The role of private 5G and CBRS in the US manufacturing sector

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1 Executive summary

US manufacturers are pursuing ambitious industrialization and reshoring goals as they look to become more competitive on a global scale and build more-resilient domestic supply chains. Many are re-evaluating their production footprints and are investing heavily in advanced technologies as they bring operations closer to home. Achieving these objectives requires significant improvements to productivity, efficiency and operational flexibility.

Connectivity is the foundation that enables this transformation. Industrial automation and real-time analytics depend on wireless networks that offer reliability, low latency, and security. Private 5G networks have emerged as a critical tool for meeting these requirements. As such, US manufacturers are deploying private 5G networks at scale. Analysys Mason estimates that 75% of US private 5G networks rely on the Citizens Broadband Radio Service (CBRS), an innovative shared spectrum band that has lowered the barriers to deploying private 5G networks.

This paper explores how private 5G networks and CBRS spectrum are being used in the USA and how potential changes to the current spectrum regime could affect the US manufacturing sector. It is based on our analysis of available data and additional research conducted by Analysys Mason, including interviews with 15 manufacturers that have deployed private 5G networks in the USA. The key findings of this paper are as follows.

- **US manufacturers are rapidly adopting private 5G networks using CBRS.** CBRS has helped to drive US leadership in private 5G: Analysys Mason's research shows that the US has deployed more dedicated private 5G networks than any other country worldwide. Hundreds of private 5G networks have already been deployed in the manufacturing sector in the USA and Analysys Mason estimates that this will rise to over 2500 by 2032. CBRS is key to this growth: over 85% of private 5G networks deployed in US factories by 2032 will rely on CBRS, almost all of which will use the General Authorized Access (GAA) tier. A large, vibrant CBRS ecosystem has emerged, consisting largely of USA-based suppliers (in contrast to the public 5G ecosystem that is dominated by Chinese and European suppliers).

- **Private 5G networks support many advanced applications in manufacturing.** Manufacturers are using private 5G networks to digitize their processes and automate their operations. The main applications include automated logistics management, computer vision and mobile robotics. The adoption of AI in the manufacturing sector will also drive the demand for private 5G to support applications such as digital twins and humanoid robotics.

- **Private 5G delivers several operational benefits and is an important enabler of many manufacturers' reshoring initiatives.** Manufacturers deploying private 5G are realizing benefits such as productivity gains, cost efficiencies from reduced downtime and labor cost savings, and better worker safety and morale. For instance, unplanned downtime is estimated to cost US manufacturers USD50 billion per year.[1] A US automotive manufacturer interviewed for this study reduced its unplanned downtime by 30% after installing a CBRS private 5G network. Private 5G is

[1] Forbes (2022), *Unplanned Downtime Costs More Than You Think*.

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more effective than public 5G and other wireless technologies in delivering these benefits because private 5G offers superior control, coverage and security.

- **Moving the CBRS band would bring significant operational disruption to US manufacturers.** US manufacturers have invested heavily in network equipment and devices for their private 5G networks. Most of the manufacturers interviewed for this study expected considerable disruption to their operations if the CBRS band were to be moved, particularly as there is no alternative band to move to that matches CBRS in the level of performance and ecosystem maturity. Several manufacturers expressed concerns over the time it would take for the CBRS hardware ecosystem (including chipsets, devices and radios) to be re-established.

  Some manufacturers expect that moving the CBRS band will slow down or halt their automation and new technology initiatives. Moving the CBRS band also risks putting the USA at a competitive disadvantage relative to other nations such as Germany and the UK that have allocated local spectrum for private 5G networks.

- **Raising power levels could disrupt the operations of the manufacturers that rely on CBRS.** Several of the manufacturers interviewed for this study are concerned that raising the maximum permitted power levels for CBRS would cause interference and degrade the performance of their private 5G networks. This could reduce the viability of private 5G in certain locations and slow down the pace of private 5G adoption in the USA, creating headwinds for US manufacturing growth and global competitiveness.

> "Private 5G has been huge… manufacturing in the US has become more of a mandate and we need to make sure we are competitive and making US manufacturing more affordable. We need more automation and productivity increases [to support those goals] and the network is a key component. CBRS has a big role to play there."
>
> *Head of IT, US automotive manufacturer*

Figure 1.1: An overview of private 5G networks and CBRS deployments[2]

2 OnGo Alliance (September 2025), *CBRS Success*.

2 Introduction

This paper discusses how private 5G networks and CBRS spectrum are being used in the USA, the contributions that they are making to the US manufacturing sector and the potential impact on US manufacturing of moving or altering the CBRS band.

It draws on primary and secondary research conducted by Analysys Mason, including 15 interviews of manufacturing and logistics companies that have deployed private 5G networks in the USA. The interviews explored how each company is using private 5G and how they would be affected by changes to CBRS. The findings from these interviews will be discussed throughout this paper and the interviewees are referred to on an anonymous basis (for example, 'a US retail goods manufacturer'). Figure 2.1 provides a summary of the interviewees.

Figure 2.1: Companies interviewed for this study

Reference number	Manufacturing sub-sector	Annual revenue	Spectrum used
1	Retail goods	>USD1 billion	CBRS
2	Food and beverage	>USD1 billion	CBRS
3	Pharmaceuticals	>USD10 billion	CBRS
4	Electronics	>USD10 billion	CBRS
5	Pharmaceuticals	>USD100 million	CBRS
6	Automotive	>USD10 billion	CBRS
7	Food and beverage	>USD1 billion	CBRS
8	Retail goods	>USD10 billion	CBRS
9	Automotive	>USD10 billion	CBRS, operator
10	Metals	>USD10 billion	CBRS
11	Automotive	>USD1 billion	CBRS
12	Food and beverage	>USD10 billion	CBRS
13	Metals	>USD10 billion	CBRS
14	Automotive	>USD10 billion	CBRS
15	Chemicals	>USD10 billion	CBRS

Source: Analysys Mason

This paper aims to explore the impact on these types of companies, and on the US manufacturing sector more broadly, if changes are made to the current spectrum regime. We do not argue for a specific position on spectrum usage but aim to provide information on how manufacturers are using CBRS spectrum and how they may be affected by changes such as the reallocation of the CBRS band or the raising of power levels.

The remainder of the paper is structured as follows.

