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5G SUPPLY MARKET TRENDS

Summary report of the Second Stakeholder Workshop on 5G Development Pathways and Policy Options

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Authors

AIT Austrian Institute of Technology
Michael Dinges (Project Manager), Karl-Heinz Leitner, Dana
Wasserbacher, Stefan Zelenbaba

Fraunhofer ISI
Knut Blind

Imec
Pol Camps, Simon Delaere

RAND Europe
Advait Deshpande, Mann Virdee

Review

Michael Bernstein, Maximilian Zieser

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1 INTRODUCTION

This document provides a summary of the second (final) stakeholder workshop that took place on 19 May 2021 during the 5G Supply Market Trends study contracted by the European Commission. The second stakeholder workshop served the purpose to disseminate, discuss and validate the findings of the study on the 5G supply market trends and to discuss and further elaborate policy options for the future development of 5G. The workshop was open to all stakeholders interested in the development of the 5G supply market. Overall, 227 interested stakeholders participated in the workshop.

The workshop started with a presentation of the results of the impact analysis of key development pathways in the 5G network ecosystem as outlined in the workshop background paper, which had been made available to the community in advance.[1] Following a presentation of the study finding and an overview on policy options, these were validated and discussed in an expert panel discussion. Moreover, the audience could post questions in the chat of the conferencing tool and provide open feedback and suggestions on policy options via a live online survey.

This document provides a short overview on the feedback from experts and the audience, including suggestions for policy options. The findings of this workshop will be used to validate and fine-tune the key findings of the impact analysis of the 5G supply market scenarios. The feedback by experts and participants allows clarification of possible misunderstandings in the draft key findings, adjustment to the summary of key findings, and prioritization of their policy relevance. The results of the workshop will directly feed into the process of specifying concrete policy options.

2 SUMMARY OF THE DISCUSSION

This section presents reflections of the expert panel on the scenarios and the impact analysis, followed by suggestions and feedback on policy options by the general audience.

2.1 Reflections of the expert panel

Overall, the expert panel provided positive feedback on the scenarios and the impact dimensions considered therein. The scenarios were deemed to be plausible, sophisticated and logical in terms of the creation process as well as the factors used for creating them. While it was noted that the scenarios have different degrees of likelihood, the scenarios allow focus on aspects of vital importance for considering the future of 5G.

Two specific comments on the four scenarios have been made:

- One expert stressed that as concerns Scenario 4 (O-RAN for Big Tech), they would expect an even stronger role of big-tech industry than suggested in the report with a time horizon of 2030. Big-Tech companies are already big suppliers in many markets, which have developed mature models around white box technological solutions. Big-Tech could support and embrace Open RAN and, particularly outside Europe, Open RAN could arrive faster and might significantly change the system. Two other experts amended that the core 5G technologies (service-based architectures, network slicing, cloudification etc.) are not only about hardware development concerning components and interfaces anymore but also increasingly incorporate machine learning and artificial intelligence. Information Technology and Telecommunications are thus in the process of being increasingly integrated, which constitutes a paradigm shift in this industry. Regarding this perspective, an expert suggested that Information Technology will probably take the lead in the industry by building momentum and revenues through the development of use cases serving vertical industries.

- Another expert suggested that Scenario 1 (Incumbent players driving 5G) reflects a situation in which the usual players carry on as usual. However, new technological opportunities may also attract new players in the field, which could be facilitated by new attempts to open up standardised arrangements. Standardisation was considered a painful and long-lasting processes which sometimes can be bypassed by technological innovation. New technological solutions can thus

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[1] https://zenodo.org/record/4752718#.YLZdb6gzaUk

cause market attraction and overwhelm existing regulatory considerations. For example, the history of the internet has frequently seen such developments.

Apart from these specific comments on the scenarios, the experts identified several topics with specific relevance for the evolution of 5G in Europe:

Supply chain diversification was seen beyond singular control by the European Union. One expert indicated that a disruption in terms of new entrants is likely to occur in the future. The panel was also concerned about supply chain diversification, given increasingly strained geopolitical relations among Europe, and other regions of the world.

