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Converged Networks and Mobility

Small Cell Deployment Strategies for Cable Broadband

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2021 Fall Technical Forum
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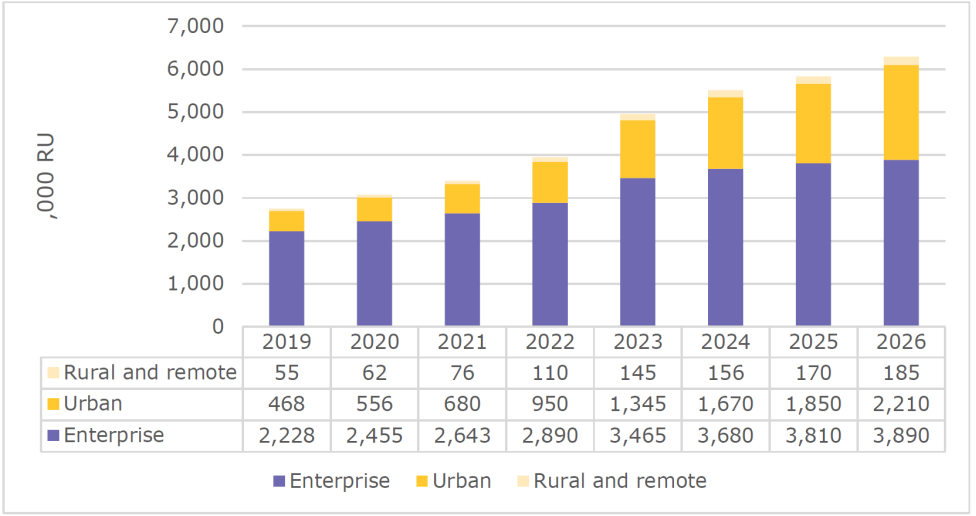
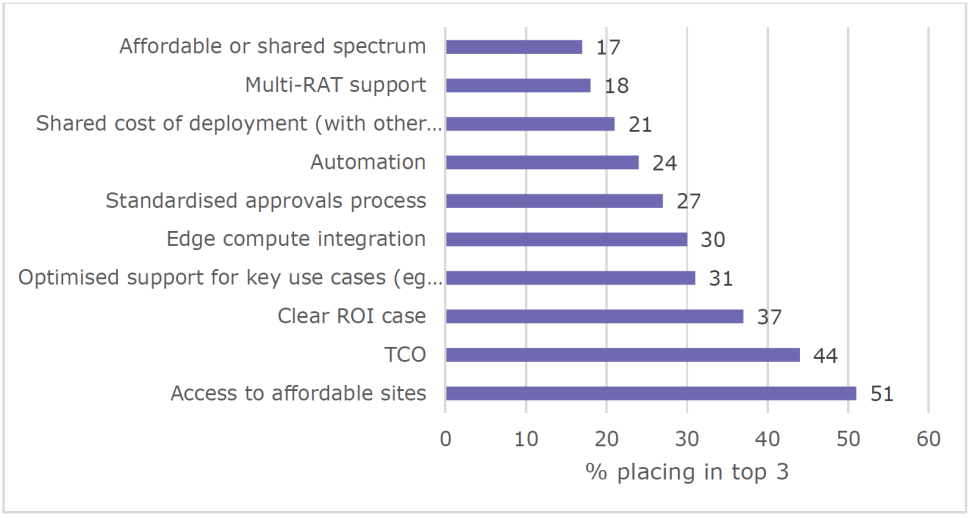
Outdoor Small Cell Market

- Outdoor small cell market to double by 2026 to over 2.2 million radios
- Affordable siting access main concern for operators
- TCO second ranked concern



	2019	2020	2021	2022	2023	2024	2025	2026
Rural and remote	55	62	76	110	145	156	170	185
Urban	468	556	680	950	1,345	1,670	1,850	2,210
Enterprise	2,228	2,455	2,643	2,890	3,465	3,680	3,810	3,890



Source: SCF 2021 Market Forecast document 050.10.5; http://smallcellforum.org/scf-market-forecast