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- **Section 3** provides an overview of what private 5G networks are, why manufacturers are deploying them, and the applications that they enable, such as computer vision and robotics.
- **Section 4** explains what CBRS spectrum is and how it differs from other types of spectrum.
- **Section 5** quantifies the size of the private 5G market in the USA, including breakouts for private networks that use CBRS and those deployed in the manufacturing sector.
- **Section 6** discusses the positive business outcomes being generated by private 5G, such as productivity gains and cost efficiencies, and explores how private 5G is supporting US manufacturers' goals, such as automation and reshoring.
- **Section 7** assesses the impact that changes to CBRS (such as moving the spectrum band or raising power levels) would have on US manufacturers that have already deployed private 5G or plan to do so.

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3 Private 5G networks and how they are used in the US manufacturing sector

3.1 Private 5G networks are dedicated networks that offer enterprises a high degree of control and security

Private 5G networks are dedicated cellular networks that are deployed for the exclusive use of a single organization, such as a manufacturer, logistics firm, or public sector organization. Private networks can use 4G (LTE), 5G or both; we use 'private 5G' in the remainder of this paper as shorthand for private networks that use either 4G or 5G.[3]

This paper focuses on private 5G networks in the manufacturing sector, though private 5G has been deployed in sectors as diverse as defense, education, entertainment, healthcare, and transportation.

Unlike public mobile networks, which are designed to serve millions of consumers across wide geographic areas, private 5G networks are optimized to meet the specific operational requirements of a defined site or group of sites, such as a factory, warehouse, or port.

Private 5G networks provide many of the same capabilities as public 5G networks, such as high data rates, low latency, and support for large volumes of connected devices, but with significantly greater control for the end user. Enterprises that deploy private networks can determine how the network is configured, which devices and applications are prioritized, and how performance, security, and resilience are managed. This level of control is particularly important in industrial environments where connectivity is mission critical to core operations, and even small periods of downtime can be costly (typically hundreds of thousands of dollars per hour).[4]

The main components of a typical private 5G network are:

- the radio access network (RAN), which provides wireless coverage across the site
- the core network, which manages traffic, security, and policy control
- radio spectrum that facilitates wireless communication
- connected devices operating on the network, such as sensors, cameras, industrial equipment, and worker devices.

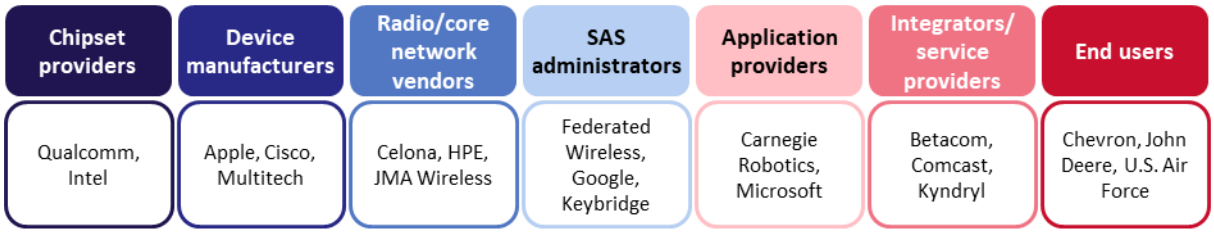
Figure 3.1 shows the range of stakeholders involved in the private 5G value chain. These include equipment vendors that supply radios and core networks, Spectrum Access System (SAS) administrators that co-ordinate the shared use of CBRS (outlined in section 4), systems integrators that design and deploy networks, and end users that operate and benefit from the networks. The strong presence of US domestic firms is a notable feature of the US private 5G ecosystem (and

[3] Private 5G networks should not be confused with Wi-Fi networks deployed in industrial settings or where companies use a VPN running over a public cellular network.

[4] Siemens, *The True Cost of Downtime 2024*.

contrasts with the public 5G ecosystem which is dominated by Chinese and European manufacturers).

Figure 3.1: The private 5G value chain and examples of USA-based companies



Source: Analysys Mason

3.2 Manufacturers deploy private 5G to support their automation and digitization goals

Private 5G networks provide a foundation upon which manufacturers can make their plants more productive and improve the quality of their output. US manufacturers are investing in automation and digitization initiatives to increase their competitiveness on a worldwide scale, and require a secure, reliable form of connectivity to enable this goal.

However, manufacturing sites often present challenging radio environments that limit the effectiveness of public cellular networks and other wireless technologies, and it is often expensive or impractical to deploy wired connectivity. Private 5G provides several advantages over these technologies.

- **Site-wide coverage.** Private 5G provides far greater reach than Wi-Fi. Large factories and outdoor yards often require extensive coverage, but the limited power of Wi-Fi means that many access points are needed to cover large areas. Wired networks can be impractical or expensive to extend into outdoor or hard-to-reach areas. Private 5G therefore offers a cost-effective alternative.
- **Reliability.** Private 5G provides predictable and reliable connectivity and can eliminate connectivity dead spots in factories and warehouses.
- **Mobility.** Private 5G is well suited to connecting devices with mobility requirements (such as automated guided vehicles and autonomous mobile robots).
- **Flexibility.** Private 5G allows manufacturers to reconfigure their production lines without the high cost and time spent on re-cabling that comes with wired networks.
- **Security.** Private 5G uses SIM-based authentication, which provides strong, enterprise-grade security. Many manufacturers have security policies that requires complete control of OT data, ruling out public mobile networks as an option. Private 5G allows sensitive operational data to be kept on site or within a controlled private cloud environment.

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> "It comes down to three major topics: reliability, coverage and control. Our plants are very metal dense and huge… you're trying to provide coverage across very large physical footprints. Predictable performance and low and consistent latency are a big deal [and led us to] invest in private 5G. We struggled to get the same results consistently from public cellular or Wi-Fi."
>
> *IT Director, US food and beverage manufacturer, on the motivation for deploying private 5G*

3.3 Private 5G supports several critical manufacturing applications

Private 5G is the foundation for numerous advanced applications that support manufacturers' wider goals. Many manufacturers are investing in automation initiatives, deploying AI-driven processes and consolidating data flows to strengthen productivity, quality control and worker safety. They are also under pressure to optimize costs, manage labor shortages, and support reshoring efforts by building plants that are more automated and efficient. The applications highlighted in Figure 3.2 support these goals.