Another point brought forward referred to **the role of the supply side in, historically, triggering demand for mobile technologies**. The idea was that once the infrastructure was put in place and opportunities are there, market demand follows. With 5G, this situation may have changed: Today, operators are not too keen on pushing a fast roll-out and the industry is still looking for significant market potentials – unsuccessfully, so far.

Closely related to the latter point, the experts emphasized the **strong relevance of the demand side** in addition to connectivity. The experts noted critically that most 5G mobile network service providers are adopting a consumer-based model, which will not generate new revenues and will probably delay the adoption process of 5G. While first experiences in successful implementation of 5G in the area of smart factories have been made, much more complex and relevant use cases (e.g. in Health) exist which needs to be explored. Indeed, the panelists highlighted the importance of strengthening the exploration of the role of verticals with all stakeholders involved.

Furthermore, it was noted that there is also a strong demand/expectation by industrial players that 5G is not a top-bottom service provision but rather should provide vertical industry with the opportunity to serve as **a source of innovation**. Sectors like transport, manufacturing and logistics especially would like to see a future 5G network that allows them to innovate and co-create new services. If network operators cannot provide such a network, new players may enter the market to cater to this need, as one panelist suggested.

The **importance to profit from innovation** as a key incentive to innovate was also mentioned. While in many scenarios, there is a movement from closed ecosystems to open ecosystems and open source platforms, the roles of standards and standards patents royalties need to be considered as incentives for innovators and researchers in Europe to invest in research and innovation.

Security issues were mentioned to be a challenge that Europe faces, but the EC was deemed to be working very hard at it. Nevertheless, security was considered to be crucial, because some highly relevant applications need to run on secure networks.

Furthermore, the panelists stressed the role of the **human, social side in the evolution of the 5G infrastructure**, which should be taken seriously. Panelists also stressed social and socio-technical considerations need to be considered in future policies concerning the deployment of 5G networks. Beyond privacy and security, examples of societal concerns referenced included to the future of work, automatization, and the digital equity.

In terms of **policy recommendations**, the panelists brought forward several distinct recommendations that should be considered for creating the future of 5G in general:

- **Spectrum policy:** While spectrum has been made available for 5G and new models of deployment in Europe are lowering the entry barrier for new operators, spectrum regulation is still highly fragmented in Europe. It was noted that spectrum regulation varies considerably among different countries in Europe. In order to benefit from scale and allow for replicability and growth, a better harmonization of spectrum policy is needed.
- **Public procurement:** Public procurement of networks was deemed to become increasingly important. Private networks are becoming important and with an early success in the creation of private networks, we might have soon a very patchy 5G network structure in the EU Member States. However, for public purposes national scale is needed. For example, Public Protection and Disaster

Networks all have been built upon 2G technologies. There is a strong demand to advance these to the next generation. Also, secure networks for railroads need to be updated etc. While the overall market in these areas is not big, the great opportunity of government investment would be to fully build out the capabilities of secure networks based on 5G. Based upon these public investments, networks could be provided that are extremely reliable and can also be used for critical business applications, which might have positive economic and social impact.

- **Universal access:** Governments need to carefully consider universal access. Policies promoting 5G access should not only consider population density, but also where services are needed, particularly with regards to public services such as security, health related services, or disaster management. Promoting 5G access in areas where such services are not big business drivers is still important because of the public interest to have such infrastructures in place.

- **Data privacy and security:** Data security and a trustworthy treatment of user data is important. While data privacy and security concerns are highly debated, 5G users should have control over the technology. Many assumptions are being made that we only "opt-in" for a certain technology, but we also need real and legitimate options to "opt-out".

- **Equality and affordability**: A closer look at the demand side with the aim to facilitate user empowerment is needed. The pandemic has shown that information technologies and telecommunication are a critical infrastructure, in which issues of inequalities and the digital divide still play an important role. 5G Networks come with the promise of providing seamless connectivity. It is thus highly relevant to address inequalities that could come with 5G. Policies should drive business models which offer different services to avoid societal lockouts and assure affordability of connectivity.

