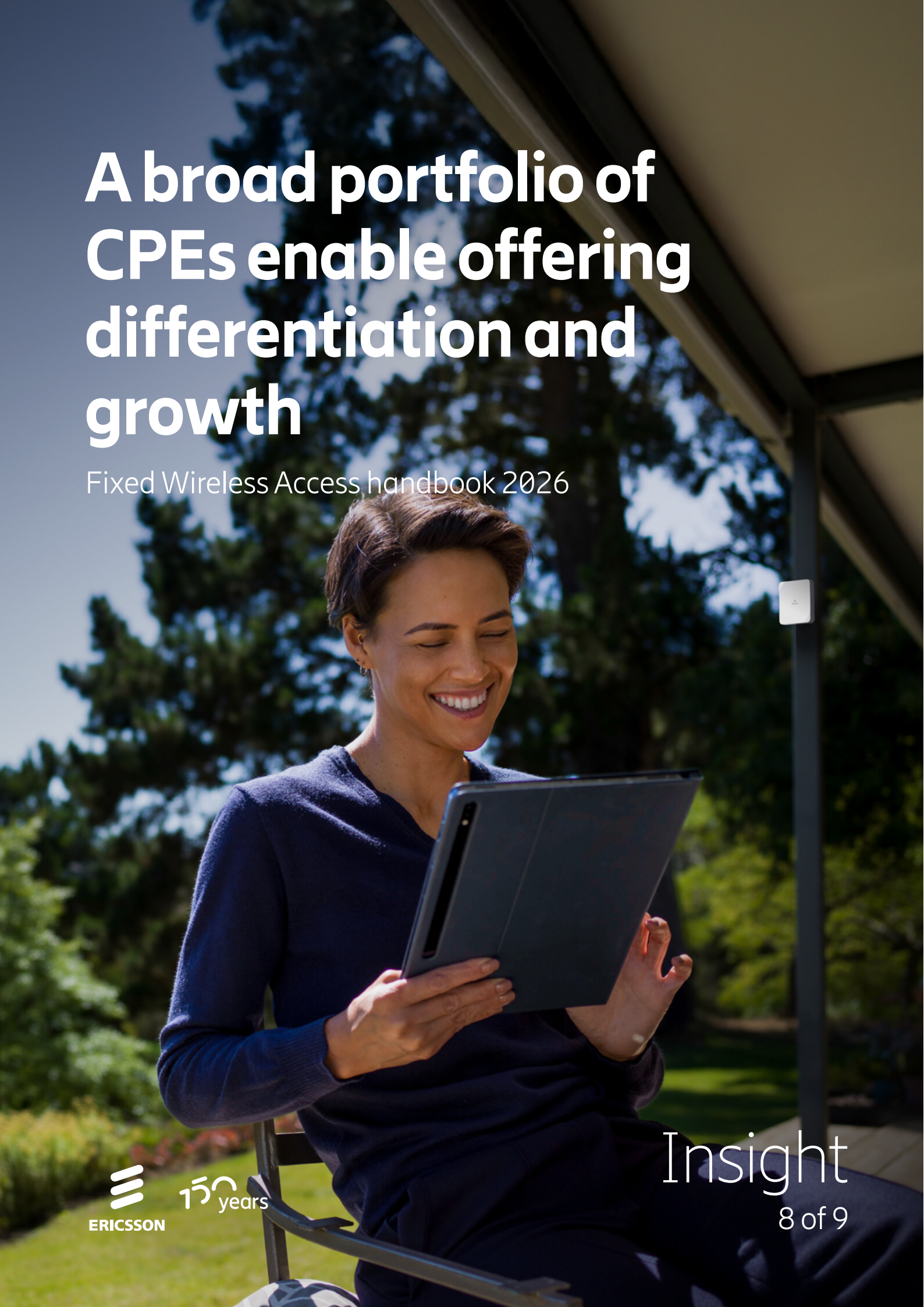
A broad portfolio of CPEs enable offering differentiation and growth