Figure 3.2: Main private 5G applications in the manufacturing sector

Application	Description	Examples
Connected workers	Private 5G provides reliable, secure connectivity over vast outdoor areas or in interference-prone indoor factories. This supports various connected worker use cases such as industrial tablets, push-to-talk communications and augmented reality (AR) headsets.	Dow Chemical deployed a CBRS network at its Freeport plant. The network provides reliable, plantwide connectivity to digitize a cumbersome paper-based maintenance order system. This significantly reduced the time taken for workers to complete operations and improved worker safety.[5]
Computer vision	AI-connected cameras on production lines can identify errors or misalignments and prompt human intervention. Private 5G can provide the required low latency and high-uplink connectivity.	BMW is using private 5G at its plant in Spartanburg, South Carolina, to enable an AI-driven video analytics system to inspect the accurate placement of metal studs onto automobile frames.[6]
Industrial tools	Manufacturers are increasingly deploying wirelessly connected torque tools, scanners, and handheld controllers to digitize workflows and improve quality control. Private 5G provides the reliable indoor coverage, low latency and secure connectivity that these tools require.	John Deere acquired CBRS PAL licenses and is deploying private 5G across its US manufacturing plants. It is using 5G-connected torque wrenches that tell employees if bolts are put on correctly, thus helping to optimize product assembly.[7]
Mobile robotics	Private 5G provides the reliable, low-latency connectivity required for automated guided vehicles and autonomous mobile robots to move safely across factories without	Del Conca, a global tile manufacturer, deployed a CBRS network at its manufacturing plant in Tennessee to provide reliable connectivity for its AGVs. It saw a two-fold improvement

5 Automation.com (2023), *Dow's Private Cellular Network Empowers Manufacturing People*.

6 The Critical Communications Review (2023), *BMW Improves Operations in South Carolina Plant with Private 5G*.

7 Mobile World Live (2025), *Feature: John Deere fires up private 5G at key factory*.

Application	Description	Examples
	interruption. Its strong mobility management and interference resistance ensure smooth handovers and consistent performance.	in wireless coverage while deploying a third of the number of access points compared to Wi-Fi.[8]
Predictive maintenance	Predictive maintenance relies on large volumes of sensor data, often collected from equipment distributed across an entire facility, to detect anomalies and predict failures. Private 5G can provide wide coverage and can connect thousands of devices simultaneously. This allows manufacturers to build real-time analytics models that reduce unplanned downtime and extend asset lifecycles.	A US electronics manufacturer[9] is using private 5G to collect data from almost all new machines installed in its US factory. It runs this data through an AI model that identifies when machines are close to failure, thus helping to reduce the time spent fixing machinery.
Security cameras	Private 5G allows manufacturers to deploy cameras across large sites, including outdoor yards, loading bays and remote storage areas, to enhance security without expensive cabling.	Cargill, a US food and beverage conglomerate, was able to deploy private 5G-connected security cameras in the yard of a manufacturing facility at half the cost of using wired connectivity.[10]

Source: Analysys Mason

Many manufacturers start with a relatively simple application, such as connected tablets and phones for workers or simple predictive maintenance, where the business case can be demonstrated quickly and without disrupting existing production processes. Once these foundational use cases prove to be reliable, manufacturers progressively introduce more complex, data-intensive or latency-sensitive applications such as computer vision or robotics. Other advanced applications follow, as highlighted in Figure 3.3. The maturity of the private 5G ecosystem will increase as device availability, application platforms and integrator capabilities continue to expand; this will enable manufacturers to add more applications to their private 5G networks over time.

8 Celona (2023), *Del Conca group standardizes on Celona private wireless to automate and streamline manufacturing operations*.

9 Company 4 in Figure 2.1

10 Celona (2026), *Cargill's Private 5G Journey: From Evaluation to Scaled Deployment*.

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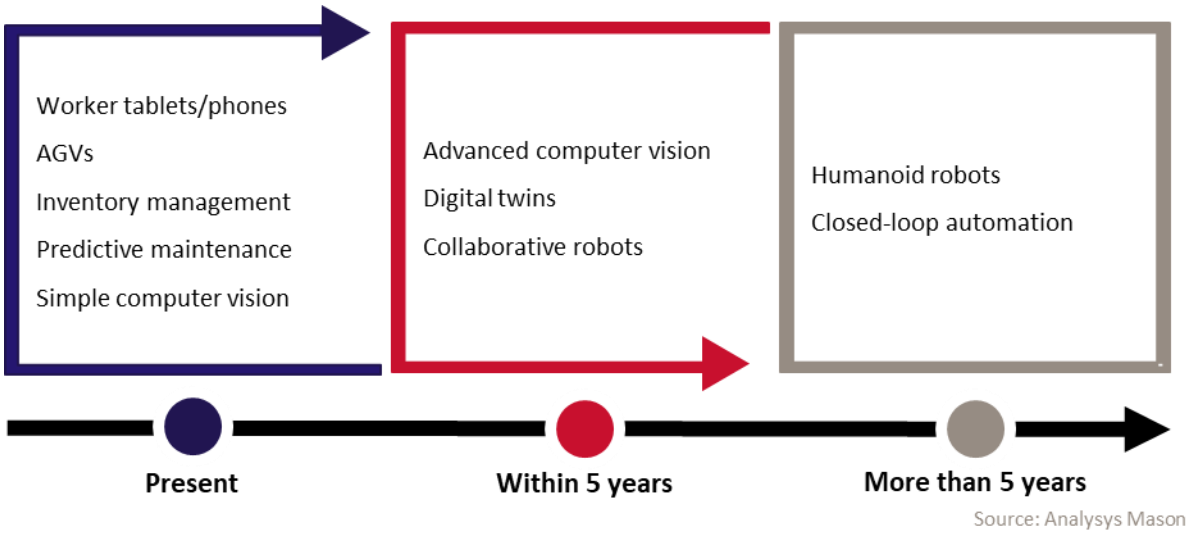
Figure 3.3: Timeline to widespread adoption of private 5G applications in manufacturing



Source: Analysys Mason

Almost all of the manufacturers that we interviewed have ambitions to develop more-advanced applications and integrate private 5G deeper into their manufacturing environments. Examples include the following.

- A US pharmaceuticals firm[11] initially deployed private 5G for the predictive maintenance of machinery on the factory floor, but is now adding other applications. "We have automatic storage and retrieval systems (ASRS) in our warehouses… automated cranes and shuttles that sort and load pallets. We're looking at moving these over [from wired connectivity] to private 5G, which will be much more flexible… and we can integrate it with other automated processes [that are using private 5G]."

