



Reduce TCO by Bundling

How a single hybrid cable cuts the total cost of ownership for point-to-point microwave links

A White Paper from RFS Technologies, an Amphenol Company



A HYBRIFLEX® hybrid cable from RFS Technologies: multiple fiber and power cables bundled under a single armored jacket.

EXECUTIVE SUMMARY

Operators building out point-to-point microwave networks absorb a cost that rarely shows up on a bill of materials but appears every month on the tower-lease invoice: the cable runs connecting the outdoor radio unit (ODU) to the indoor baseband unit (IDU). The traditional approach uses four separate runs — two fiber lines and two power cable lines — for every high-capacity radio link. Replacing those four runs with a single bundled hybrid cable, such as the HYBRIFLEX® 2×2 hybrid cable from RFS Technologies, can cut annual operating expense by roughly a million dollars for a network adding 200 microwave hops a year, recover the incremental cable cost in under twelve months, and reduce installation time, weather exposure, and damage risk along the way. This paper walks through why the cost exists, how cable bundling removes it, and what the total-cost-of-ownership (TCO) math looks like as a network scales.

1. The Overlooked Cost Driver in Microwave Networks

Point-to-point microwave remains one of the fastest and most economical ways to bring backhaul capacity to a cell site, a small cell cluster, or a remote facility, especially where fiber is unavailable or cost-prohibitive to trench. Most of the attention in microwave deployment goes to the radios: frequency planning, link budgets, antenna sizing, and modulation schemes. Far less attention goes to the physical connection between the outdoor radio and the equipment it feeds — yet that connection recurs at every single hop, on every tower, for the life of the network, and it carries cost implications that compound at scale.

Every additional cable run on a tower is not just a one-time materials cost. It is a monthly line item on the tower lease, an added hour of technician time on every installation, another point of failure exposed to wind, ice, and UV, and another opportunity for a wiring error that takes a link down. When a network is adding tens or hundreds of hops a year, small per-hop inefficiencies become large, recurring costs — and that is exactly where bundling hybrid cabling starts to pay for itself.

Total cost of ownership is the right lens for evaluating this kind of decision precisely because the cost is spread out and easy to underweight at the planning stage. TCO combines the one-time capital cost of equipment and installation with the recurring operating cost of leasing, maintaining, and eventually repairing that equipment over its service life. A cabling choice that looks like a rounding error on a single site's capital budget can become one of the larger line items in a network's multi-year operating budget once it is multiplied across a build program's full hop count, which is exactly the calculation this paper works through in Section 5.

2. Background: How Cabling Became a Cost Problem

For a single, low-capacity microwave outdoor unit, the traditional cabling model works reasonably well. One power cable or hybrid line carries power and signaling to the ODU, installation is straightforward, and operating expense is modest. This is still a cost-effective approach for low-capacity links with a single radio per tower position.

The economics change as capacity requirements grow. Higher-capacity links increasingly pair two radio units in a single antenna assembly (a common configuration for doubling link capacity without doubling antenna footprint), and each radio unit needs its own power feed and its own fiber connection back to the baseband equipment. The traditional response has been to simply run more cable: two separate fiber lines and two separate power cable lines between the IDU and the ODU pair, each installed, terminated, and maintained independently.

That approach carries four distinct costs that grow directly with the number of hops built:

Higher operating expense, because most tower-lease agreements bill per cable run rather than per radio; four lines cost roughly four times what one line costs, every month, for the life of the site.

More challenging and time-consuming installation, since each of the four runs must be separately routed, secured, weatherproofed, and terminated on the tower.

Greater risk of installation error and rework, simply because there are more terminations, more connectors, and more chances to cross a pair or damage a jacket during the climb.

Reduced resilience in harsh weather, because four separate, thinner runs are more exposed to wind loading, ice accumulation, and UV degradation than a single reinforced cable.

