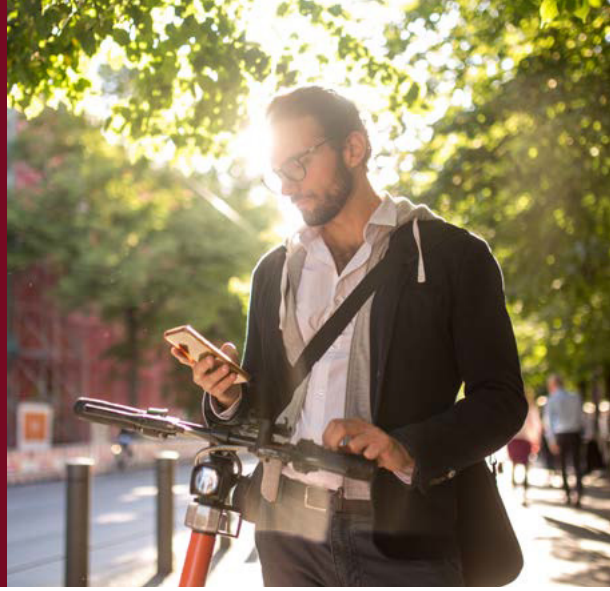
GSMA

The Impact of Spectrum Set-Asides on 5G

Germany

3500 MHz set-aside drives high auction prices and promotes inefficient spectrum use



Key lessons

What: Set aside of 100 MHz for industry users in 3500 MHz band

Why: Creation of incentives for local campus networks and Industry 4.0

How: Allocation of low-cost local licences based on application process with eligibility limited to owned/rented premises.

Impact: Inflated auction prices by c. €3 billion, whilst industry interest in the set-aside remains limited

Overview

- German regulator BNetzA set aside 100 MHz in 3500 MHz prior to the 2019 spectrum auction to create flexibility for new or developing 5G business cases and Industry 4.0.
- The immediate impact of the set-aside was to create scarcity in the mobile spectrum auction. This ultimately led to no German operator gaining access to 100 MHz in 3500 MHz, with total spectrum prices inflated by up to €3 billion.
- In contrast, interest from industry users remains low, with only 322 campus licences issued to date and mobile operators providing services to industry users using their own, artificially-limited spectrum.
- Furthermore, due to the 'real estate' licensing model chosen by BNetzA, set-aside applications are outside of urban areas, where the spectrum would be needed most by mobile operators, creating inefficiencies in spectrum use.

Background

With German industry contributing nearly 30% to GDP and amid growing interest in Industry 4.0, regulator BNetzA considered options for providing spectrum access for as-yet-unknown 5G use cases. Ahead of the 2019 spectrum auction, BNetzA decided to set aside 100 MHz in the 3500 MHz band for industry users to stimulate the creation of localised campus networks.

Licences for the set-aside spectrum are allocated based on an application process, where only the owner or leaseholder of the respective premise is entitled to apply. The German regulator had expected significant demand, but the expected rush for local licences did not materialise and, since the start of the licensing in November 2019, the number of users has grown slowly.

The (small) licence cost is calculated through a simple formula considering the applied-for bandwidth, licence duration and coverage area – with heavy-traffic or urban areas being priced higher than rural areas. For example, a 20-year 100 MHz licence covering 1km^2 of production plant premise in urban areas costs about €60.000. While it is not a direct comparison, the contrast to the cost of ~€150 million per 10MHz paid by mobile operators in the auction is significant.

The set-aside includes 'use-it-or-lose-it' and non-interference clauses, and low Wtransmit powers are encouraged. In addition to the set-aside in 3500 MHz, BNetzA also made the 26 GHz band available under a 'first-come, first-served' approach, with both mobile operators and other users being able to apply for licences.

Main lessons

As of June 2023, about 269 campus licences were issued in the 3500 MHz and an additional 16 in 26 GHz. Licensees include manufacturers, airports, and research campuses. Most of these licenses are actually not allocated to industry – as initially targeted - but to research institutes, universities or consulting companies. BNetzA does not publish further information on licence duration, area coverage, or bandwidths. However, with only 269 local licences, it is highly likely that the set-aside spectrum is going unused across large parts of Germany.

Furthermore, as the right to apply for the spectrum is limited to the owner / leaseholder / tenant of the area ('real estate licensing model') where the spectrum is meant to be deployed, the spectrum cannot be reasonably assigned in areas with fragmented ownership structures, i.e. it remains unused in city centre and residential areas – where it is most urgently needed by mobile operators. This has created significant inefficiencies in spectrum usage.

In parallel, partnerships between mobile operators and industry players are evolving, with Lufthansa and car manufacturer e.GO relying on Vodafone and Hamburg harbor, university hospital Bonn and machine facturer Arburg working together with Telekom Deutschland. Notably, some of these networks utilise the operators' spectrum: innovative solutions are thus possible even without the set-aside.

At the same time, the estimated cost of the set-aside to the industry has been immense. With only 300 MHz of 3500 MHz spectrum auctioned, none of the four operators obtained 100 MHz, with two operators actually acquiring less than 80 MHz. The artificial scarcity induced by the set-aside drove prices to around 300% of those in neighbouring countries where sufficient spectrum was available – leaving German operators paying an excess of almost €3 billion and demonstrating the high financial cost of creating set asides in core bands.



Dedicated 3.5GHz set-aside



Large economic cost (to mobile industry)



Low take-up to date (inefficient spectrum use)

Final impact

By creating the set-aside, BNetzA made up to 100 MHz of crucial 5G spectrum available for 'as-yet-unknown' use cases. In contrast, due to the scarcity induced by the set-aside, none of the mobile operators has access to 100 MHz for deployment today. This prevents the mobile operators from providing the standardised maximum possible performance of their 5G service to German customers.

Concerns about the efficiency of spectrum use are exacerbated when considering that only 269 campus licences have been issued so far and industry players continue to rely on the operators' spectrum assets for deploying campus networks. It appears that BNetzA's stated objectives for the set-aside could have been achieved more efficiently by placing the spectrum in the auction.

Finally, auction prices rose by up to €3 billion as a result of the set-aside. These funds could have been better invested into improving network coverage – a key topic currently pushed by both the German government and BNetzA ahead of the next spectrum auction.

Read more:
https://www.gsma.com/spectrum/resources/the-impact-of-spectrum-set-asides-on-5g/