Fixed Wireless Access handbook 2026



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Insight

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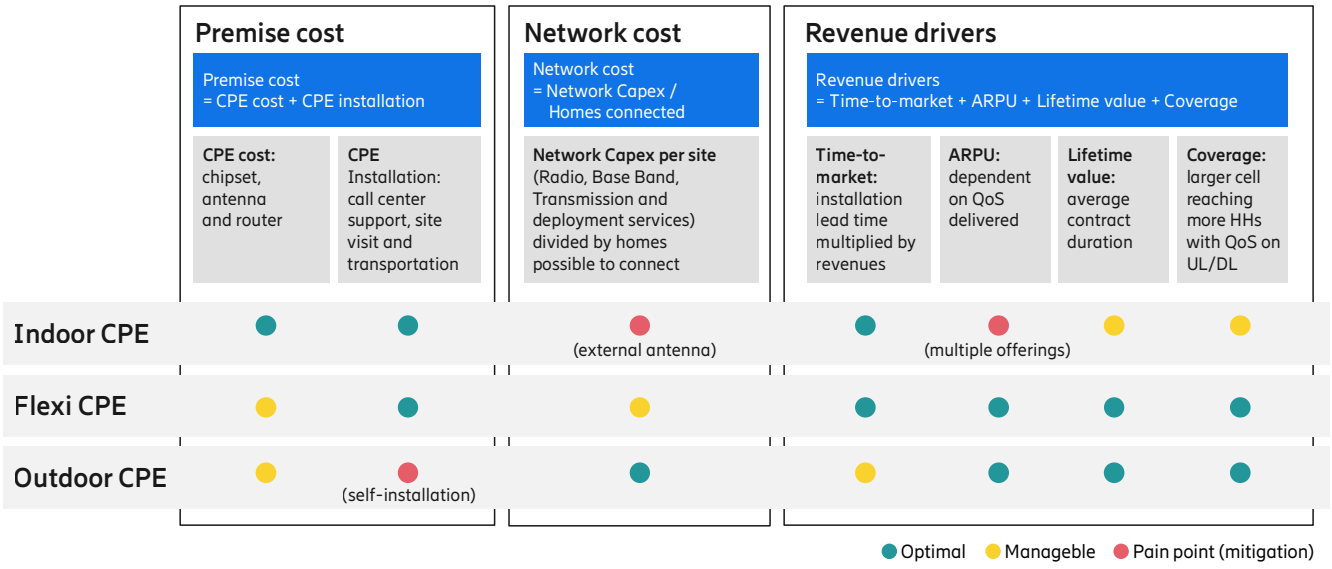
Flexi CPEs maximizing major profitability drivers

Selection of CPE form factor is a key parameter for designing FWA offerings. There is a lot of focus on the CPE premise cost while two other drivers, network cost and revenue drivers, are often not assessed in defining the complete profitability impact for the CPE choice.



Premise Cost related to the direct costs to connect a premise, home or Small Medium Business location. It includes the cost for the CPE, where indoor CPEs tend to be cheaper than outdoor CPEs as these include less expensive antenna components. Installation cost is another parameter, with indoor CPE having an advantage as there are no/minor cost associated such as eventual call center support for self-installation. While outdoor CPE´s many times comes with a self-installation app, many homes might prefer professional installation. Based only on this criteria, indoor CPEs scores better than outdoor CPEs.

Network Cost is a key parameter that is often not quantified properly. This includes all related FWA network costs for a RAN site (and proportion for Core and other elements such as packet core), which needs to be allocated for connected FWA users. Outdoor CPEs have a much higher spectral efficiency compared to indoor CPEs, enabling 2-3x more FWA connections per site. As a result of that, outdoor CPEs score much better than indoor CPEs on this parameter as unitary network cost per CPE would be 2-3x lower for outdoor CPEs compared to indoor CPEs. Some service providers address the drawbacks of indoor CPEs adding external antennas as an option, including upgrade to external antenna for high end users at a later stage.

A complete CPE profitability review takes into consideration four revenue drivers related to the CPE choice. Time-to-market is a key differentiation for FWA, with CPE choices also affecting that parameter. Indoor CPEs would generally enable a faster time-to-market as there is no need for on-site installation. The lead-time difference of Order-to-Activation days between indoor and outdoor deployments multiplied by monthly ARPU would quantify the time-to-market difference. Another parameter is related to customer lifetime value, where outdoor CPEs could provide higher stickiness resulting in longer customer contracts and lower churn compared to indoor CPEs. Last, outdoor CPEs will provide larger cells reaching more households and will be able to provide faster and more predictable broadband speeds compared to indoor CPEs and could be monetized with higher ARPU levels.

