

INFRASTRUCTURE

Nathan Peres

5G broadband is developing at an ever so fast pace, the telecommunications industry is pitching 5G as the superfast successor to today's current 4G offering. Although, many have greeted 5G implementation with negative sentiment, the fact of the matter is, telecom companies are struggling to digest the needed capital investment associated with a the new 5G network. There are many factors when considering the barriers to both execution and implementation of 5G. This report will investigate the execution of 5G infrastructure in Germany. Specifically, this report will investigate challenges related to the construction of 5G broadband infrastructure. This report will highlight how 5G infrastructure will be met with market and political barriers.

This report will focus on a few key problems. First, this paper will provide a primer regarding the capital investment needed to facilitate the shift from 4G LTE to the new 5G network. Second, this report will expand on the struggle's businesses are facing in the deployment of 5G, specifically, rural telecommunication network infrastructure. Moreover, this report will analyze the need for collaboration between government and telecoms, particularly, investigating the rational for cell infrastructure incentivization. In the final section, this report will investigate the partnership between the telecom industry and local government, specifically, how the government can assist during the construction of small cell bases. In brief, this report will analyze the implementation of 5G infrastructure in Germany with retrospect to market risk and political exposures.

HIGH COSTS

In Germany, Telecom companies are faced with the sole challenge of necessitating 5G, but it is going to come with inherent cost.

Illustrated in Figure 1, the past five years have been weak for European telecommunication companies, as their valuations continue to decline. The will for telecom giants to take on this large-scale investment is looking rather bleak, especially during a time of dwindling profits and returns.ⁱ Moreover, Deutsche Telekom, one of Germany's largest telecommunications provider, took on a €2 billion investment in Germany's spectrum auction. Deutsche Telekom's (DT) has, and will continue, to take on a large costs when bring 5G to market. For example, the big three German mobile network providers speculate that achieving countrywide 5G coverage could come at a combined cost of €60 billion.ⁱⁱ



Figure 1
5-year chart of the SXKP Europe
600 Telecommunications Index
(Source: Bloomberg Terminal)

5G is transmitted through millimetre wavelengths, this means that cell bases can emit hyper fast speeds, while only being able to cover much smaller areas. Meaning, telecom companies are now faced with a trade off, that being, the need to expend capital resources in rural low coverage areas. As per the German Federal Network Agency, they imposed a clause on the spectrum auction, stating that the telecom provider bylaw, must construct 5G broadband infrastructure in rural areas. Deutsche Telekom is now feeling the pressure to combat dead spots, despite the fact that expanding mmWave bandwidth to these regions comes at high cost and low profitability, making it hard to justify the high investment costs related with this requirement.

MITIGATION:

Government Lobbying and State Accountability

By 2025, analysts predict 99 percent of the German population will have access to the 5G network. This will come at the expense of procuring mobile base stations, additional research, kilometers of fiber optical cable, additional sensors and network equipment. To facilitate the business case for telecom companies, the German government needs to ease federal regulation and reduce taxation. For example, eliminating the costly spectrum action. To deal with the bureaucracy, Deutsche Telekom should direct a sizable effort to lobby the German government. With the construction of 5G, DT is introducing millions of euros into the German economy and the federal governments must acknowledge their impact. For example, it is expected that the European region will benefit from a \$135 billion increase in GDP as a result of 5G—the nations contributing the most include France, Germany, and the United Kingdom.ⁱⁱⁱ Therefore, an effective lobbying and communication strategy can be used as an effective tool to apply

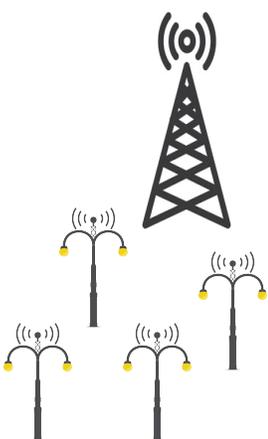
political pressure. This can result in the reduction of regulatory constraints that impede the telecommunications industry. Additionally, the government should provide incentives, subsidies, and tax breaks for telecoms taking on rural 5G coverage. Taking on the rural coverage initiative is large, and because this requirement has been imposed on the industry by the German government, the telecom companies should receive assistance for taking on this unfavourable requirement. In brief, this project is mutually beneficial for the society at large, meaning the German government should assist DT in this effort.

It has been reported that Deutsche Telekom is partnering with two other firms, Telefónica Deutschland and Vodafone to expand the 5G network to rural areas.^v The best practice going forward, is to place the small cell sites in rural areas that would receive the most benefit from its emittance of 5G broadband. For example, near agricultural sites, industrial areas, and near train lines. These are the areas that will be benefitting greatly from the technology advances as they will demand the most from the value add of 5G speeds. As well, governments should compensate telecoms that take on this unprofitable requirement. This could come as the form of tax breaks or federal subsidies. For example, PwC state that under the current model, corporations can deduct start-up and formation expenses as incurred.^{vi} Governments should ensure that similar tax deductions can be applied to the expenses incurred from addressing dead zones in rural areas.



