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CommScope: Supporting Service Providers on Their Journey to Net Zero

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Contents

The telecom industry needs to act urgently for the climate

In order to limit the negative impact of climate change on the planet and its inhabitants, the Paris Agreement, adopted in 2015 by 196 parties, states the need to halve global CO2 emissions compared to 2015 levels by around 2030, and to reach net-zero CO2 emissions by mid-century to limit global warming to a recommended 1.5°C compared to pre-industrial levels.

In 2021, the European Union also adopted the Climate Law, which sets a legally binding target to become climate-neutral by 2050. It also sets the intermediate target of reducing net greenhouse gas emissions by at least 55% by 2030 compared to 1990 levels.

Every industry and company has a role to play to achieve these ambitious targets. In its Smart 2020 report, the International Telecom Union (ITU) estimates that the ICT industry generates approximately 2% of global emissions and it urges information and communication technology (ICT) organizations to reach net-zero greenhouse gas (GHG) emissions by 2040, if possible, or 2050 at the latest, and has published guidance on how to set net-zero targets.

“Net zero” is when an organization has reduced its value chain emissions following “science-based pathways,” with any remaining residual GHG emissions being fully neutralized by removals (e.g., reforestation). Targets are considered “science based” if they are in line with what the latest climate science deems necessary to meet the goals of the Paris Agreement. The ITU has worked with the GSMA and other organizations to define the trajectories for the telecom industry.

Scope 1 emissions, or direct emissions, come from sources owned or controlled by a company—such as the emissions from vehicles and boilers. Scope 2 emissions refer to emissions from the generation of purchased electricity consumed by a company. And scope 3 emissions come from sources not owned or controlled by the company, but from activities related to the extraction and production of purchased materials, transportation, or the use of sold products and services.

Achieving these objectives requires urgent and strong action. The table in **Figure 1** shows examples of decarbonization measures as suggested by the ITU.

Figure 1: Decarbonization measures suggested by the ITU

Operating energy efficient network	Alternative energy
• Power-saving features • Alternative energy supply • Consolidation and virtualization • Free cooling and location optimization	• Self-production of renewable energies • Purchasing renewable energy • Energy supply innovation
Efficiency in buildings and services	**Application of the circular economy principles**
• Monitoring solutions for efficient buildings • Focus on energy conservation measures • Alternative mobility concepts • Videoconferencing and audioconferencing	• Eco-design of products and services • Reuse of network equipment • Optimizing the lifecycle and end-of-life of customer products and services • Selling repairable products

Source: ITU

In this white paper we will explore how CommScope Outdoor Wireless and its clients can build more sustainable networks together.

CommScope's commitment to sustainability

CommScope's corporate vision is "to produce innovative technology that can play a vital role in creating a sustainable future while minimizing potentially harmful environmental effects." To realize this vision, the company has defined several priorities:

- Reducing the environmental effects of its operations and facilities
- Developing solutions that meet CommScope customers' current and future sustainability requirements
- Sourcing responsibly and minimizing supply chain risks.

In CommScope's outdoor wireless business segment specifically, this strategy is guided by the following principles:

- Creating eco-friendly designs that enable network energy efficiency and a smarter use of resources
- Generating sustainable operations and supply chain
- Extending the solutions lifecycle
- Rethinking packaging and logistics.

By the first quarter of 2023, CommScope will have completed its own sustainability assessment and validated its sustainability strategy. Science-based targets (SBTs) are currently being defined and will also be announced and implemented by the company in 2023.

These are important milestones, but CommScope has been considering circularity principles and has been rethinking the design and the choice of materials used to fabricate its products and their entire lifecycle for years. The next section presents some concrete initiatives.

Key actions to make mobile networks more sustainable

Good radio planning and the right sizing of networks help realize energy and dollar savings