Flexi CPEs – best of both worlds

Flexi CPEs aim to bring the best of both indoor and outdoor CPE worlds. These flexible CPEs capture the benefits of self-installation and fast time-to-market from indoor CPEs while having better spectral efficiency somewhat comparable to outdoor CPEs (i.e., higher antenna gains and lower attenuation loss). A key benefit of such flexible CPEs is that they enable service providers to use the same type of unit for homes both near to and further away from the radio site. It is important that the device offers the required antenna gain, power class, household mounting options and attenuation loss, to deliver the desired ease of installation and performance.

The most recommended approach is for service providers to have multiple CPE´s depending on market offering and location type (suburban and/or rural) being served. The service provider suggests the customer the preferred CPE type (e.g., flexi CPEs to locations over 1km to the mobile site and indoor CPEs for users close to the site). This adds more flexibility for end users and service providers to optimize the best CPE solution for the customer needs and location.

Differences in CPE performance

The biggest difference between outdoor and indoor CPE versions is the ability to achieve promised service levels, especially during busy hours. An indoor CPE device is comparable with a smartphone device in terms of the radio resources required, or slightly worse as it's always located indoors. By contrast, an outdoor CPE device has the advantage of a 15–25 dB better signal quality, which equates to lower Mbps production cost, higher speeds and better coverage – which is especially valuable further out in the cell in mid-band and mmWave deployments.

There are many parameters impacting the network gain when it comes to selecting CPE type like antenna gain, CPE power class, attenuation, inter-site distance and spectrum frequency.

An outdoor CPE provides the best performance as it has an in-built directional antenna (for example, 10–14 dBi at 3.5 GHz) and is installed with a predictable radio link quality to the selected Radio Base Station. The typical antenna configuration has two Rx antennas, but devices with four Rx antennas are also available. More Rx antennas can be useful in urban environments, as multiple signal paths are available to the device. However, the transmission mode for a single CPE is still only rank-2 as the modem is expected to be installed with good line-of-sight or near line-of-sight.

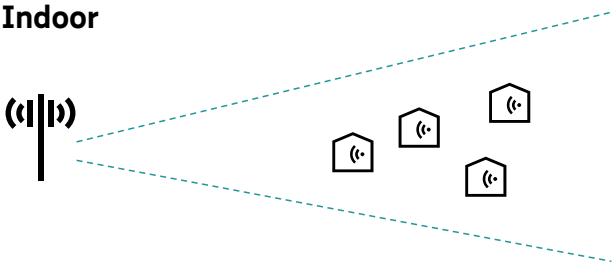
A correctly installed outdoor CPE is directed to the best serving cell, leading to a lower link budget path loss and improving the utilization of mid-band and mmWave TDD spectrum. The large gain in signal quality is a result of the 10–15 dB difference in antenna gains and the avoidance of another 10–15 dB in wall/window attenuation losses suffered by indoor devices. Another contributor to signal attenuation in indoor devices is the deep indoor loss, as the device is likely to be placed in the middle of the home (i.e., away from the window), perhaps to provide optimal WiFi coverage, contributing another 5 dB in path loss.

Whereas indoor CPE is comparable to a smartphone in terms of spectrum efficiency, outdoor CPE is typically two to three times more efficient. Put another way, for the same data consumption, around two to three times as many households can be served or, alternatively, two to three times as much spectrum would be needed to serve indoor-only FWA households. A final advantage of outdoor CPE is that the relative performance difference between the best, median and worst users is significantly lower, which makes FWA commercial service agreements easier. The most important aspect is to make sure that the users on the cell edge or in poor radio conditions get an outdoor CPE in order to use radio network resources as efficiently as possible.

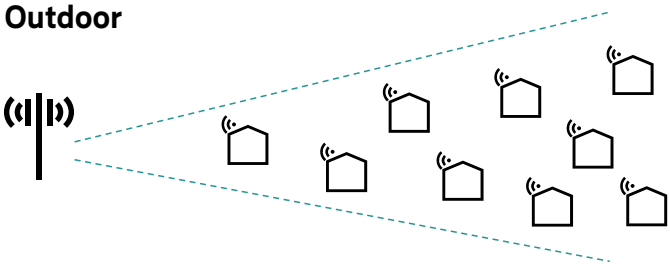
End-users may detect that they receive fairly good coverage and acceptable speed with an indoor device, but this can change very fast once a specific cell gets loaded with more users. In an unloaded cell, any user can get many radio resources (PRBs) allocated, and achieve acceptable speeds whatever the radio link quality and the fact that only QPSK modulation may be possible, for example. In a loaded busy hour scenario, significantly fewer resources get scheduled, and only the devices able to handle higher modulations (such as 64- and 256-QAM) can achieve acceptable speeds.