Primer on 5G Infrastructure; Understanding 5G Frequency Spectrum

5G is the future of telecom and data transmission, it has been reported that 5G (under ideal conditions) will outperform its 4G predecessor 20-fold in relation to speed.^{vii} It will require additional infrastructure cost to achieve the hyper fast 10 gigabyte per second download rate that 5G is capable of. To emit 5G signal that allows for hyper fast speed, additional 'small-cell bases' are needed to ensure devices are in sufficient range with signal emitters (also known as 'small-cell bases') which facilitate faster download rates. Small-cell transmitters emit millimetre wave (mmWave) bands – these wavelengths can deliver hyper fast signal, but they cannot cast broadband signal very far (this phenomenon being better known as path loss).^{viii} For example, macro-cell bases only have a radius up to 2 km in a given city centre and small-cells have a radii of a few hundred meters.^{ix} Thus, to achieve the fast download speeds that telecoms are marketing, telecom providers must deploy a large number of cells within a given geographic area.^x This is often why 5G is first piloted in dense urban populations like downtown cores, university campuses, and other high traffic areas. Ultimately, it will take partnership with government and telecom to ensure the success rollout of 5G in the German marketplace.



Traditional towers are several hundred feet tall, and generally do not have enough power to provide fiber-optic-like services over the air to thousands of customers in a densely populated area.

Where possible, antennas can be attached to existing street lamps and utility posts. Smaller in size, these poles (new or old) can be placed in greater numbers to deliver 5G.

EXECUTION AND OPTIMIZATION STRATEGY

As previously mentioned, delivering 5G in Germany will require telecoms to absorb the additional investment cost needed to procure the required small-cell bases. DK has committed to procuring and installing an additional 10,000 small-cell bases to ensure the delivery of mmWave coverage in large dense urban cores.^{xi} Moreover, Deutsche Telekom have also committed to laying ~60,000 kilometres of additional fiber optic line.^{xii} McKinsey mentions that one-third of the cost of mmWave implementation will derive from the spending on macro and small-cell bases.^{xiii} It is unclear of the exact hardware and infrastructure cost, but DK is committing 5.5 billion euros per year in order to roll out 5G by 2025.^{xiv} This investment is no small cost and telecoms throughout the country hope to reap 5Gs added benefits by turning a profit. As 5G small-cell bases begin to appear, consumers will be attracted to mmWave access as they begin to experience the value add of hyper fast bandwidth speeds.

MITIGATION:

Infrastructure Monetizing

To progress the dialogue on 5G mmWave delivery in Germany, DT should focus on collaboration with other stakeholders in undertaking this task. This could be facilitated in two ways. First, DT should look at monetizing the infrastructure they are implementing. With the needed increase of small-cell bases, other telecommunication companies will rely on the infrastructure instated by early adopters of mmWave technology, in this case DT.



Therefore, it would be well advised that DT use this opportunity as a way to monetize their investment by selling access to their infrastructure to other businesses. This will provide value to the larger ecosystem at hand as it progresses the business case for 5G.^{xv} The model would look something like this: business-to-business-to-third-party, meaning early adopters of 5G mmWave will collaborate and offer the 5G capabilities with other paying B2B partners.^{xvi} Simply put, it would be as if DT is charging a toll for access. This business model can be facilitated because 5G technology allows for network slicing. In layman's terms, a third party can buy a "slice" of the operator's 5G network capacity—which is being emitted through the newly instated infrastructure—for its own use.^{xvii} This will allow early adopters to find other revenue streams by monetizing their infrastructure capabilities to other business and not just the end user. In facilitating network slicing, other stakeholders can partner with early adopters who have the capabilities to instate 5G mmWave bandwidth ensuring the infrastructure is in range for said third party. For example, university can partner with DT to instate mmWave infrastructure on campuses. In short, when early adopters unlock additional revenue streams it can aide in their ability to reinvest in additional network capabilities in its task of full 5G coverage.

Second, the German government must work in greater partnership with the telecom industry. Providing the nation with full coverage is a large task and instating the needed infrastructure comes with inherent regulatory roadblocks. The placement of small-cell antennas is regional and therefore, telecom contractors need to work with sub-regional governments to reduce regulation and red tape. Learning from the United States, sub-regional government can simplify and accelerate the approval process (i.e., building permits) when contractors are installing new macro and small-cell sites in public areas.^{xviii}

Telecoms want to facilitate 5G bandwidth, this comes with the need for additional infrastructure—policymakers need to reduce red tape, expedite the permit approval procedure, rework construction regulations, and provide access to new geographical placements.^{xix} Letting market forces work efficiently to facilitate 5G in a timely manner will allow for swift and effective coverage throughout a jurisdiction. Reducing cumbersome policy will allow DT and other telecoms to get their asset to market—which comes with a positive local economic impact. When policymakers reduce regulation, they should instate a tit-for-tat policy response, mandating telecoms to hire and procure locally. This will be seen as a win for government, it will signal to their constituency that they are committed to advancing the local economy. This can be initiated as an off-set policy which is often used for defence procurement and in theory can be applied to the facilitation of 5G infrastructure. As illustrated, the 5G mandate is a fine balancing act between advancing telecom's interest and that of the state.