- A US electronics manufacturer[12] is currently using private 5G for predictive maintenance and computer vision but is exploring how the technology can enable more automation. "We are testing out a lot of robotics tools and robotics arms [that transport components across production lines] … these are very latency-sensitive. They all use Ethernet, but we want to use private 5G, which will make it much easier when reworking production lines."

- A US automotive components manufacturer[13] is developing a digital twin of its factory (digital twins are virtual replicas of physical objects or systems that are used to simulate behavior and optimize operations). "We're looking at using private 5G to build a digital twin… it's collecting raw data from all of these IoT sensors and feeding that into large language models purpose built for industrial product design…this is going to help us to optimize the design of next-gen production lines."

11 Company 3 in Figure 2.1

12 Company 4 in Figure 2.1

13 Company 9 in Figure 2.1

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- A US retail goods manufacturer[14] has plans to invest further in automation. “We have some robotics [using private 5G] but we have a lot more to do… we want to go further on automation but can only do so much with our legacy networks. A lot of our goods packing process is quite manual and we’re looking at how we can use private 5G to automate and improve that.”

[14] Company 8 in Figure 2.1

4 CBRS spectrum

4.1 CBRS is a critical enabler of private 5G networks

The CBRS band is a shared spectrum band in the 3.5GHz range (3550–3700MHz). It represents a novel approach to spectrum management and is designed to efficiently utilize spectrum while protecting incumbent users. Spectrum in the CBRS band was previously reserved primarily for the military, with some limited commercial uses, but the FCC authorized the full commercial use of CBRS during the first Trump Administration in January 2020.

This paper explores how CBRS is used in private 5G networks. It is also used by:

- wireless internet service providers (WISPs) to offer fixed-wireless access (FWA) services
- mobile network operators (MNOs) to add coverage and capacity to their public networks
- mobile virtual network operators (MVNOs) to offload traffic from public networks
- neutral host network providers to improve public network coverage in sites such as commercial buildings, corporate and academic campuses, and entertainment venues.

CBRS was designed to lower the barriers to entry for new users of cellular spectrum, including enterprises that wish to deploy their own private networks. It allows manufacturers and other enterprises to avoid the challenges of getting MNOs to dedicate sufficient licensed spectrum and resources to provide the necessary coverage and reliability, or paying upfront fees for exclusive spectrum licenses with geographic areas and regulatory requirements that do not match their needs.

CBRS has been the catalyst for the strong growth of private 5G networks in the USA. Analysys Mason's research shows that more dedicated private 5G networks are deployed in the USA than in any other country worldwide. The USA is also one of the leaders worldwide in terms of the number of private 5G networks deployed per capita.

CBRS operates under a three-tier access model (Figure 4.1).

- **Tier 1** consists of Incumbent Access (IA) users. These include authorized federal users (primarily the US Navy) and a few fixed satellite service sites. IA users retain priority access to the spectrum and are protected from interference from Tier 2 and Tier 3 users.

- **Tier 2** consists of Priority Access License (PAL) holders. PALs were assigned using competitive bidding and holders have licensed access to spectrum in the 3550–3650MHz band at the county level. PAL users are protected from interference from Tier 3 users, but only in their actual areas of operation within the license area.

- **Tier 3** consists of General Authorized Access (GAA) users. The GAA tier is 'licensed-by-rule'; users do not need to hold individual licenses and can freely use the 3550–3700MHz band outside of designated protection zones for IA users, as long as they do not cause harmful interference to IA or PAL users. GAA users must accept interference from IA and PAL users if operating in the same geographical area.

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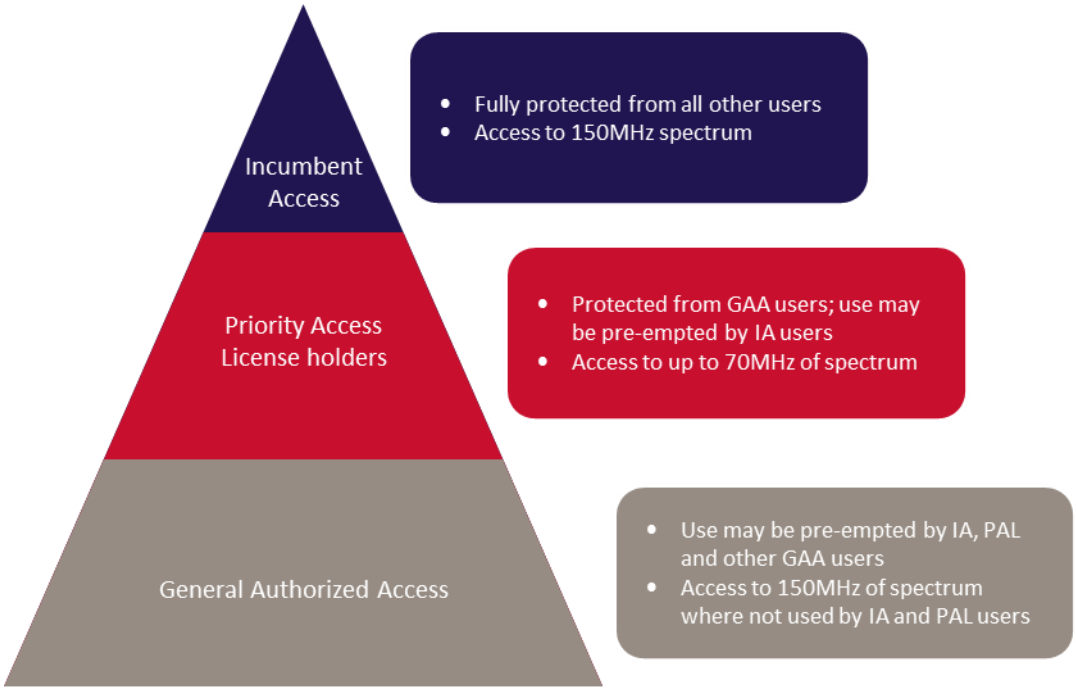
Access to the CBRS band is dynamically managed by Spectrum Access Systems (SASs), which co-ordinate spectrum use in real time to prevent harmful interference. Other countries such as Brazil, Germany and the UK also offer dedicated spectrum for private 5G networks, but the three-tiered sharing structure of CBRS access is unique to the USA.