Small Cell Deployment Challenges

- Unavailability of utility power or fiber
- Zoning, siting, permitting and regulations
- Logistical issues with local utilities
- Utility power disturbances
- Cost-prohibitive if construction

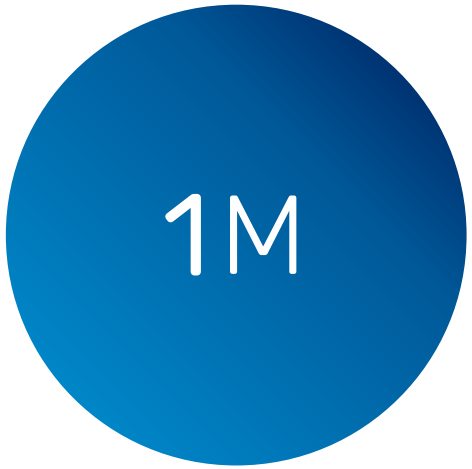
Small Cell Deployment Power Options Solutions

Coax / HFC

Remote DC Power

Local Power

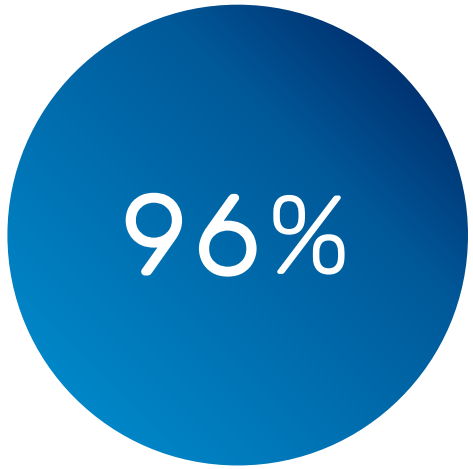
Availability of HFC Networks



Miles of HFC fiber

Miles of HFC coax

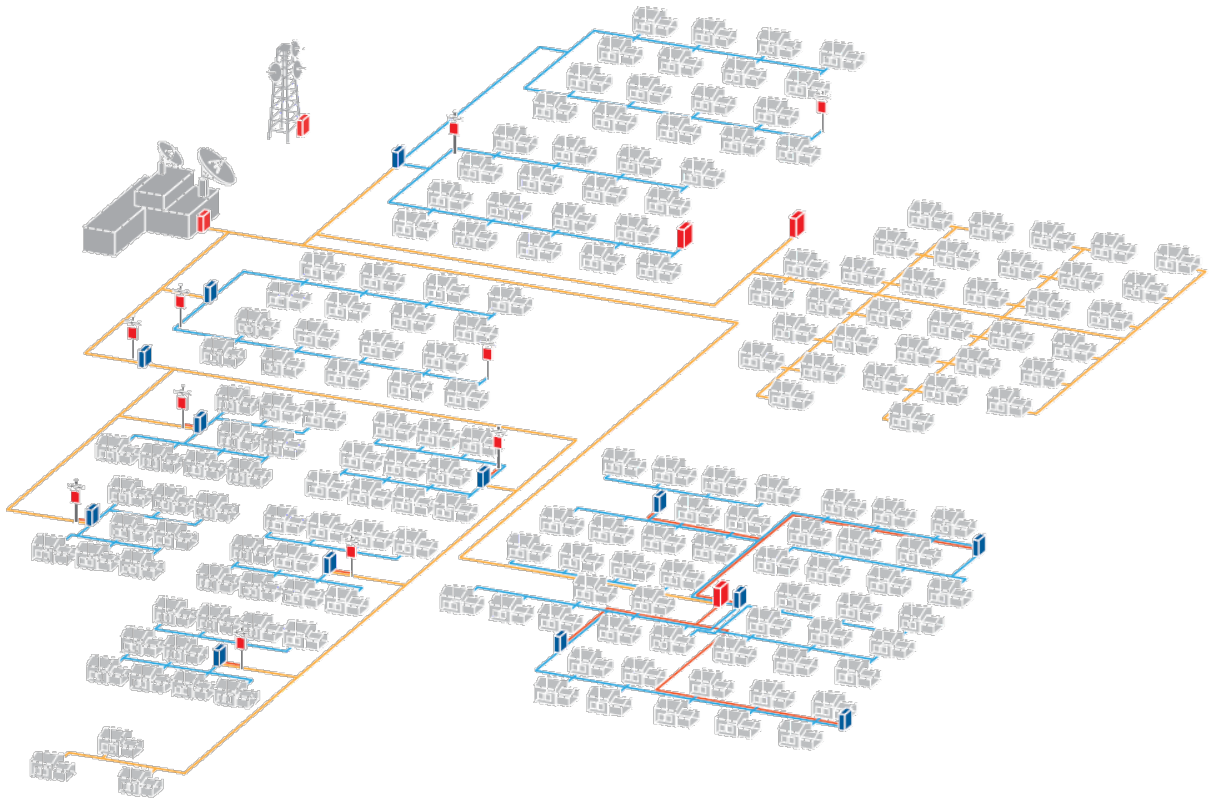
Cable broadband customers



U.S. homes with access to broadband 25/3 Mbps or faster

Coax / HFC Advantages

- Local franchise agreements for simple siting
- HFC infrastructure well maintained
- Battery backup provides hours of runtime during utility outages
- DOCSIS® 3.1 provides high speed, low-latency backhaul for small cells



