

A 5G AMERICAS WHITE PAPER

ENERGY EFFICIENCY AND SUSTAINABILITY IN MOBILE COMMUNICATIONS NETWORKS

DEC 2023

Presentation Slides

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"Innovation is required for the telecommunications industry to address sustainability and energy efficiency challenges. Many network operators are aiming for Net Zero emissions through energy-efficient operations and renewable energy integration. The actions of companies working together collaboratively are critical to address the impacts of climate change and strengthen the resilience of our communities and industry."

Dan Druta, Lead member of Technical Staff, AT&T

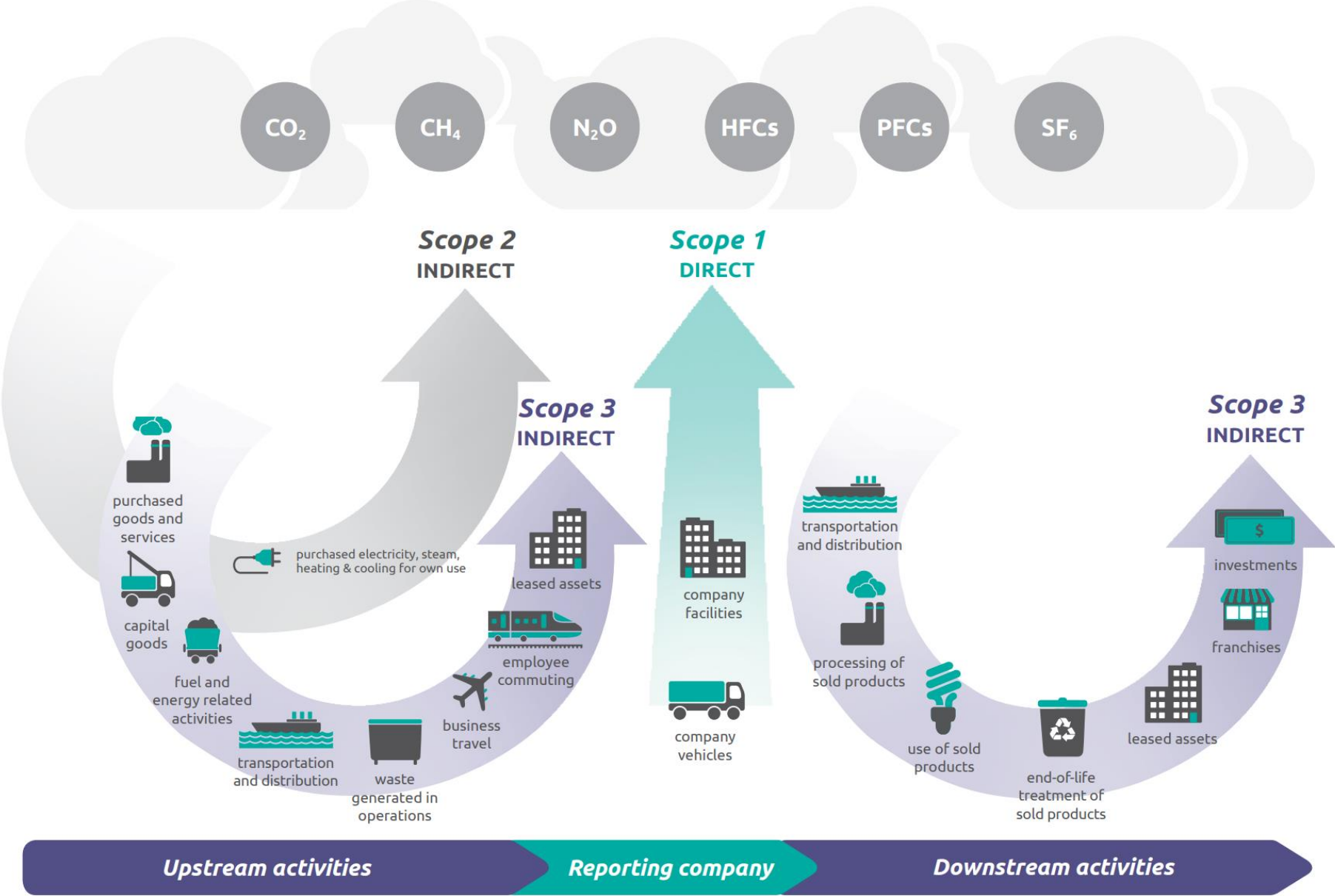
"MNOs and vendor partners are aggressively targeting sustainability, focusing on reducing carbon footprints and optimizing energy consumption, especially for 5G networks. Innovations in dynamic energy-saving techniques, cloud-native frameworks, and diverse network deployment strategies are crucial in this endeavor."