Figure 4.1: The CBRS three-tier access model



Source: Analysys Mason

4.2 CBRS provides unique capabilities to manufacturers

CBRS meets a range of manufacturing needs that were not fully satisfied by the previously available options. CBRS gives enterprises a way to deploy reliable connectivity without the cost or dependency associated with traditional licensed bands, and the limited number of mobile network operators that offer them, while still fitting alongside existing Wi-Fi and mobile operator services. Most manufacturers adopt a hybrid approach where CBRS spectrum is used alongside other spectrum options, as described below.

- Wi-Fi remains essential for office environments and some indoor production areas. However, manufacturers often use CBRS alongside Wi-Fi when they need predictable uplink performance, mobility across large areas, and stronger control over interference. CBRS acts as a complementary layer for operationally critical or mobile applications.

- Public mobile networks can provide manufacturers with wide-area coverage outside of their facilities but can struggle to reach indoor industrial environments. Public networks also do not provide the level of control required for manufacturers that have strict security policies for OT data. CBRS complements public cellular networks by providing manufacturers with greater

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control, coverage, and improved performance. It allows manufacturers to keep all data on premises, which is critical for sensitive manufacturing operations that involve highly priced IP.

- US manufacturers could opt to work with operators to lease their spectrum for use in private 5G networks. These deployments are much less common than CBRS based networks because they are more expensive, less flexible, and risk exposing critical data. Enterprises typically prefer to build networks themselves or work with a preferred integrator or service provider rather than rely on an MNO.

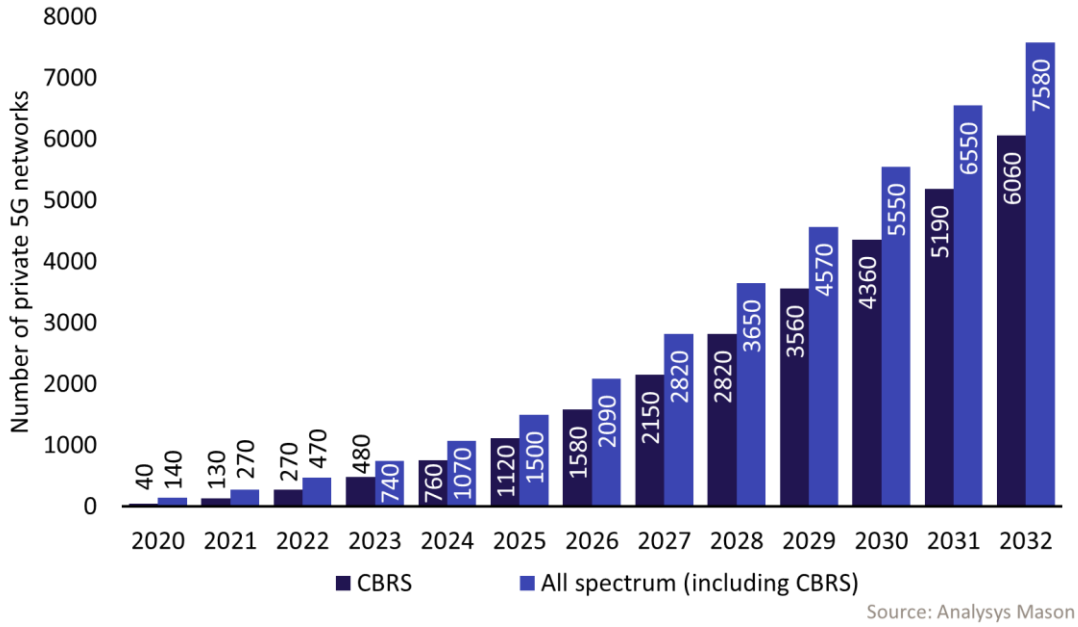
> "CBRS was a much cheaper option [than using operator spectrum] as we want to deploy at scale. We're not big enough for the carriers… they can only dedicate so much resource to you. We get much better support working with our local [managed service] provider."
>
> *IT Director, US automotive manufacturer*

5 The private 5G opportunity

5.1 The US private 5G market is growing rapidly

The market for private 5G networks in the USA has grown rapidly since the introduction of the CBRS band, and this growth is expected to continue throughout the second half of the 2020s. Figure 5.1 shows Analysys Mason's forecast for the total number of private networks in the USA, growing from 1500 in 2025 to more than 7500 by 2032. We estimate that almost 75% of the US private 5G networks that were deployed in 2025 use CBRS spectrum; this share will increase to 80% by 2032.

Figure 5.1: Number of private networks, by spectrum type, USA[15]



Analysys Mason's research shows that manufacturing accounts for a significant share of private 5G network deployments. Indeed, we estimate that the manufacturing sector alone accounted for almost a quarter of CBRS private networks in 2025 – more than any other sector – and this share will rise to 36% by 2032. More than 85% of all private 5G networks in the manufacturing sector will rely on CBRS by 2032.

[15] Non-CBRS private networks include deployments using operator licensed spectrum, spectrum from other licensed rights holders (such as Anterix, which holds spectrum in the 900MHz band) and unlicensed spectrum. We include hybrid private networks where at least one of the network equipment elements (core or radio) is to be used only by a single organization, but do not include end-to-end network slices that run over public networks.

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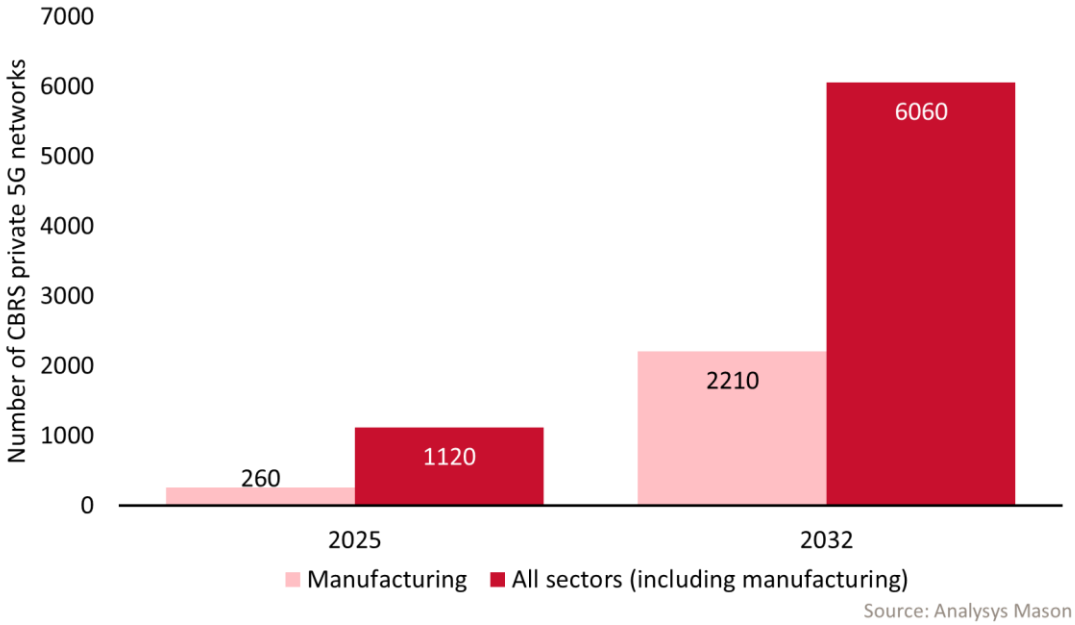
Figure 5.2: CBRS private networks by sector, USA