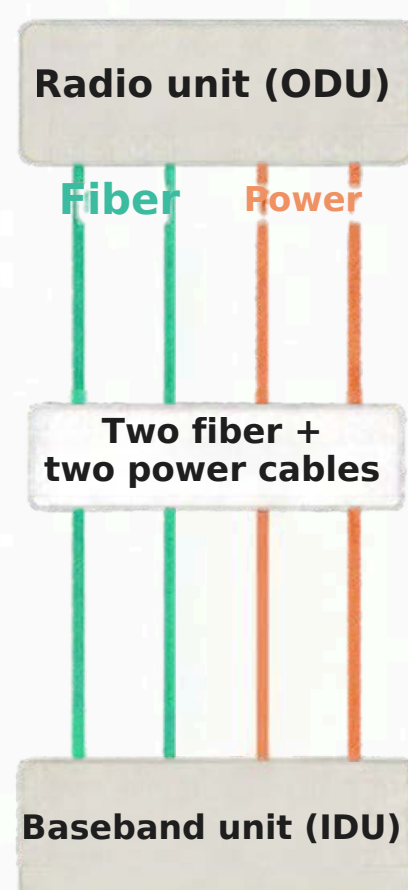
None of these costs are visible in a link budget or a radio data sheet. They surface later in the OPEX line of a site's operating cost, in the extra day a crew spends on a difficult install, and in the truck roll that follows a cable failure. One bundled hybrid cable, carrying the same fiber and power paths inside a single jacket, removes all four cost drivers at once.

3. The Current Situation: Traditional Cabling at Scale

The difference between the two approaches is easiest to see side by side. In the traditional model, the radio pair at the top of the tower terminates into four independent cables that run the full length of the tower to the equipment cabinet below. In the bundled model, those same electrical paths, consisting of two fiber pairs and two power cables travel inside a single 2x2 hybrid cable with one set of terminations at each end.

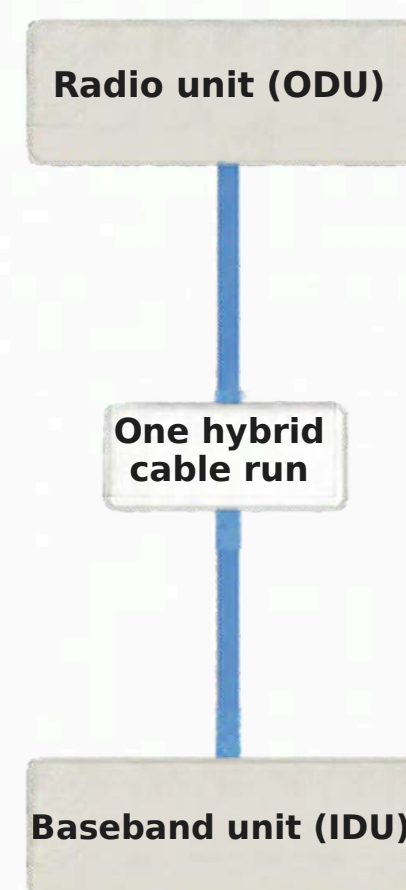


Traditional cabling



- 4 separate runs (2 fiber + 2 power cables)
- Tower lease billed per line ~ 4 lines
- Longer install time, higher damage risk
- Harder to weatherproof each run

HYBRIFLEX® hybrid cable



- 1 run carries both fiber pairs + power
- Tower lease billed per line ~ 1 line
- Single termination, plug-and-play
- One jacket to seal and support

Traditional cabling uses four independent runs per radio pair; the HYBRIFLEX® 2x2 hybrid cable consolidates the same paths into one run.

The practical consequences of that consolidation show up throughout the project lifecycle. During design, a single cable is easier to specify and route. During installation, riggers handle one reinforced cable instead of four separate ones, with a single plug and play termination at each end instead of four. During operation, the tower lease bill reflects one line rather than four, and there is one jacket to inspect rather than four. And because the hybrid cable's armored construction is purpose-built to carry structural as well as electrical loads, it holds up better in the high-wind, high-ice environments where exposed multi-cable runs are most likely to fail.

One hybrid cable run replaces four separate power cable and fiber runs — without changing anything about the radios, the antennas, or the link design.

4. The Case for Bundling: What a Hybrid Cable Changes

A hybrid cable is not a new transmission medium; it is a packaging decision. The same single-mode fiber pairs and the same coaxial power cables that would otherwise run as four separate cables are combined inside one armored, weatherproof jacket, factory-terminated at standard lengths with connectors that plug directly into the radio and baseband equipment. RFS Technologies' HYBRIFLEX® cable line was built around exactly this idea, suitable for construction ODU connections. Nothing about the radio, the antenna, or the RF link design needs to change, the cable simply carries the same signals more efficiently.

Bundled hybrid cabling is one part of a broader connectivity portfolio; RFS Technologies, an Amphenol company, also supplies RF transmission lines, fiber and power cabling, and indoor wireless systems across macro and small-cell access networks, microwave backhaul, broadcast, and defense applications. That breadth means the same bundling approach used to simplify a microwave ODU connection extends naturally to hybrid and multi-service cabling for other site types, letting operators standardize on one cabling partner and one installation practice across a wider range of network infrastructure.