1. Source: https://www.ncta.com/broadband-facts

Small Cell Design Considerations for HFC

Housing size limitations

- Aerial communications space

Physical (outside) connections

- Strand-mount, HFC coax port, ground, antennas

Power

- Quasi-square wave, voltage range, resilience

Backhaul

- DOCSIS® 3.1, outdoor-hardened, firmware

Safety

- Electrical shock, RF exposure

Environmental protection

- Water, salt, UV, wind

Network integrity

- Noise, EMI

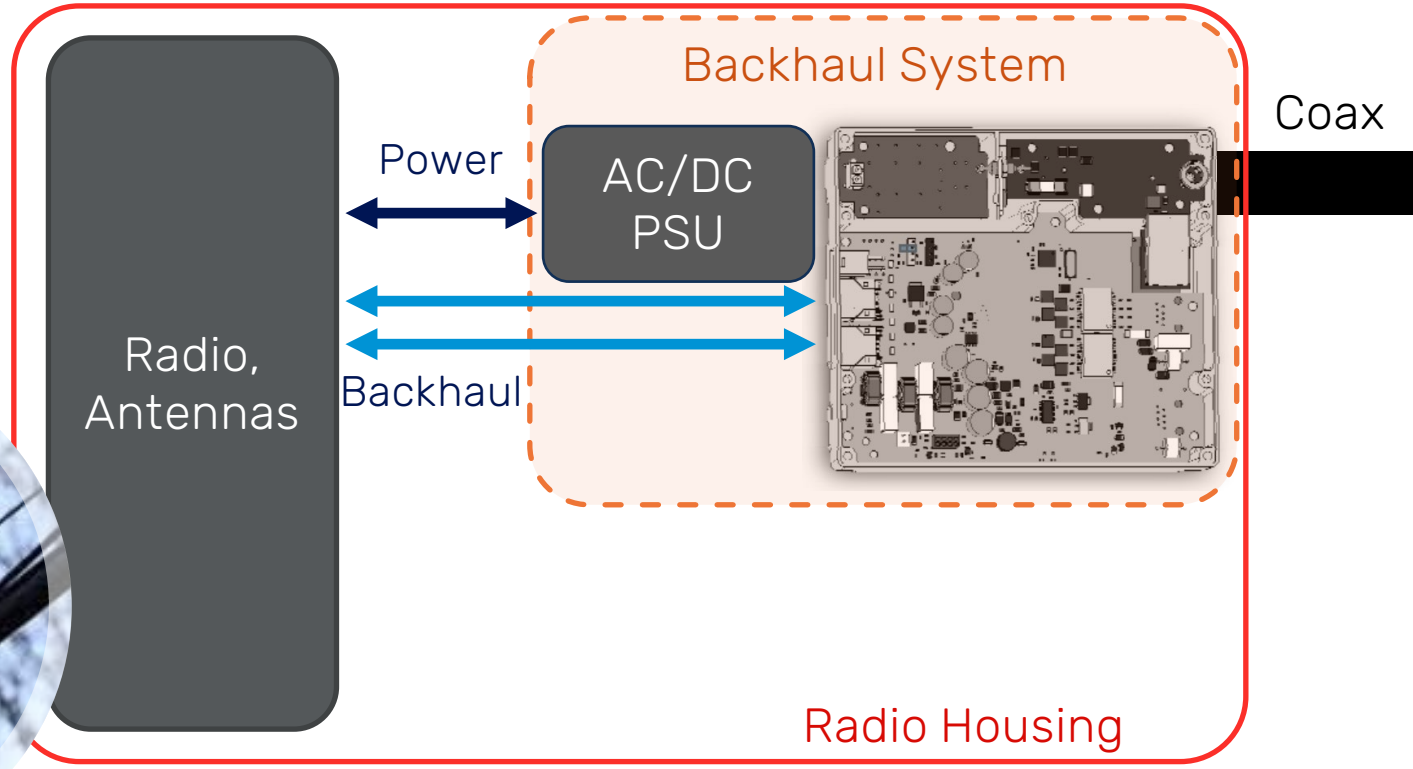
Remote management

- Modem, radio, power

Connecting Small Cells to HFC

Integrating HFC Components

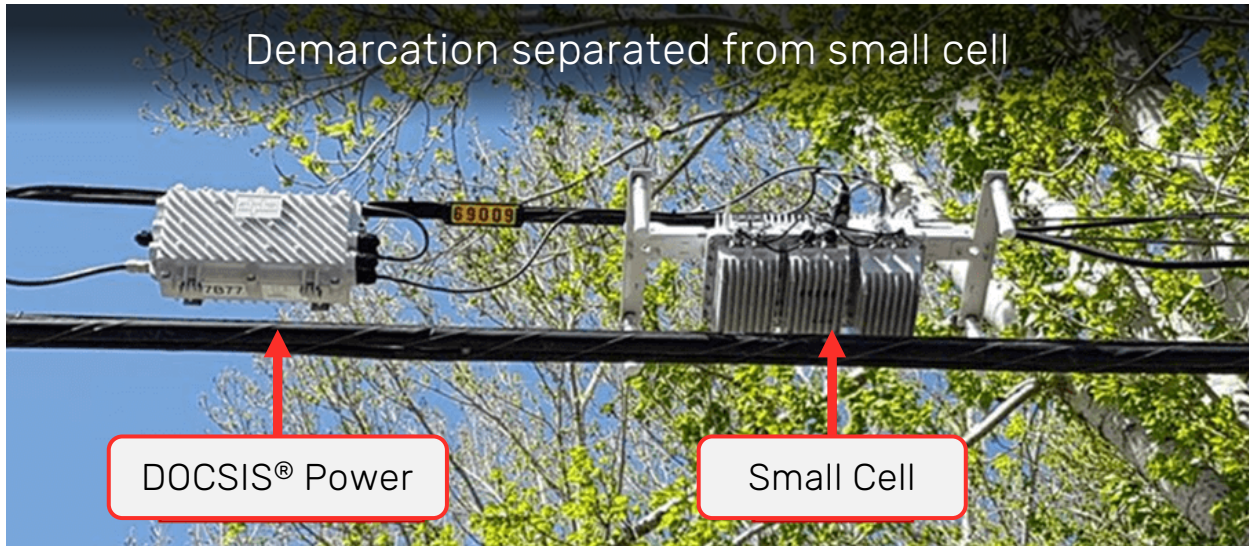
- Radio manufacturer designs HFC components into small cell
- Housing must be designed to meet cable broadband industry standards