The modulation and channel coding scheme are determined by the devices' continuous Channel Quality Indicator (CQI) feedback in the uplink. A lower CQI indicator will make it very 'expensive' for the radio network to stream higher data rates, for example for video and TV with a lower modulation level.

Indoor



Outdoor



Key parameters

Power and antenna gain

Attenuation loss

Frequency and cell size

Rule of thumb

Outdoor CPE will improve spectrum efficiency and allow two to three times as many served households with comparable service levels.

Alternatively, two to three times as much spectrum is needed for indoor CPE.

The right mix of indoor and outdoor CPEs

As mentioned previously, outdoor CPEs provide significantly better spectral efficiency compared with indoor CPEs. While it may be an absolute necessity to have outdoor CPEs for homes in some locations, there are other locations, such as those close to a base station, where indoor CPEs are quite sufficient. Outdoor solutions are generally more expensive, and more complex to install, so there is a trade-off between providing high performance and the cost of equipment and installation.

In cost-sensitive cases (such as where there is lower ARPU) or where time-to-market is crucial, it makes sense to deploy indoor units, which are typically cheaper and faster to deploy. For example, if the available spectrum is large, a first approach could be to provide indoor CPEs to most homes, with an option to replace them later with outdoor units, as required.

On the other hand, if the number of potential customers in an area is large relative to the available spectrum, it might be worth identifying customers who would benefit the most from outdoor CPEs during the sales process. The proportion of outdoor units might be larger in more difficult propagation conditions, such as significant foliage, terrain variation and obstacles blocking line-of-sight. Moreover, the improved spectral efficiency of outdoor CPEs typically boosts range, which in turn increases the potential customer base, and drives up the proportion of outdoor CPEs.

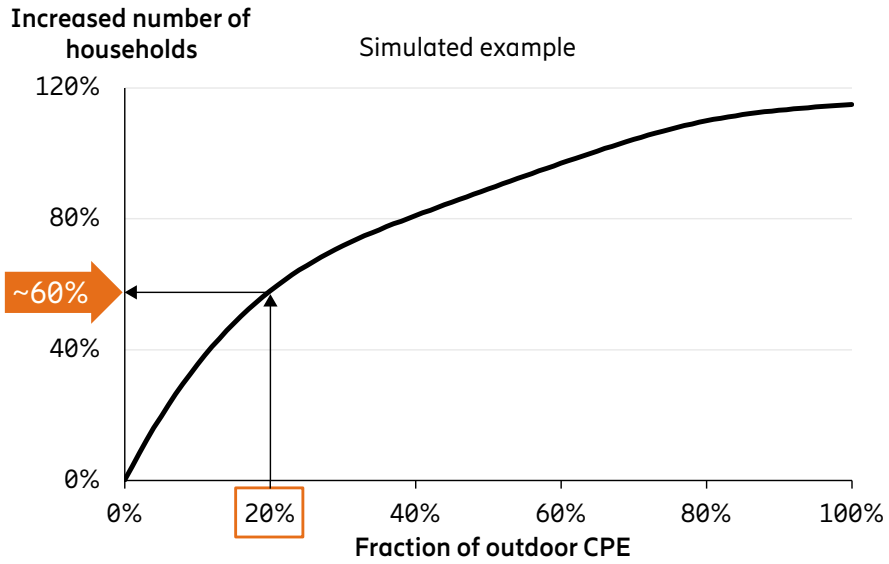
Benefits of indoor
- Lower CPE cost
- No installation cost
- Fast deployment

Benefits of outdoor:
- Increase capacity
- Address more customers
- Larger coverage
- Higher speed and consumption level

The graph to the right illustrates how performance can differ with CPE type, using a simulated example in which the indoor CPEs have gradually been replaced with outdoor units, starting with the homes in the worst propagation conditions. The capacity increase has been normalized against a reference number of subscribers that can be served per sector on average, with only indoor CPEs. It is clear from the shape of the curve that most of the capacity gains come from providing the worst-located homes with outdoor CPEs. If the 20 percent worst-located households are assigned outdoor CPEs, the average number of homes per cell increases by around 60 percent, while the capacity is slightly more than doubled when only outdoor CPEs are used. In this case, the uplink was the limiting factor when only indoor units were used, but when the 20 percent worst-located homes were assigned outdoor equipment, the uplink capacity increased so much that the case became downlink-limited instead.