**Daniela Laselva, Distinguished Member of Technical Staff,
Nokia**

"The paper underscores the importance of energy efficiency in 5G and future mobile generations, urging operators and vendors to adopt existing technical capabilities and invest in new, optimized technologies. This approach is key not only for sustainable network operations but also in enabling industries like manufacturing and agriculture to achieve greater energy efficiency through various IoT solutions."

Humberto LaRoche, Principal Engineer, Cisco

Overview of GHG Protocol Corporate Standard scopes of emissions across the value chain



De-carbonization measures towards Net Zero

CATEGORIES:

OPERATING ENERGY-EFFICIENT NETWORK

1. Multiple power saving features
2. Alternative energy supply
3. Consolidation and virtualization
4. Free cooling and location optimization

EFFICIENCY IN BUILDINGS AND SERVICES

5. Monitoring solutions for efficient buildings
6. Focus on energy conservation measures
7. Alternative mobility concepts
8. Videoconferencing and audioconferencing

ALTERNATIVE ENERGY

9. Self-production of renewable energies
10. Purchasing renewable energy the certificate of origin and PPA
11. Energy supply innovation

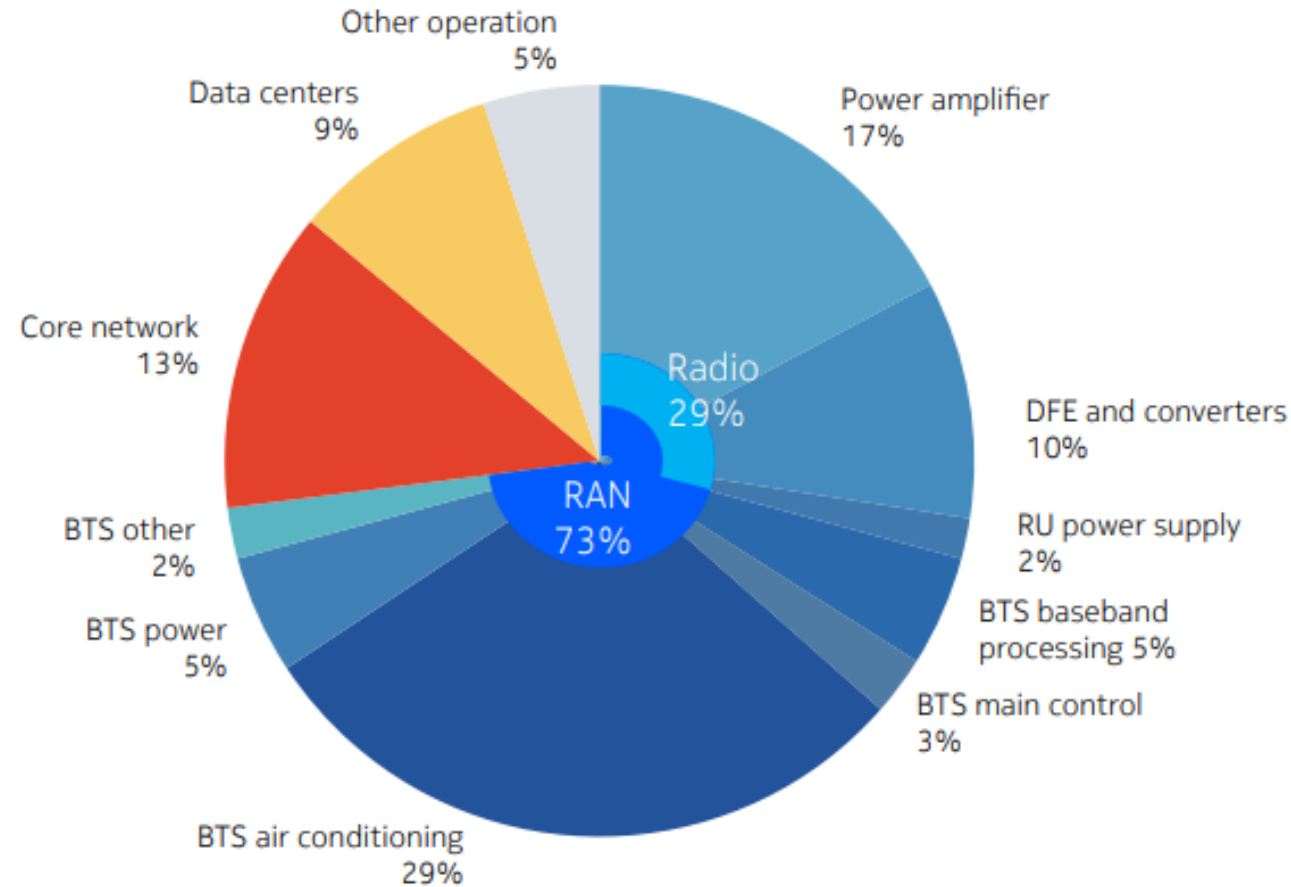
APPLICATION OF THE CIRCULAR ECONOMY PRINCIPLES

12. Eco-design of products and services
13. Reuse of network equipment
14. Optimizing the life cycle and end-of-life of customer products and services
15. Selling repairable products

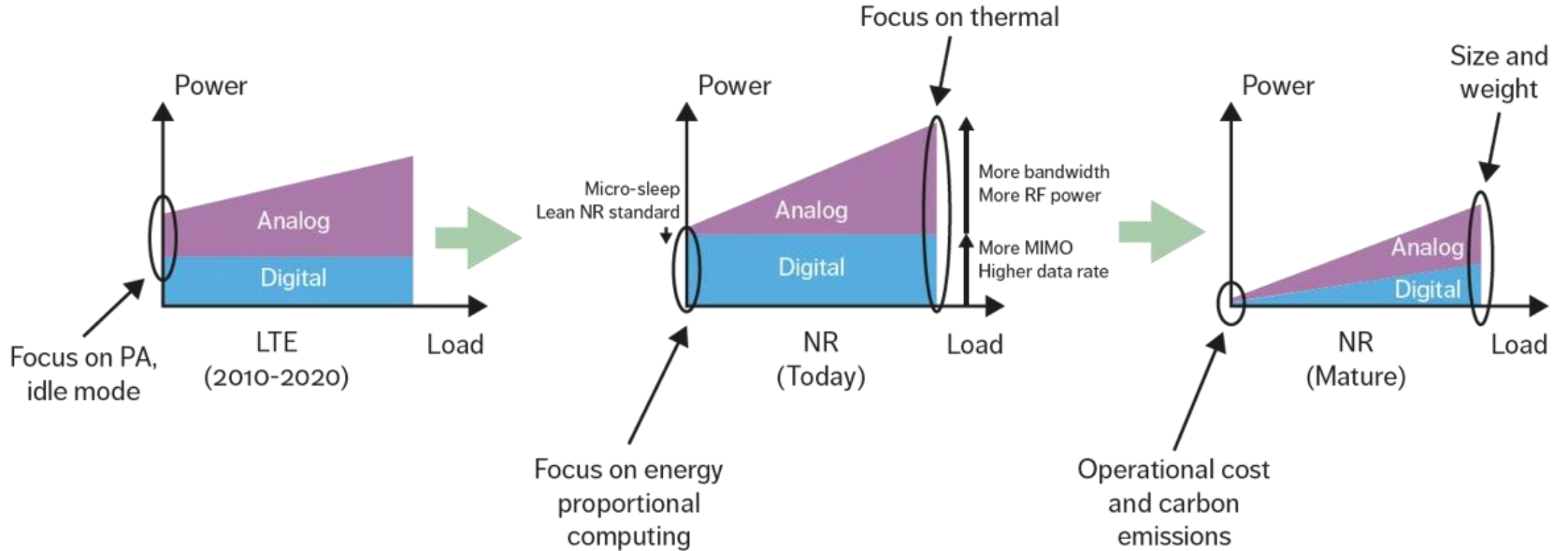
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Figure 2 – Decarbonization measures
(source: [ITU-T L.1470])