2.2 Suggestions from the Audience

In addition to the reflections of the panelists, the participants were invited to provide suggestions on policy recommendations to support the future of 5G supply market via a live online survey. The following sections summarize the responses and policy recommendations made by the participants.

2.2.1 Key principles for European Public Policies related to the 5G ecosystem

The respondents to the online survey and the comments in the chat suggested several principles European public policy, related to an open and secure 5G ecosystem, should adhere to:

- Public 5G policy should **encourage innovation and innovation leadership** that will provide for new services and should **reduce barriers for innovators and SMEs**. Encouragement of more openness and higher interoperability is seen as a valid option, but openness should not compromise on security.

- Public policy should **take an ecosystem perspective** and should not be limited to a RAN issue. Objectives like resilience, transparency, sustainability and autonomy must be considered from an ecosystem perspective. Public policy should **avoid fragmentation** and ensure that stated policy objectives such as increased openness are being achieved. Policies should leverage a European ecosystem and develop key competences that are needed in a time where cloud services, information technologies and telecom are merging in 5G.

- Public policy should foster **technological autonomy** of Europe and reduce its dependency on large tech companies from outside Europe. Public policy should strengthen European SMEs and start-ups and enable significant investments, actively supporting the development of new and innovative services.

- Public policy should foster a **transparent, market driven approach** that enables strategic autonomy with open competition. It should go beyond the support of big players and support the emergence of a broad 5G ecosystem. Public policy should **stimulate private investment for sustainable digital services**.

- A market driven approach also entails that public policy should adhere to **technology neutrality** and **technology neutral regulation**, which does not favour a particular architecture. Also, **protectionism** should be avoided, which can provide tensions with the plea for fostering technological neutrality.

- Public policy should ensure that 5G development is based on open standards that are WTO/TBT compliant, including the EU directive on standardisation[2]. The 5G ecosystem should be based on common **European standards** and fully open for all ecosystem players. Parity in terms of security of different architectures should be ensured, and standards should assure interoperability to avoid lock-in.

- Public policy should set measures that account for **public interest** in terms of security, energy efficiency, social benefits, social inclusion and innovation. **Public procurement** would allow to invest in relevant use cases for Europe and **spectrum policy** plays an essential role in the overall development.

2.2.2 Specific policy suggestions

In addition to the principles outlined above, suggestions for focusing certain policy areas have been made by the participants in the live online survey.

For the **advancement of skills**, a general promotion of education in STEM fields and the development of digital (programming) skills from a young age to higher education was deemed essential. At the higher education level, participants mentioned a specific need for increasing skills in virtualization technologies and network innovation, as well as the provision of schemes between universities and SMEs to develop cloud-native telecom skills. Further skills-related suggestions concerned 1) support for general certification of specialists, and 2) EU-wide capacity building for Member States with limited financial capabilities and 3) consideration of the needs of EU candidate and neighboring countries. Moreover, participants suggested promoting gender equality schemes in education.

Related to **standardisation, test beds and certification** the suggestions have been diverse and partly contradictory. Whereas some mentioned that the EU should pursue a policy of certification due to negative security outcomes, others demanded security certifications for open RAN components and the support of a certification process for sub-components destined to power a public network, e.g., for interoperability, for supply-chain diversity, for security. In this regard, also the demand to standardise and certify products without looking at country of origin but adhering to European norms was suggested.

Several participants suggested that the EU should encourage 3GPP and ETSI to take on standard setting for open, interoperable networks and follow a joint approach in standardisation. Standardisation is seen to be a global effort and it was suggested that Europe should take the lead to coordinate a global multilateral cooperation approach such as an Action Plan on standardisation. In opposition to this view, another respondent expressed the necessity to find a way for public bodies to monitor the progress of relevant standards (including informal industry ones) while leaving the choices to industry.