Even though the results are dependent on the individual case parameters, the example indicates conceptually the effects of mixing indoor and outdoor units. For a real case, the proportion of subscribers who should be equipped with indoor units will depend on the spectrum efficiency required to address the targeted customer base.

Capacity gains by replacing indoor with outdoor CPE



Most capacity gains achieved by providing outdoor CPE to worst located households

Well-defined form factors for sub-6 GHz CPEs

Segment/Performance	Indoor gateway		Flexible installation receiver		Outdoor receiver	
Attenuation loss	High		Mid – Low		None	
CPE antenna gain	~3–6 dBi	~7–11 dBi	~3–6 dBi	~7–11 dBi	~10–14 dBi	~15–18 dBi
CPE size	In-built		Smartphone	Tablet	Laptop	
CPE mounting options	Desktop		Flexible (desktop, window, wall)		Wall/rooftop	
Typical installation	Self-install				Technician	
Typical areas	Urban – Suburban				Suburban – Rural	

5G FWA CPE shipments increased from ~30% to ~60% of overall FWA CPE shipments from 2022 to 2025[1]

Traditionally, FWA CPEs come in two main form factors: indoor gateway (or indoor CPE) and outdoor receiver (or outdoor CPE). Flexible installation receiver (or flexi CPE) is third form factor that has emerged with the rise of 5G FWA. It combines the consumer-friendly self-installation of indoor CPEs, with a better spectral efficiency somewhat comparable to outdoor CPEs (enabling high capacity and speed).

Indoor Gateway

The indoor form factor is the most common in the market as it enables self-installation, short time-to-market and lower solution costs. Indoor gateways offer an integrated form factor with in-built WiFi router. Self-installation is supported by visual instructions, mobile apps, and signal-strength indicators that guide optimal placement of the CPE.

Flexible installation receivers

Flexible installation receivers (or Flexible CPEs) offer a compact form factor with similar antenna gains as for indoor CPEs. These flexible devices offer higher spectral efficiency than indoor CPEs through the elimination of attenuation losses (enabling high capacity and speed). They lower the bar for self-installation also on the outside of the home. They can be installed inside, close to a window, or outside, on a window or wall. Self-installation is supported by visual instructions, mobile apps, and signal-strength indicators that guide optimal placement and direction of the CPE. Flexible CPEs are IP65 rated and powered over Ethernet (PoE). Typical setups consist of a compact flexible CPE, a single flat Ethernet cable, and a complementing indoor WiFi router.

Outdoor receivers

Outdoor CPE devices offer the highest spectral efficiency (enabling high capacity and speed), long lifecycle and higher longevity with customers. Outdoor CPE devices have clear performance advantages compared to indoor devices, but generally require installation performed by a certified technician. The outdoor CPE devices commonly have a larger formfactor to cater for the higher gain antennas. They can be installed on a wall or on the roof. Outdoor CPEs are IP65 rated and often powered over Ethernet (PoE). Typical setups consist of an outdoor CPE, an Ethernet cable, and a complementing indoor WiFi router.

5G FWA

5G FWA has reached mainstream with almost 250 service providers having commercial 5G FWA services as of December 2025 according to GSA. Shipments of 5G FWA CPE have been increasing and are expected to represent almost 60% of the overall shipments in 2025 compared to around 30% during 2022/2023, according to the GSA FWA CPE Survey.

1) GSA 4G/5G FWA Forum CPE Survey, Ericsson analysis.

Increasing availability of 5G mmWave CPEs

Segment/Performance	Indoor gateway	Flexible installation receiver		Outdoor receiver		
CPE mmWave EIRP	Proof-of-Concept	Designed products	~45–51 dBm	~33–39 dBm	~39–45 dBm	~45–51 dBm
mmWave Power Class			PC1	PC5/PC2	PC1	
CPE FR1 Antenna Gain			~3–6 dBi	~7–11 dBi	~10–14 dBi	
CPE size			Tablet	Tablet	Laptop	
CPE Mounting Options		Flexible (window, wall)		Wall/rooftop		
Typical Installation		Self-install		Technician		
Typical Areas		Urban – Suburban		Suburban – Rural		

mmWave-capable 5G FWA CPE shipments stable at ~5% of the overall 5G FWA CPE shipments[1]