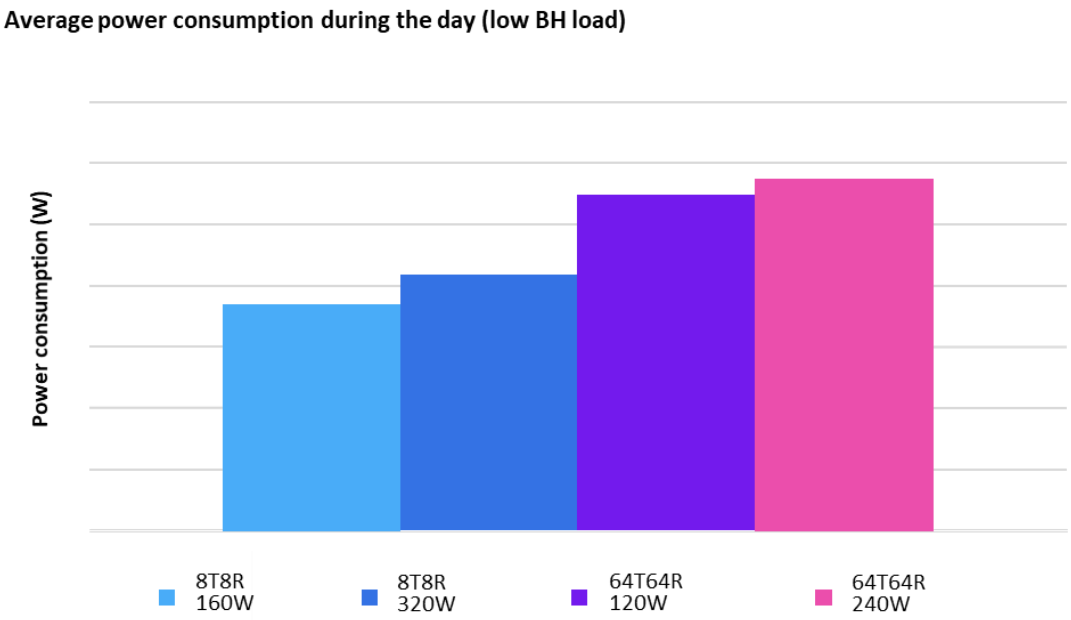
When designing their network, service providers consider the most appropriate solutions for each site and scenario based on requirements such as capacity, population density, and topography. The configuration of a given cell site particularly takes into consideration the expected demand and traffic in the area covered by the site to calculate the maximum and the average capacity required.

Capacity available is largely determined by the choice of radio unit and antenna. Massive MIMO technology (radio/antenna configurations that utilize 16 or more transmit and receive ports) was first introduced with 4G, but it has really become pervasive since the introduction of 5G. Compared to a traditional 2T2R or 4T4R radio unit, a 32T32R or 64T64R massive MIMO active antenna system (AAS) provides multiple times the capacity. Massive MIMO is a great innovation and brings good capacity benefits for deployments in dense urban areas. However, this kind of equipment also consumes more power and is more costly and is therefore not always the best choice for less dense areas, for example.

By definition, 8T8R radios offer less capacity than 32T32R or 64T64R, but they still provide a significant boost in capacity when compared to traditional 2T2R or 4T4R radios, while supporting multi-user MIMO (MU-MIMO). It is important to right-size the network. In many scenarios, 8T8R radios are an effective solution. They provide sufficient capacity and consume approximately 30% less power and emit 30% less carbon emissions when compared to 32T32R AAS based approach, with little difference in downlink coverage. According to tests realized by CommScope, combining an 8T8R radio with 160W output power and a high-quality passive antenna offers about the same downlink coverage as a 32T32R 100W AAS.

Figure 2 provides a power consumption comparison for different MIMO and output power configurations at equivalent load.

Figure 2: Average power consumption during the day (low busy hour load)



Source: CommScope

Note: Average power consumption per hour in 24 hours; low busy hour load (10%); 5G site with 20% 5G penetration

According to CommScope's calculations, when compared to a 64T64R AAS, 8T8R radios consume 50% less power, which represents an equivalent power saving per site of between 4000kWh and 5000kWh annually, between 1300kg and 1600kg CO_2 emissions avoided, and €1,300 to €1,600 of savings. The calculations are conservative and based on a relatively low electricity cost of €0.3/kWh. Savings could be even higher where and when the price of the kWh is higher, as is currently the case in many countries unfortunately.

When such savings are replicated over a service provider's thousands or tens of thousands of cell sites, this represents a very significant improvement in environmental impact, as well as multi-million euros or dollars in annual savings, which can then be reinvested in the continuous modernization of the network.

Planning for active and passive antennas?

Active and passive antennas can be integrated or disaggregated. From a sustainability point of view, the disaggregated option, where active and passive antennas are distinct units that can operate independently, extends the lifespan of passive antennas in the eventuality of the active antenna replacement or of a RAN vendor swap. In that sense, the choice of disaggregation made by CommScope with its Mosaic antenna platform is a more sustainable one.

Using more energy-efficient antennas helps to reduce RAN power consumption

Even without downsizing, and at equivalent configuration and capacity, it is possible to realize significant efficiency improvements when modernizing sites. This is because newer generations of antennas are typically more energy efficient than the previous ones.

Savings that can be achieved depend on the configuration of the site, the expected traffic load, and the generation of the product being replaced, but CommScope estimates that new improved-design antennas can help to reduce CO_2 emissions by up to 480Kg per year, per site.