6 Private 5G's contribution to the US manufacturing sector

6.1 Private 5G is enabling US manufacturers' automation and reshoring goals

Manufacturers do not deploy private 5G networks simply to adopt new technology; instead, these networks help to solve their operational efficiency challenges and achieve their strategic goals. These goals include reshoring production, strengthening supply chain resilience, and enabling automation to address workforce pressures. It is essential for US manufacturers to control costs and boost productivity to support these goals. Many are turning to private 5G networks to help them do so, and these networks are already delivering measurable improvements in several areas.

6.1.1 Cost efficiencies

A survey found that 69% of US manufacturers have started to reshore their supply chains, but rising costs are the biggest barrier to reshoring.[16] Indeed, several of the manufacturers we interviewed cited the ability to reduce costs as a reason for investing in private 5G to support reshoring.

> "We moved production out of China to the US to manufacture onshore. Labor costs are higher and raw material prices have increased a lot so we looked for ways to cut costs…one way is through increased automation and to build a smart factory. We need to collect a lot of data so need a fast, secure network that is totally under our control."
>
> *Head of Data, US electronics manufacturer*

Private 5G is helping manufacturers to control costs by reducing unscheduled downtime. Siemens estimates that the cost of unscheduled downtime can range from USD36 000 per hour in the fast-moving consumer goods sector to over USD2 million per hour in the automotive sector.[17] Many of the manufacturers we interviewed saw reductions in unplanned downtime after deploying private 5G.

A US pharmaceutical firm[18] previously used Wi-Fi to monitor the temperature of products stored in freezers and is now using private 5G. "We had an incident where a freezer went offline and there was around USD250 000 of product that had to be scrapped. That was a huge event and the trigger point to say 'we need a more reliable network.' We haven't had any incidents since [deploying the private 5G network]."

Reducing downtime can also help to reduce labor costs, as it did for an automotive manufacturer.[19] "Private 5G has been a lot more reliable [than Wi-Fi]… we've been able to cut unplanned downtime by 30%. We're spending less on IT staff that are managing and troubleshooting the network… in

16 Manufacturing.net (2024), *U.S. Manufacturers Plan to Increase Reshoring to Get Better Value, More Security*.

17 Siemens, *The True Cost of Downtime 2024*.

18 Company 5 in Figure 2.1

19 Company 6 in Figure 2.1

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some sites we've reduced the number of IT staff by 15–20%... so there's been direct labor cost savings."

6.1.2 Productivity gains

Private 5G networks can boost productivity by reducing operational bottlenecks caused by limited connectivity and automating previously inefficient processes.

> "We have two main use cases in the factory: robotics on the production line and quality inspection [computer vision] of individual parts to make sure they fit in the car. There's a couple of KPIs that have justified the investment [in the private network]. The main one is throughput per shift, which is up 15–20%, so we're assembling cars at a much faster rate. The other is defect rate reduction [from automated quality inspection], where we've seen an 35% improvement."
>
> *Head of IT, US automotive manufacturer*

An automotive components manufacturer[20] boosted productivity due to the flexibility that private 5G provides over wired networks. "The big win was on faster changeovers. I can optimize my plant lines and get it up and running at a much quicker rate without all that cabling…we've been able to cut the production line changeover time in half."

6.1.3 Improved worker safety and morale

Private 5G networks can also provide non-financial benefits. Automating processes can improve worker safety by reducing the presence of workers in hazardous environments.

An automotive manufacturer[21] described how private 5G is helping to improve safety on site. "Once we had the main applications in place [AGVs and predictive maintenance] we started to think about other things we could add on… we now have workers with panic buttons they can use in emergencies wherever they are on site. And we've started testing 5G connected AR glasses for remote support… it's early days for that use case but it should mean fewer workers on-site in hazardous areas."

A food and beverage manufacturer[22] also reported improved worker satisfaction after deploying private 5G. "The main benefit is reduced downtime but there were indirect benefits too. Small things like workers being happier at having connectivity where there were previously dead spots… both for operations and just things like being able to listen to music. That was an interesting one for us and it came through in improved employee NPS [a measure of employee satisfaction]."