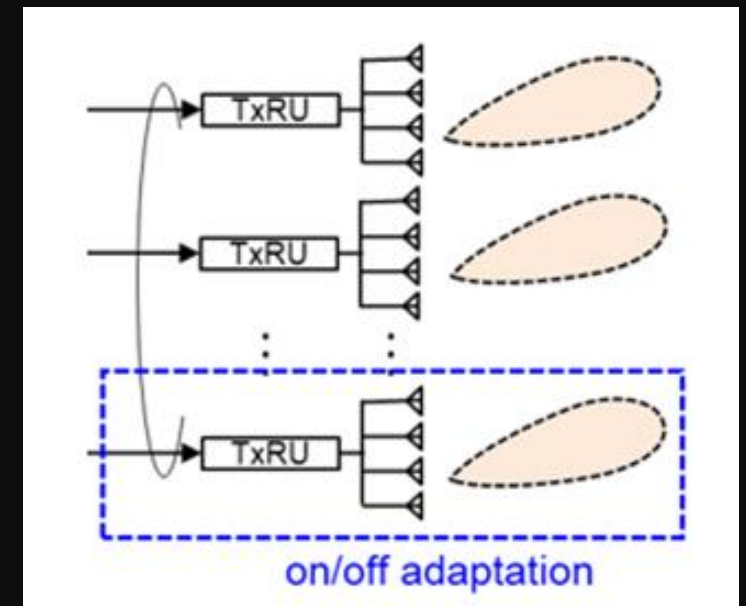
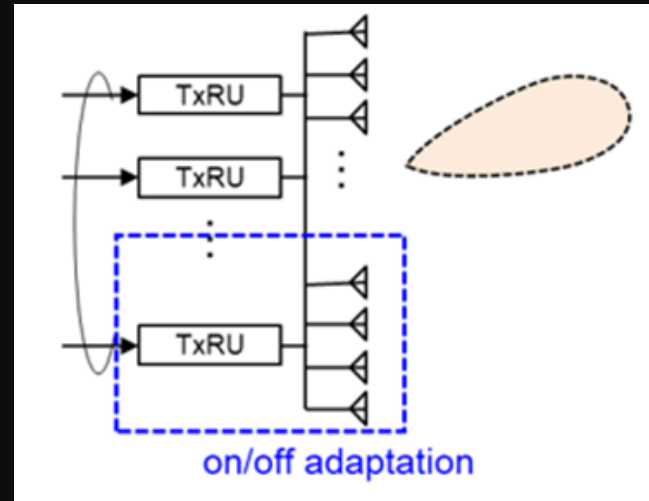
Network Power Consumption Split by Domain. Source: Nokia Bell Labs (based on NGMN data).



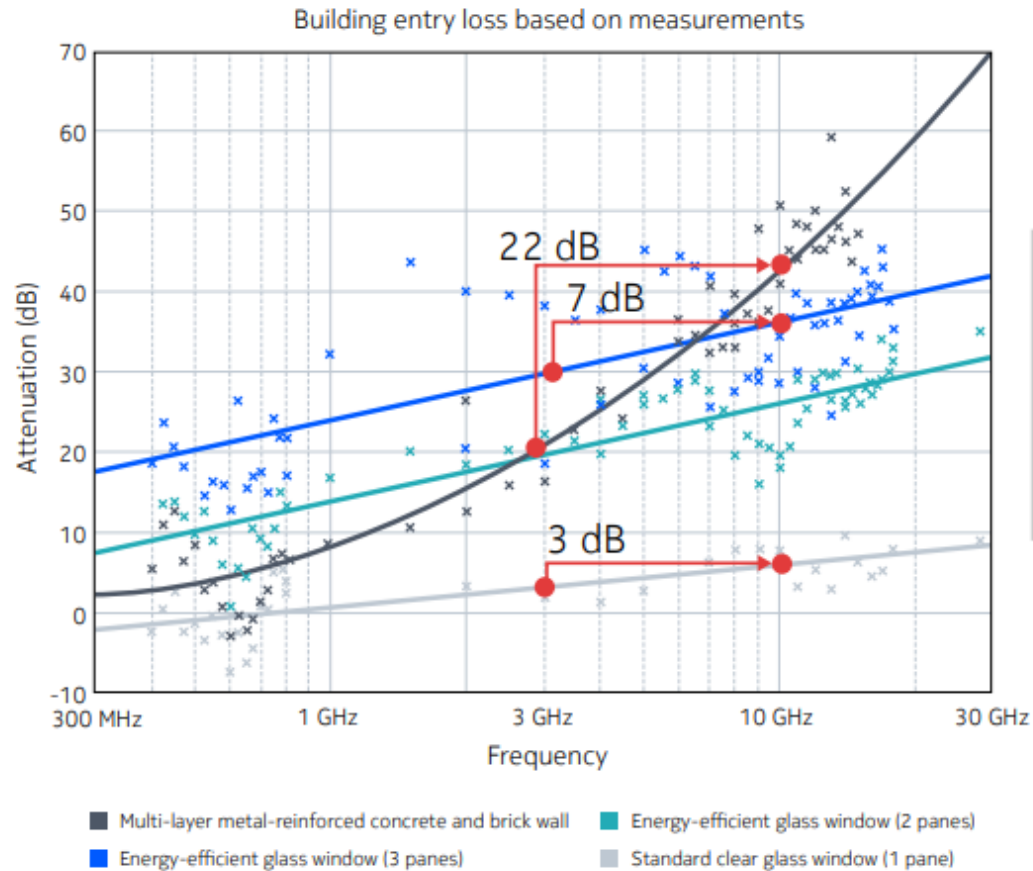
The power consumption journey of the radio unit in the base station