The notion was expressed that public policy should support the requirement for interoperability, e.g., the demonstrated ability for a sub-component from a vendor to work with 2 or more other vendors. Concerning the O-RAN Alliance a respondent expressed the need to develop its governance mechanisms to ensure openness in its processes, participation, and transparency.

Concerning **test beds,** opinions diverged. Whereas one respondent suggested that test beds should be restricted to non-commercial deployments only, other opinions were that test beds should always be the precursor of real-life business opportunities and include incumbent vendors as test-bed suppliers, or even be commercial. Additional opinions stressed the need 1) to establish R&D testbeds in each country and 2) for a European policy regulating access to the 5G spectrum by verticals in a campus environment.

As regards **R&D funding**, the need for investment across the whole chain was expressed, including blue sky research, development, trials, pilots, and large-scale deployment in market-failure areas. Funding should stimulate industry investment and industry views should be taken adequately into account. R&D Funding should also allow for structured and stable collaboration frameworks with leading universities and research

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[2] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32012R1025

institutes. It was suggested that funding should also be provided for Plugfest events, certification labs and norms, and tests and pilots.

Several participants noted difficulties for SMEs to participate in publicly funded R&I actions and therefore suggested promoting specific instruments for SMEs. Suggestions included the development of a small grants scheme for supporting individual research efforts, a quota of 30% for R&D funding for SMEs, and initiatives for SMEs to develop cloud-native and other next paradigm telecom technology.

Other suggestions focused on the exploitation of synergies and the promotion of 5G solutions, including the need for specific topics (cloud-native technologies, Artificial Intelligence, Machine Learning, Privacy and 5G/6G security) and target groups (Smart City and Smart regions, skills development of public operators in cloud-based telecom). Further comments stressed the need to examine the value of public R&I investments on equipment vendors in the past.

Concerning **public procurement**, respondents provided the following suggestions:

- to ensure a good balance between R&D funding and public procurement
- to create EU-wide public procurement guidelines and recommendations
- to focus on multi-vendor, non-proprietary solutions based on open standards rather than proprietary solutions / to ensure that public procurement will be based on harmonized European Standards instead of creating technical regulation
- to encourage public procurement of 5G solutions
- to use public procurement to build and strengthen the European supplier landscape
- to use public procurement for building a 5G network implemented by European SMEs across 100 European universities
- to replicate the DARPA approach (more risk, unclear whether desired outcome will be reached, less questions, more focus on impact) when it comes to funding European 5G SMEs

For policies related to **market competition and growth,** several comments noted that Europe is already a market leader in the supply market domain, and that European sovereignty should be ensured. Several respondents noted that more attention should be paid to support promising spinoffs from academia and that support for the emergence of new EU players through piloting activities is needed. Participants stressed the need for public and private investment in 5G start-ups, and a focus on procurement policies that allows to create a European market for emerging players.

Additional responses pointed to the need of **making much more spectrum available**, to enable more operators (nation-wide and local), to promote competition (infrastructure and services), and to favour separation of infrastructure and services. Furthermore, a respondent suggested that the EU should follow the UK's lead in developing a Telecoms Diversification Strategy and mitigate the current risks of dominance.

As regards **security aspects** of 5G supply side, responses were quite diverging. While some respondents claimed that reliance on open source codes should deliver more security than proprietary solutions due to the scrutiny cyber security researchers can give to open source as opposed to proprietary closed vendor codes, others claimed that open source codes could expose more security risks.

In addition to this ongoing debate, responses suggested that:1) effective security requires a concerted European approach, 2) that clear test and measurement aspects on how to test "security" are needed, 3) ETSI should come out with clear test cases, and 4) that security measures of electronic communications networks and services should remain under the umbrella of European Electronic Communications Code.

Concerning **energy efficiency** some respondents stressed that this is already a major requirement for 5G and that energy efficiency of any new product and solution should improve considerably when compared with other existing products in the market (3G/4G). Distinct suggestions were to 1) define and enforce energy efficiency targets (KPIs) for 5G and 2) to incentivize energy efficient solutions.