operational efficiency beyond the 5G-Advanced capabilities, including more efficient support of new spectrum bands (e.g. 6-7 GHz), network automation, AI as a service, energy efficiency, and delivering ubiquitous coverage. These expectations were described in [1]. Further guidance on 6G design requirements from operator perspective were documented in [2].

Constraints from operator perspective

The commercial availability of 6G services will be constrained by:

- the finalisation of 6G standards specifications, especially in 3GPP
- the availability of network equipment (software and hardware) and devices
- the deployment of networks and launch of commercial offers by operators in each country

As the actors who deploy the networks, operators will eventually determine the commercial availability of public 6G services. Assuming availability of equipment and devices that support the existing and new frequency bands required for 6G deployment, operators have additional constraints that drive the deployment timeline, including required level of investment, compliance with NetZero trajectories, and regulation.

Deploying a new technology requires significant investment: therefore, this investment must – among others – be justified by reasonable confidence on a sustainable return on investment. Hence the requirement that 6G needs to deliver tangible value to both end users and operators, and the design guidance intended to limit the cost of deployment, that were expressed in [2]. Beyond initial launch, the pace of investment in deployments will be affected by the extent to which 6G use cases provide a clear added value compared to what can be achieved with 5G technologies. In addition, the magnitude of a potential big technological change may extend adoption timelines.

The value to end users and the cost of network deployment are driven for a significant part by the design choices made in standardisation. In this respect, a single drop of 6G initial specifications including RAN and core network aspects in the same release will be key in order not to reproduce the 5G situation where the full promise of 5G could not be delivered from initial deployments, and where multiple network rollouts and device generations were needed in the 5G timeframe, blurring the value proposition to customers and generating migration complexity for operators.

The capability to decorrelate investment in software and hardware infrastructure is a key operator expectation to optimise investment. Deploying 6G by means of software upgrades in the 5G legacy frequency bands will both limit the required 6G investment, and will facilitate faster 6G roll-outs. Conversely, 6G deployments may be strongly delayed if operators have to face infrastructure renewals and software upgrades at the same time. In addition, reusing the already existing 5G hardware as much as possible will alleviate the carbon impact of 6G, thereby facilitating its deployments from the perspective of operators commitments to be NetZero by 2040 or 2050.

A dominant aspect of regulation when it comes to new technology deployment is the availability of new spectrum. For 6G, this will be instrumental for the use cases requiring extra capacity. In areas where network capacity is sufficient, the legacy 5G spectrum can be reused.

Given the impacts of standards on the drivers for operators to deploy 6G, it is critical to take the time necessary for producing standards ensuring the above requirements, learning the lessons of 5G-SA deployments, and not to rush into decisions having potentially detrimental impact on the industry. In this respect, extending the completion date of 3GPP Release 21 should be considered if such a risk is identified.

Indicative deployment timeframe

The timing of 6G deployment is expected to vary across geographical regions, driven by a combination of technical, economic, and strategic considerations. Experience from previous generations indicates that rollout timelines are closely linked to regional market conditions, regulatory frameworks, and operator strategies.

Another consideration is that large-scale deployments depend on the availability of a fully developed ecosystem (hardware and software), encompassing both network infrastructure and a broad base of compatible devices.

Current industry perspectives suggest that commercial introduction of standardised 6G capabilities is likely to emerge in the early years of the 2030s, preceded by trials and demonstration systems. However later deployments are entirely possible and the actual deployment dates will vary depending on national and operator choices. The important factor for NGMN operators is that specifications of sufficient quality are completed before standardised 6G capabilities are introduced commercially, potentially by extending the completion date of 3GPP Release 21 if necessary.

As standardisation will have a key impact on 6G timelines, a key message to standards organisations to ensure a smooth and healthy 6G deployment is the need to deliver the required specifications, including for RAN and Core Network, in a single drop of 3GPP Release 21, in order to enable deployment of a complete system without multiple phases that result in unnecessary complexity and market confusion.

02 REFERENCES

[1] NGMN 6G USE CASES AND ANALYSIS (2022); https://www.ngmn.org/wp-content/uploads/220222-NGMN-6G-Use-Cases-and-Analysis-1.pdf

[2] 6G KEY MESSAGES – An Operator View (2025); https://www.ngmn.org/wp-content/uploads/2506_NGMN_6G-Key-Messages_An-Operator-View_V1.0.pdf

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NEXT GENERATION MOBILE NETWORKS ALLIANCE

NGMN - Next Generation Mobile Networks Alliance - is a global, operator-driven organisation established by leading international mobile network operators (MNOs). As a global alliance of operators, vendors, and academia, NGMN provides industry guidance to enable innovative, sustainable and affordable next-generation mobile network infrastructure.

Key focus areas include Mastering the Route to Disaggregation, Green Future Networks, and 6G, while supporting the full implementation of 5G. NGMN drives global alignment of technology standards, fosters collaboration with industry organisations and ensures efficient, project-driven processes to address the evolving demands of the telecommunications ecosystem.

VISION

The vision of NGMN is to provide impactful industry guidance to achieve innovative, sustainable and affordable mobile telecommunication services to meet the requirements of operators and address the demands and expectations of end users. Key focus areas include Mastering the Route to Disaggregation, Green Future Networks and 6G, while supporting the full implementation of 5G.

MISSION

The mission of NGMN is:

- To evaluate and drive technology evolution towards the three **Strategic Focus Topics:**
  - **Mastering to the Route to Disaggregation:**

    Leading in the development of open, disaggregated, virtualised and cloud-native solutions, moving towards agentic AI-based operating models.
  - **Green Future Networks:**

    Building sustainable and environmentally conscious solutions.
  - **6G:**

    Providing guidance and key requirements for design considerations and network architecture evolution.
- To define precise functional and non-functional requirements for the next generation of mobile networks.
- To provide guidance to equipment developers, standardisation bodies, and collaborative partners, leading to the implementation of a cost-effective network evolution.
- To serve as a platform for information exchange within the industry, addressing urgent concerns, sharing experiences, and learning from technological challenges.
- To identify and eliminate obstacles hindering the successful implementation of appealing mobile services.

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