Type 1 adaptation (logical antenna port level)
Type 2 adaptation (physical antenna element level)

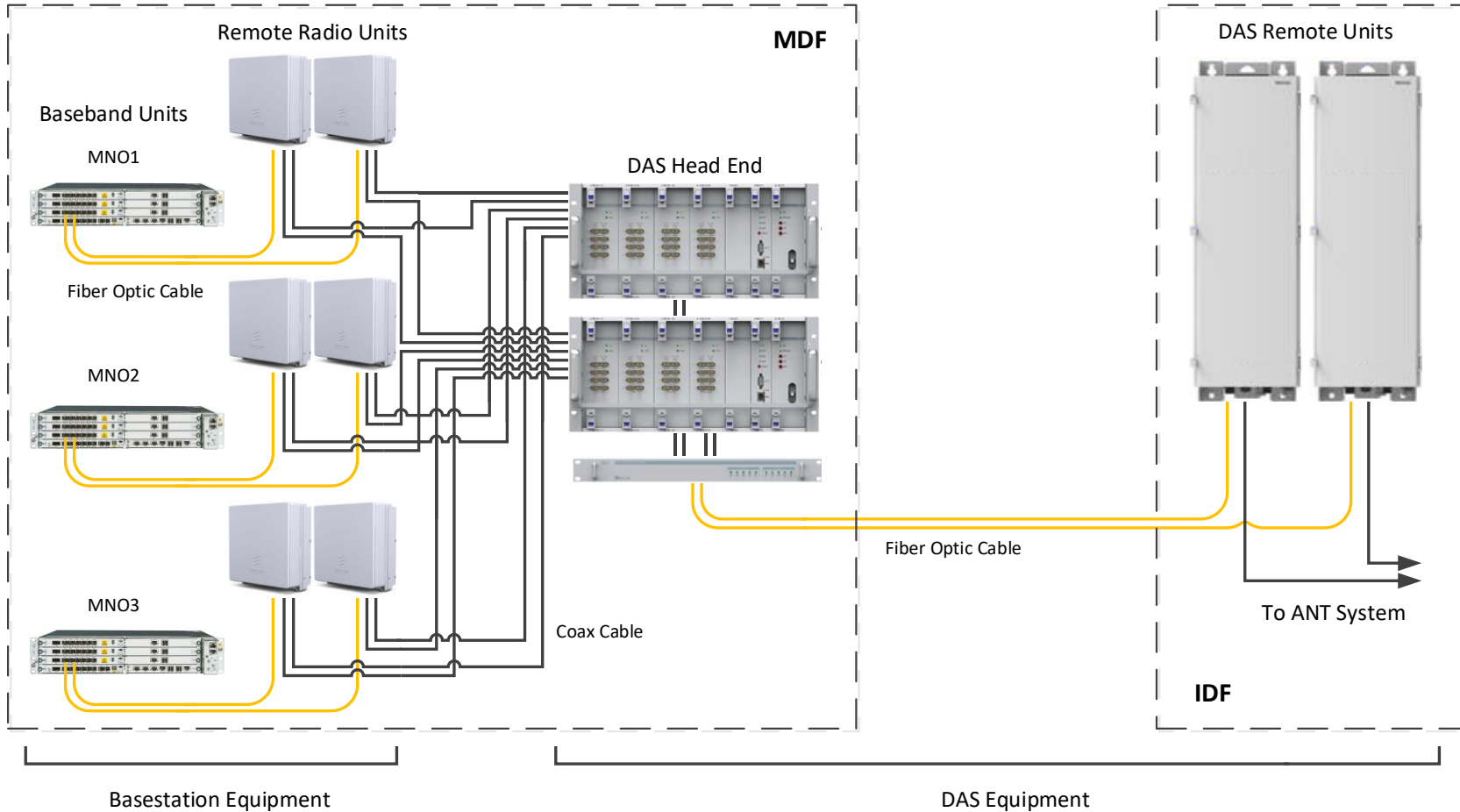


Penetration loss measurements as a function of frequency for different building materials.



- Indoor penetration loss increases from 3 to 10 GHz
- Standard clear glass: 3 dB
- Energy efficient glass: 7 dB
- Reinforced concrete: 22 dB

Dual band 2x2 MIMO DAS deployment. In this case, the system is hosting three different MNOs.



Monthly energy used by the network vs solar-generated energy

Source: Motive Energy Telecommunications Group, Inc.