There are complex technologies and advanced design techniques behind these improvements, and there are at least two critical efficiency areas:

- **Antenna radiation efficiency (internal losses).** This describes the ratio of the power radiated by an antenna to the power input to the antenna. When reducing the antenna's internal losses, it is possible to power down the radio unit and still maintain the same coverage, which means reducing the power consumption without impacting the user experience. Savings will be maximized in urban areas with short inter-site distance (ISD), satisfactory coverage, and medium to high load.
- **Antenna patterns efficiency.** This describes the ability of the antenna to focus the energy on the desired target area and minimize radiation outside that desired area. This in turns improves the signal to interference and noise ratio (SINR), which means the same quality of service can be delivered using less radio frequency (RF) resources, thereby enabling the reduction in radio unit power consumption. Savings will be maximized in medium-to-high-load scenarios.

In summary, well-designed antennas offer better radiation and patterns efficiencies and allow the reduction in overall RAN power consumption without impacting the user experience. In addition, more efficient antennas help to extend network coverage in suburban and rural areas, minimize the number of cell sites required, and ultimately reduce the overall power consumption in the network (see **Figure 3**).

Figure 3: Balancing power savings and coverage (figures may vary depending on the network)

Source: CommScope

Procuring eco-friendly network equipment has a direct positive impact on carbon footprint

One of the most impactful and efficient ways for service providers to transform and reduce their environmental footprint is to select and deploy more eco-friendly network equipment when they modernize their networks.

Lengthening the lifetime of specific network equipment can in some cases be the best decision in terms of environmental impact. However, when such equipment has a low energy efficiency or simply when it reaches end-of-life, it should be replaced.

CommScope invests in the development of eco-friendly designed products that have a smaller carbon footprint. For example, the company has announced that it will reduce the use of aluminum in antennas' reflectors by 1,000 tons by 2025, thereby reducing CO2 emissions by 18,500 tons.

Similarly, the company has developed and introduced new innovative materials such as GFRPP that replace less eco-friendly material such as glass fiber (see insert).

Another example is the design of antenna mounting systems. CommScope has redesigned fixed tilt brackets to be smaller. As a result, these are 53% lighter than variable tilt brackets. This is not just about weight reduction, as the elimination of downtilt brackets also helps reduce passive intermodulation (PIM) and accelerate installation, providing both performance and business benefits on top of environmental ones. PIM describes the generation of unwanted signals that create interferences, and ultimately reduce the performance of the network, often requiring technical teams to visit the site for troubleshooting.

How does it work?

CommScope has introduced next-generation antenna radomes made of glass fiber reinforced polypropylene (GFRPP), which replaces traditional fiber glass. This material is 100% recyclable, 20% lighter thanks to lower material density, and offers comparable mechanical properties such as UV and heat resistance. This is realized without being detrimental to the performance. In fact, the new material even enables better RF transparency and thus better RF performance.

Power and cooling solutions are also key to site modernization

While radios and antennas contribute to a high portion of the total energy consumption at the cell site, the rest of the site equipment, and particularly power and cooling solutions, should not be neglected.

Power solutions

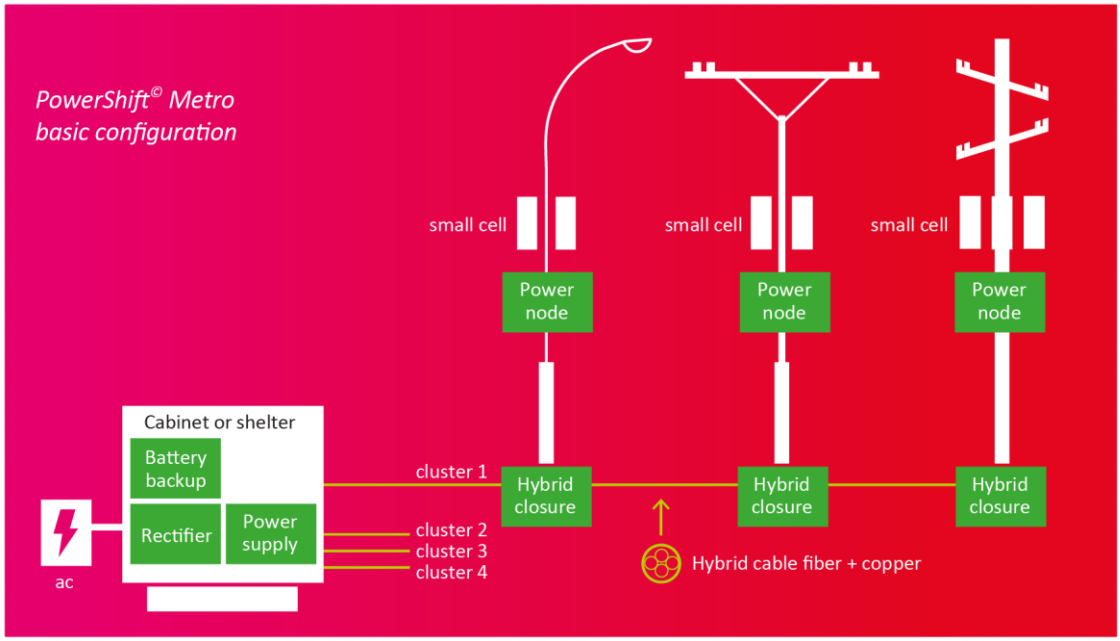
With more spectrum bands and more powerful remote radio units (RRUs) positioned at the top of the tower, site power needs are also increasing. Just as it is important to deploy the appropriate radio capacity to meet the traffic demand, it is equally important to appropriately size the power architecture according to the power needs of each site.