20 Company 9 in Figure 2.1

21 Company 14 in Figure 2.1

22 Company 7 in Figure 2.1

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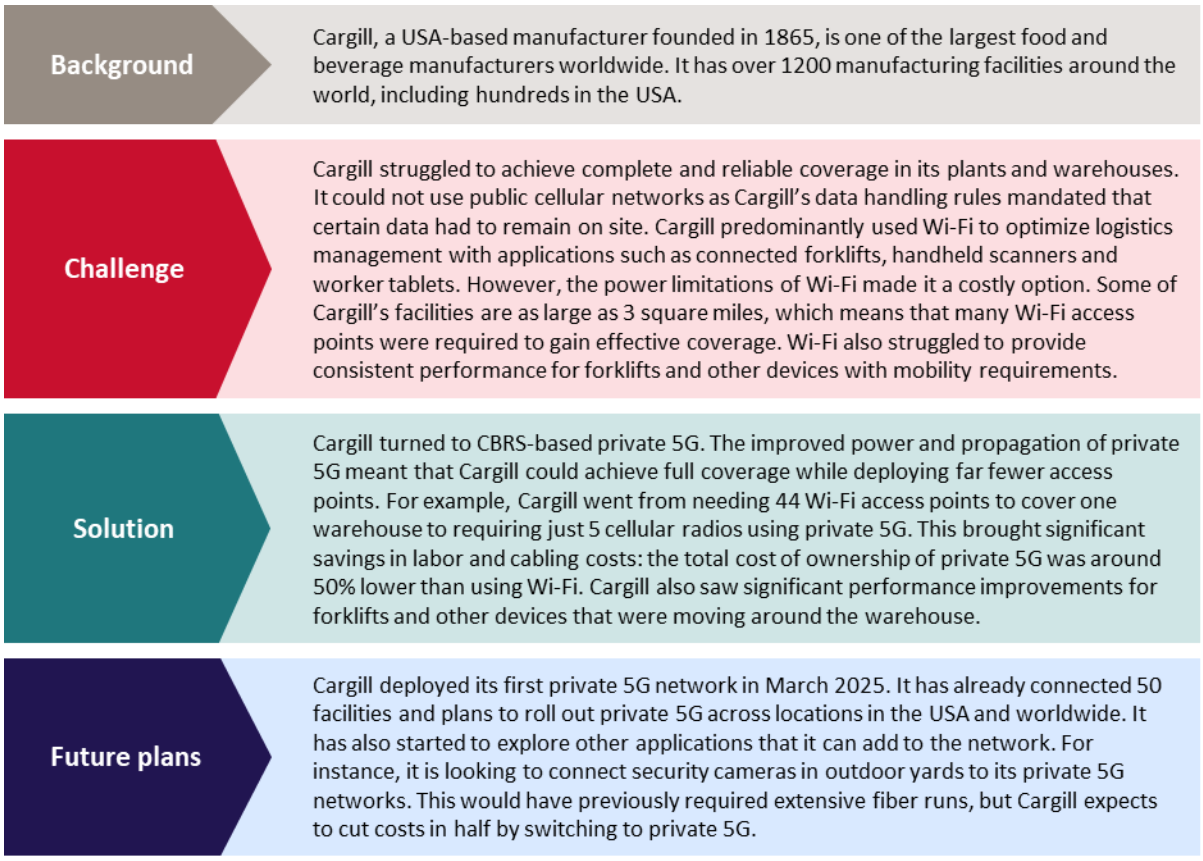
Figure 6.1: Private 5G in action: Cargill case study[23]



Source: Analysys Mason

[23] This case study is based on information disclosed in a webinar between Celona and Cargill. Celona (2026), *Beyond the Use Case - Why Cargill is Building its Manufacturing Connectivity Foundation on Private 5G*.

7 The potential impact of changes to CBRS

7.1 Proposals have been made to reallocate the CBRS band or raise the maximum permitted power levels

Proposals are under consideration that could alter how the CBRS band is used. The two most notable proposals are as follows.

- **Reallocating some or all of the CBRS band.** For instance, AT&T has proposed relocating current CBRS users from the 3.55–3.7GHz band to the 3.1–3.3GHz band. This could enable the 3.55–3.7GHz band to be used for full-power, licensed mobile use.[24]
- **Changing CBRS power levels.** The FCC published a notice of proposed rulemaking regarding changes to the CBRS band in August 2024.[25] One of the proposed changes is to increase the maximum permitted power levels for CBRS transmissions. This could conceivably make CBRS spectrum more suitable for wider-area deployments, but risks creating harmful interference to lower-power users, including for GAA users.

This paper does not seek to argue for or against either of these proposals, but we will discuss how these proposals would affect CBRS users in the manufacturing sector based on the views expressed by the manufacturers interviewed for this research.

7.2 Reallocating the CBRS band could cause significant operational disruption to US manufacturers

Private 5G networks using CBRS spectrum depend on radios and devices that support the 3.55–3.7GHz band. With no comparable band available, it is unclear what devices could replace CBRS equipment if the CBRS band were was moved. Moreover, any such replacement – even if feasible – would take several years. The CBRS sharing framework (including the corresponding software layers) would need to be redeveloped to work with the new band and the hardware ecosystem of chipsets, radios and end user devices would need to be rebuilt from scratch.

Several of the manufacturers interviewed for this study expected significant disruption and operational costs if the CBRS band were to be moved.

- An electronics manufacturer explained:[26] “There would be huge production line disruption…. we cannot open up machines ourselves to replace sensors [as it would break warranties], so we would need to contact the equipment manufacturers to change them for us… it would be a very painful process. We would also need to send teams to each site to check if the right data is still being collected and transported, which would add additional costs.”

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24 AT&T (2024), *Ten Years Later: A New Vision for the 3 GHz Band*.

25 FCC (2024), *FCC Looks to Modernize 3.5 GHz Citizens Broadband Radio Service Rules*.

26 Company 4 in Figure 2.1

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- A food and beverage manufacturer described:[27] "We have a few warehouses that were dark [lacking connectivity] before we put in private 5G. We don't have Wi-Fi in the background so private 5G is the only connectivity solution there and the whole ERP warehouse management system is based on tablets using CBRS... moving the band would be devastating for us."

- A food and beverage manufacturer stated:[28] "It would be painful, financially and in terms of operational risk. You're talking about a major investment on our side… we will have to delay our intelligent automation initiatives while we take out critical staff to get all of this infrastructure sorted out. That's not a small project".

Some manufacturers also expressed concerns over the impact on the CBRS ecosystem. OnGo Alliance reports that there are 1369 FCC-approved CBRS-capable devices, including cellular modules, routers, phones, tablets and handheld devices. Equipment manufacturers would have to redesign, retest and recertify their hardware; this may not be feasible, and even if it was, could take years and leave private network users with a limited choice of hardware.

A metals manufacturer[29] expected this to cause challenges to its private 5G network. "It's taken a lot of time for modules and devices to come on board that support CBRS… for some applications there isn't much choice of supplier. If CBRS was moved that ecosystem would have to start from scratch and some of those devices might not support CBRS again, or would be much more expensive, which would be a problem for us."

> "We're only now reaching the point where most of our field devices are CBRS-capable. Any major change to the band plan could render a large portion of that equipment incompatible, potentially forcing another 3–5 years of turnover or requiring substantial reinvestment at each site. This would not only increase costs but also disrupt operational continuity, delay innovation projects, and create additional complexity in managing global infrastructure standards."
>
> *Head of Connectivity, European chemicals manufacturer*

7.3 Increased power levels could adversely affect manufacturers using CBRS spectrum, including GAA users

Proposals to increase the maximum permitted power levels for CBRS transmissions could have implications for both PAL holders and GAA users. The greatest effects would be felt by private network operators that rely on GAA spectrum. Several manufacturers such as John Deere acquired PAL licenses to deploy private networks, though the majority of CBRS deployments in the manufacturing sector utilize GAA spectrum.