In brief, the full implementation of 5G broadband must come as a result from public-private partnership. The politics of 5G has to do with the fact that the telecom industry has to adhere to the governments' mandate while also navigating cumbersome regulatory burdens. The result is added costs for telecom firms like Deutsche Telekom and delayed delivery for consumers. This report speculates that one of the largest challenges will come with

the installation of small cell bases particularly, working with local authorities to permit the building and installing of multiple cell bases. Overall, there will be multiple challenges when getting 5G deployed, but establishing a strong partnership should be a priority. DT needs to work with all levels of government and key industry players if countrywide 5G coverage is going to be a reality.

-
- ⁱ Grace Dobush, "Connectivity: Is Germany Actually Ahead of the Game on 5G?" Handelsblatt, November 28, 2018, <https://www.handelsblatt.com/today/companies/connectivity-is-germany-actually-ahead-of-the-game-on-5g/23583706.html>.
- ⁱⁱ Nic Fildes, "5G: Can Europe Match the US and China on Mobile Networks?," Financial Times, January 27, 2019, <https://www.ft.com/content/650d3bf8-1e32-11e9-b2f7-97e4dbd3580d>.
- ⁱⁱⁱ GSMA, "Study on Socio-Economic Benefits of 5G Services Provided in mmWave Bands," The WRC Series, December 2018.
- ^{iv} "Germany's Corporate Lobby: Turning American," The Economist, The Economist Newspaper, May 15, 2015, <https://www.economist.com/business/2015/05/14/turning-american>
- ^v Friedrich Ludwig Hausmann and Matthias von Kaler, "Government Relations: Germany," Getting The Deal Through, PWC Legal, February 2020, <https://gettingthedealthrough.com/area/106/jurisdiction/11/government-relations-germany/>.
- ^{vi} Andrea Middel, "Joining forces to combat dead spots," Telekom, November 2019, <https://www.telekom.com/en/company/details/joining-forces-to-combat-dead-spots-585428>
- ^{vii} "Germany - Corporate Deductions," PWC - Tax Summaries, PWC, January 10, 2020, <http://taxsummaries.pwc.com/ID/Germany-Corporate-Deductions>.
- ^{viii} "5G Speed Is Data Transmission in Real Time," Deutsche Telekom, October 8, 2018, <https://www.telekom.com/en/-company/details/5g-speed-is-data-transmission-in-real-time-544498>.
- ^{ix} G. R. MacCartney, Junhong Zhang, Shuai Nie and T. S. Rappaport, "Path loss models for 5G millimeter wave propagation channels in urban microcells," 2013 IEEE Global Communications Conference (GLOBECOM), Atlanta, GA, 2013, pp. 3948-3953.
- ^x German Federal Government, "5G Strategy for Germany," Federal Ministry of Transport and Digital Infrastructure, July 2017.
- ^{xi} "5G Key Enabling Technologies," Samsung, March 2020, <https://developer.samsung.com/tech-insights/5G/5g-key-enabling-technologies>.
- ^{xii} Stephan Broszio, "5G for our country, Germany," Deutsche Telekom, November 10, 2018 <https://www.telekom.com/en/company/details/5g-for-our-country-545510>.
- ^{xiii} IBID
- ^{xiv} Ferry Grijpink, "The Road to 5G: The Inevitable Growth of Infrastructure Cost," McKinsey & Company: Technology, Media and Telecommunications, McKinsey & Company, February 2018, <https://www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/the-road-to-5g-the-inevitable-growth-of-infrastructure-cost>.
- ^{xv} Jo Harper, "Germany's 5G: The bidders – and what's involved," DW: Business, DW, January 31, 2019, <https://www.dw.com/en/germanys-5g-the-bidders-and-whats-involved/a-47301598>.
- ^{xvi} "Making 5G Pay," PWC, March 2020, <https://www.strategyand.pwc.com/gx/en/reports/making-5g-pay.pdf>.
- ^{xvii} IBID
- ^{xviii} "Network Slicing can be a piece of cake," Swisscom press release, Ericsson, https://www.ericsson.com/assets/local/digital-services/doc/-Network-slicing-Report-Final.pdf?_ga=2.155838136.2067076220.1575395551-297515707.1573186850.
- ^{xix} Stephan Broszio, "5G for our country, Germany," Deutsche Telekom, November 10, 2018 <https://www.telekom.com/en/company/details/5g-for-our-country-545510>
- ^{xx} Dirk Wossner, "5G in Germany: Huge opportunities – if we all start out together now," Telekom: Management Unplugged, Telekom, November 15, 2019, <https://www.telekom.com/en/company/management-unplugged/details/5g-in-germany-huge-opportunities-if-we-all-start-out-together-now-585206>.