There are many fewer 5G mmWave-based FWA commercial networks globally, which explain the lower CPE volumes compared to 5G FWA on sub-6 GHz (FR1). Despite that, it is notable that 5G FWA mmWave-capable CPE shipments grew almost at CAGR 34% from 2022-2025, similar to the sub-6 GHz 5G FWA CPE shipments at CAGR 32% in the period, according to the GSA 4G/5G FWA Forum CPE Survey. For 2025, shipments of 5G FWA CPEs that are mmWave-capable are expected to surpass 1 million units, representing around 5% of the overall 5G FWA CPE shipments.

Emerging form factors for mmWave-capable devices

The primary form factors for commercially available 5G mmWave FWA CPEs are outdoor receiver (or outdoor CPE) and flexible installation receiver (or flexi CPE).

For **outdoor receiver**, there are variants of size (mainly driven by sub-6 GHz/FR1 antenna gain). Technicians typically install these devices in suburban and rural areas in wall or rooftop scenarios.

Flexible installation receiver for mmWave-capable 5G FWA CPEs are highly desired. This form factor would typically focus on urban and suburban scenarios where the distance to the base station is relatively small (less than 1 km). As a result, high-gain antennas for sub-6 GHz/FR1 would not be required, making the overall form factor smaller, like a tablet.

1) GSA 4G/5G FWA Forum CPE Survey, Ericsson analysis

CPE choices support a speed-based strategy

The choice of customer premises equipment (CPE) is critical in supporting 5G FWA commercial strategies, in particular for Tiered Speeds and Premium Experience.

Service providers using outdoor CPEs are more likely to have speed based FWA plans. The latest GSA FWA Market update from December 2025 shows that two in three (66%) service providers that have speed based FWA offerings utilize a combination of Indoor and Outdoor CPEs. Three of four (75%) of service providers utilizing only outdoor CPEs have speed based plans. By comparison, less than 60% of service providers using only indoor CPEs have speed based plans. Important to note that GSA categorizes the flexible self-install CPEs in the Outdoor CPE statistics.

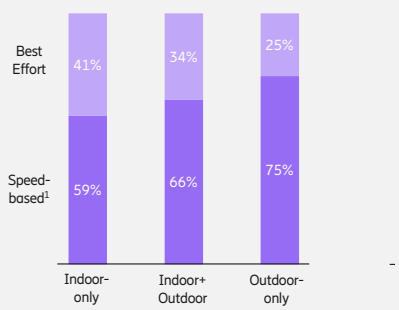
There is an increasing number of service providers having Indoor and Outdoor CPEs. In many cases these have been of service providers that initially had only indoor CPEs and later added alternative of outdoor to complement their offerings. The latest GSA FWA Market update from December 2025 shows that 50 service providers have FWA offerings supported by Indoor and Outdoor CPEs, doubling from 2024.

Many service providers in Europe have added outdoor CPEs to complement indoor CPE offering plans. Based on the latest GSA FWA Market Report, it is possible to see that 35 service providers in 21 countries in Europe have FWA offerings including both indoor and outdoor FWA CPEs.

CPE Choice for global 5G FWA service providers

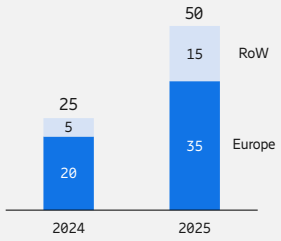
5G FWA offers and CPE type

% of 5G FWA offers, December 2025



Adoption of Indoor+Outdoor CPEs

Service providers with option for Indoor or Outdoor CPEs for 5G FWA offers



Indoor+Outdoor in Europe

Countries with service providers having Indoor+Outdoor CPEs for 5G FWA offers

1) Include service providers that have speed-based as well as speed-based+best effort.Source: GSA FWA Market reports Nov 2024 and Dec 2025, Ericsson analysis

Flexible self-install CPE: Unlocking scale and higher-speed FWA tiers

Leading mobile service providers are demonstrating that flexible FWA CPE can be both easy to self-install and commercially transformative. What was once perceived as complex, technician-dependent equipment has evolved into consumer-friendly, self-installable solutions that support rapid deployment and superior performance.