Higher power limits would allow PAL holders to operate at greater transmission strength. This could adversely impact coverage areas for other CBRS users, including other PAL holders and GAA users operating within the range of these higher-powered radio transmissions. GAA users may not operate on the same channel as a PAL holder within the PAL holder's actual operations area, which would

[27] Company 12 in Figure 2.1

[28] Company 2 in Figure 2.1

[29] Company 10 in Figure 2.1

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expand greatly if power were increased. The expanded areas of some PAL holders could also come at other PAL users' expense. Several CBRS users' availability (both PAL and GAA) would therefore decrease proportionally. Even outside the protection areas, PAL and GAA users would need to reduce their operational power to ensure they did not interfere with the PAL holder.

The combined effects of lost GAA channels and reduced PAL and GAA power levels could reduce the viability of CBRS-based private networks for numerous industrial use cases. An automotive manufacturer[30] expected raised power levels to cause performance issues for its private 5G network. "It might affect the quality of the network… some of the use cases should still work well but others may not. If it becomes a bottleneck we'll have to look at alternative technologies for those use cases, which will bring its own cost."

Increasing power levels may also require the Department of Defense (DoD) to revisit the CBRS dynamic protection areas and their 'neighborhoods'. These neighborhoods are designed to protect critical federal operations such as radar systems used by the US Navy. The neighborhoods were significantly reduced in size following updates to the CBRS band in 2024 and currently cover only around 3% of the continental USA. Neighborhoods may need to be widened or re-drawn if higher-power CBRS operations raise the risk of interference to DoD systems. This would further reduce the geographies where PAL and GAA users can operate reliably, and would have a particularly adverse impact on manufacturers with facilities near coastal areas or military installations.

One retail goods manufacturer[31] also raised concerns about a potential 'tragedy of the commons' scenario. Some users may raise their transmission power to protect their own network performance if power levels are increased. This escalation could lead to progressively higher interference, which would have a particularly significant impact on other PAL holders and GAA-based private networks that must accept interference from IA, PAL and other GAA users.

> "There's a chance that we get interference that could drown out our network… other nearby users might raise power levels too and the whole thing could escalate. We're in the GAA tier so most at risk… it could diminish the ability to operate our network."
>
> *VP of Technology, US retail goods manufacturer*

30 Company 11 in Figure 2.1

31 Company 8 in Figure 2.1

8 Conclusion

Private 5G networks already deliver meaningful benefits to US manufacturers by helping them to boost productivity, reduce downtime, and accelerate automation. These improvements are supporting broader goals such as reshoring and modernizing domestic production. The value of private 5G will only increase over time as manufacturers continue to automate their operations and deploy complex applications at scale.

CBRS has been central to this progress. Its shared-spectrum model has enabled manufacturers to deploy affordable, superior-quality private 5G networks, and it has supported the growth of a strong ecosystem of USA-based vendors, integrators and technology providers. CBRS will therefore continue to hold a central place in the broader connectivity ecosystem that supports manufacturers' productivity, automation and reshoring ambitions.

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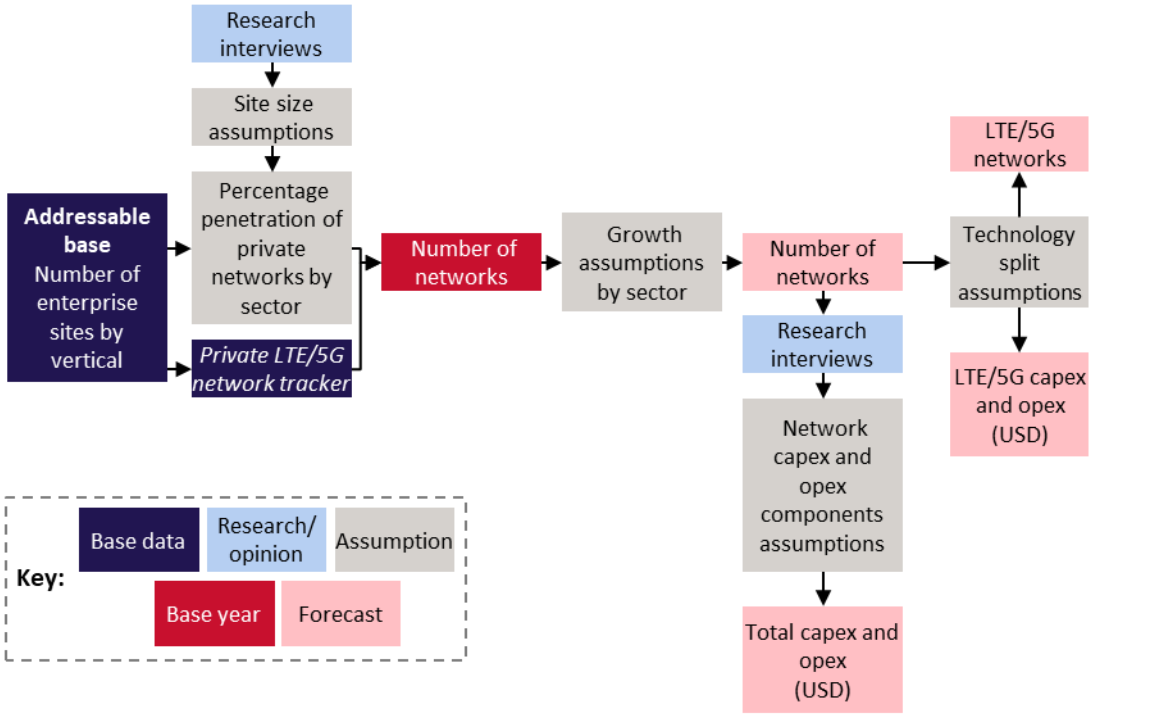
9 Appendix

Figure 9.1: Glossary of terms

ASRS	Automatic storage and retrieval systems
CBRS	Citizens Broadband Radio Service
GAA	General Authorized Access
IoT	Internet of Things
LTE	Long-term evolution
PAL	Priority Access License
RAN	Radio access network
SAS	Spectrum Access System
WISP	Wireless internet service provider

Figure 9.2: Analysys Mason's forecast methodology



Source: Analysys Mason

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