CommScope's PowerShift Macro solution sits between the DC power plant and the top of the tower RRUs, utilizing dynamic voltage regulation to compensate for line resistance within the power trunks to maintain the ideal voltage setpoint for RRU operation. Based on analysis comparing this unique dynamic voltage regulation capability to a fixed boost solution or no boost solution, PowerShift Macro typically delivers higher system efficiency, reducing energy consumption and providing operational expense savings. The solution also enables the reuse of cables on existing sites and thinner gauge cables for new deployments. And finally, due to PowerShift Macro's ability to operate on a lower input voltage, it will operate off the existing battery plant to extend site runtime by up to 50% during a power outage.

CommScope's PowerShift Metro solution introduces innovations and efficiency improvements in the small cell domain. The solution provides peak shaving and load shaping capabilities, providing the ability to supply power from the public grid when electricity rates are low and switch to batteries as

the primary source of power, not only during outages but also in normal operations during peak hours. For small cells specifically, each node traditionally requires a dedicated power supply, but a single PowerShift Metro solution can be deployed to supply power to multiple small cell sites in a given area, reducing the physical and environmental footprint (see **Figure 4**).

Figure 4: PowerShift Metro serving a cluster of small cells



Source: CommScope

Cooling

Base stations generate a lot of heat and often require cooling. It is estimated that cooling can represent between 30% and 45% of all power consumption at a typical cell site.

CommScope has developed Monitor, a forced-air cooling solution that replaces conventional air conditioning and maintains specified thermal balance while reducing energy use by up to 90%.

Combined, these innovations help to build and operate more sustainable mobile networks.

Rethinking the impact of the supply chain at all stages, including packaging and logistics

Most energy consumption and GHG emissions are related to the manufacturing of equipment and their usage, but other aspects of the lifecycle such as packaging and transportation also matter. When thousands (and even millions at industry level) of units of equipment are moved from their place of manufacturing to the location where they are deployed, the carbon emissions are not negligible.

CommScope's Outdoor Wireless division is striving to improve its packaging and logistics and, thanks to the new packages the company has developed, it is able to transport 40% more product in a standard container when compared to traditional packaging. This leads to a significant reduction in GHG emissions related to transport, in the order of 30%.

The company is also eliminating single-use plastic and reducing the amount of cardboard in packaging.

Conclusion

CommScope has a clear vision and roadmap for the development of a more sustainable outdoor wireless solutions business, grounded in quantified indicators. The company enables service providers to realize significant improvements in both energy consumption and GHG emissions, thanks to continuous innovation in its product lines, the development of smarter material, and sustainable engineering processes.

These efforts can be seen in the RF path and site power solutions portfolios in particular, where the company Base Station Antennas enable lower power consumption, reduced carbon footprint, and improve network performance through enhanced antenna radiation and patterns efficiency, coupled with enhanced network coverage.

In addition, the company is currently conducting Life-Cycle Assessments (LCAs) and developing Environmental Product Declarations (EPDs).

All these activities address service providers' four main sustainability priorities: building sustainable supply chains with an aim to reduce scope 3 emissions; reducing their environmental impact; continuing to improve their networks' energy efficiency; and building strong governance and monitoring of their green networks' key performance indicators (KPIs) and associated methodology.

Many service providers around the world are progressively implementing changes and actions that will lead to improvements in sustainability, such as Deutsche Telekom, Vodafone, Telefonica, and Orange. CommScope is already the partner of many of the most environmentally advanced service providers that have committed to net zero by 2025 for scope 1 and 2 emissions.

Omdia encourages all service providers to accelerate and systematically include and prioritize environmental considerations in their network strategy and in their vendor selection process.

Appendix

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