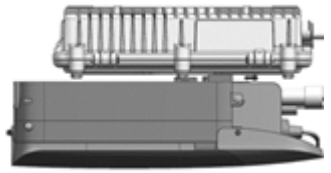


HFC Demarcations for Small Cells

Separation of HFC and Small Cell

- HFC coax power & DOCSIS® conversion isolated from radio
- Enables off-shelf small cell radios
- Significantly improves time to market by eliminating custom small cell for HFC
- Increased reliability by separating core competency





Demarcation attached to small cell

Local Utility Power for Small Cells

Power Solution Driven by Radio Voltage

AC-powered Radios:

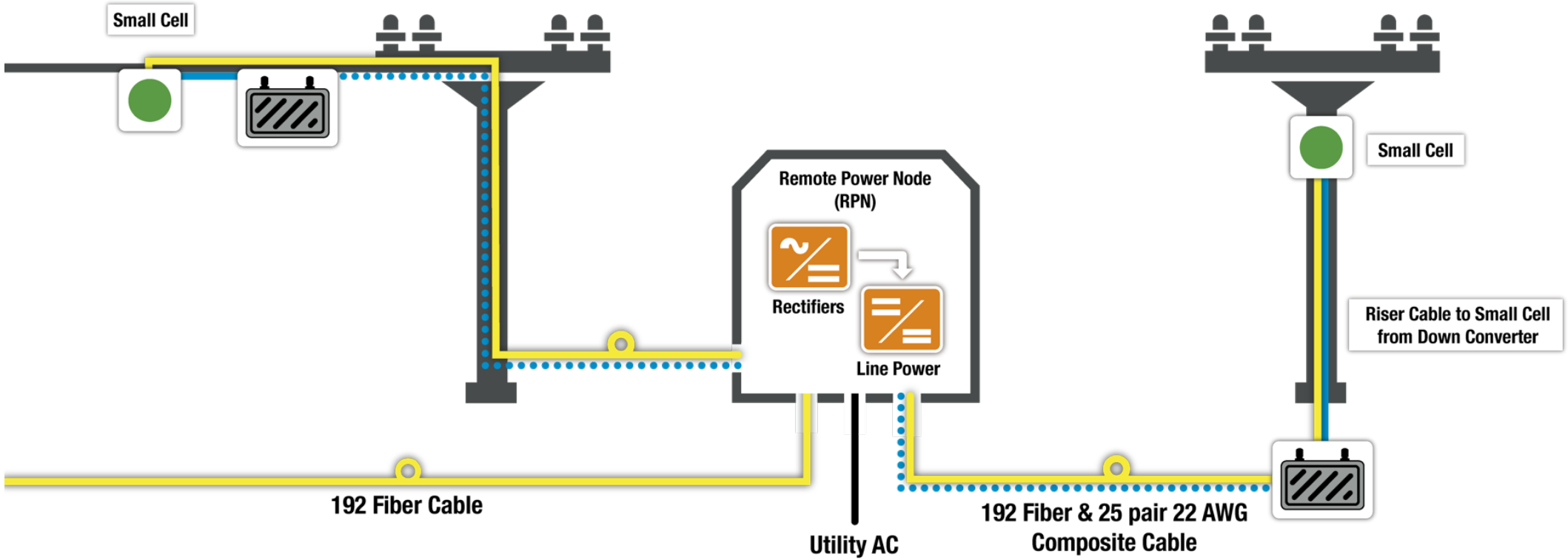
- Utility AC if available (rooftop, building) – quick, low cost, no battery
- Existing cable UPS - quick, low cost, battery backup

DC-powered Radios:

- AC to DC PSU (with or without batteries)

Remote DC Line Power for Small Cells

Another Remote Powering Option



Summary

- Small cell sites do not always coincide with the availability of utility power or backhaul
- Operators have a range of options for leveraging HFC network power and backhaul to support new small cell deployments
- Existing coax (CATV) or twisted pair (telco) infrastructure can power small cells
- In greenfield builds, coax or copper can be run alongside backhaul fiber

Source: https://www.ncta.com/broadband-facts

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Thank You!

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