Operators such as VodafoneThree UK, Telia Norway, T-Mobile Poland, Telenor Norway, Bite Lithuania, and Verizon USA all provide FWA CPEs that enables customers to install outdoor or window-mounted receivers themselves. Typical setups consist of a compact outdoor unit (receiver), a single Ethernet or flat cable, and an indoor WiFi router, supported by visual instructions, mobile apps, and signal-strength indicators that guide optimal placement.

Beyond installation simplicity, flexible CPEs play a critical role in enabling higher-speed FWA tiers. By moving the radio outside the building envelope, service providers significantly reduce signal attenuation caused by walls, insulation, and coated windows. The result is improved SINR, more stable modulation schemes, and higher achievable throughput—particularly on 5G mid-band and, where available, mmWave. This technical advantage allows service providers to confidently offer premium speed tiers and performance-based differentiation, rather than positioning FWA solely as a best-effort alternative to fixed broadband.

From a commercial standpoint, the combination is powerful. Self-installation lowers cost-to-connect and accelerates time-to-revenue, while outdoor CPE expands coverage and the addressable market for high-speed plans. Customers benefit from faster activation and visibly better performance; operators benefit from higher ARPU, improved NPS, and more efficient network utilization.

Importantly, many service providers complement self-install with an optional professional installation for complex cases, preserving flexibility without undermining scale. This hybrid approach supports mass-market deployment while maintaining service quality.

As shown in this handbook, easy self-installation and higher-speed service tiers are not trade-offs—they are mutually reinforcing. Outdoor CPE is increasingly a cornerstone of competitive FWA strategies, enabling service providers to scale profitably while delivering performance that rivals traditional fixed access.

VodafoneThree UK

Telia Norway

T-Mobile Poland

Telenor Norway

Bite Lithuania

Verizon USA

Source: Ericsson and service provider websites.

CPE ecosystem cooperation

There are a large number of vendors who offer both indoor and outdoor CPEs for FWA. However, quite a few of them are small players compared with MBB device vendors, with typically a handful of customers. Currently, the largest market is for indoor LTE CPEs including WiFi and router functionality, which are sold in mobile service providers' retail stores. The Global mobile Supplier Association (GSA) now regularly publishes a '4G/5G FWA Device Ecosystem Company Directory' (4G-5G FWA Company Directory), and regularly reports on service provider FWA activities and devices (5G - FWA Global Status Update). The GSA has identified 80 5G FWA CPE vendors, with over 350 5G CPEs announced (GSA, December 2025).

In principle, any CPE device on the market will work – after relevant and normal IODT has been conducted at the chipset level – just as with smartphones. Ericsson is currently working with four OEM suppliers of LTE and NR CPE, all capable of design and adaptation, and with the ability to supply the necessary volumes to meet market demand. Some vendors focus on 'off-the-shelf' product portfolios, while others are ODM design houses.

Several of these OEM suppliers are based in Taiwan, and include:

- **Zyxel** Communications who offers CPEs with high-capacity connectivity, enhanced network security and deployment flexibility. Zyxel 5G NR FWA solutions incorporate the most advanced technologies providing customers with a superior self-adaptive, zero-dead-zone WiFi experience.
- **WNC** is one of the world-leading company for RF design especially in Cellular and WiFi products. WNC has also designed and tested advanced high-power mmWave CPEs, which make use of mmWave extended range feature.
- **Askey**, which is another innovative OEM, focused on being early to market with 5G NR mid-band and mmWave products for both outdoor and indoor use.
- **GreenPacket**, a Malaysia-based company, which offers innovative 5G/4G FWA CPE solutions, with different characteristics for multiple usage scenarios. GreenPacket is capable in redesigning product to fit every customer unique deployment scenario with a wide range of high performance indoor, outdoor and flexible installation FWA CPEs to meet customers' diverse needs.

Overall, there is a fast pace of innovation and evolution in the FWA CPE market, and we will see new products continuously being introduced. The 3GPP device ecosystem is huge, and service providers with an Ericsson FWA network will be able to benefit from this, by using and interworking with the most suitable CPE at the best price, functionality and performance.

ASKEY

greenpacket

WNC
Wistron NeWeb Corp.

ZYXEL
COMMUNICATIONS

Read all nine insights on capturing the value of 5G FWA

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Ericsson
SE-164 80 Stockholm, Sweden
Telephone +46 10 719 0000
www.ericsson.com