That packaging decision delivers value across three categories that together define the total cost of ownership of a microwave hop:

Lower Operating Expense

Because tower-lease and colocation agreements typically bill per cable run, consolidating four runs into one is the single largest lever on recurring cost. Across a network building out 200 hops a year, that difference alone is worth roughly a million dollars annually in avoided lease and maintenance expense, savings that begin accruing from the first hop deployed and continue for as long as the site is on the air.

Lower Installation Cost

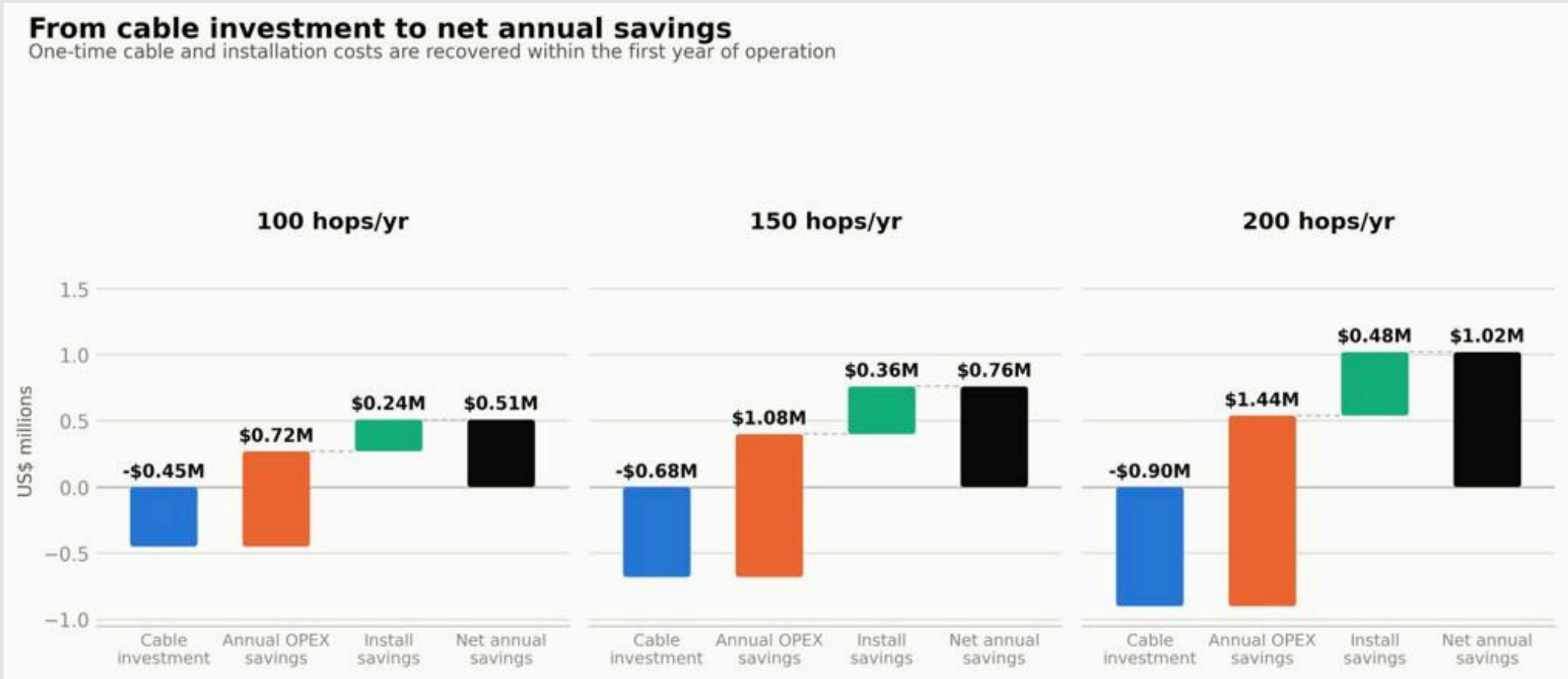
A single hybrid cable with pre-terminated connectors supports plug-and-play installation: one cable to route, one set of connections to make, and far less time spent on the tower. That translates directly into fewer billable installation hours per hop and a lower probability of installation error working at height.

Lower Maintenance Cost

A single armored cable is inherently more resistant to the wind loading, ice, and UV exposure that degrade thinner, unshielded runs over time. It also avoids the tower-traffic conflicts that arise when a co-locator's crew must work around four separate cable runs to reach their own equipment, and its added structural integrity reduces the risk of an outage caused by physical damage to any single run.

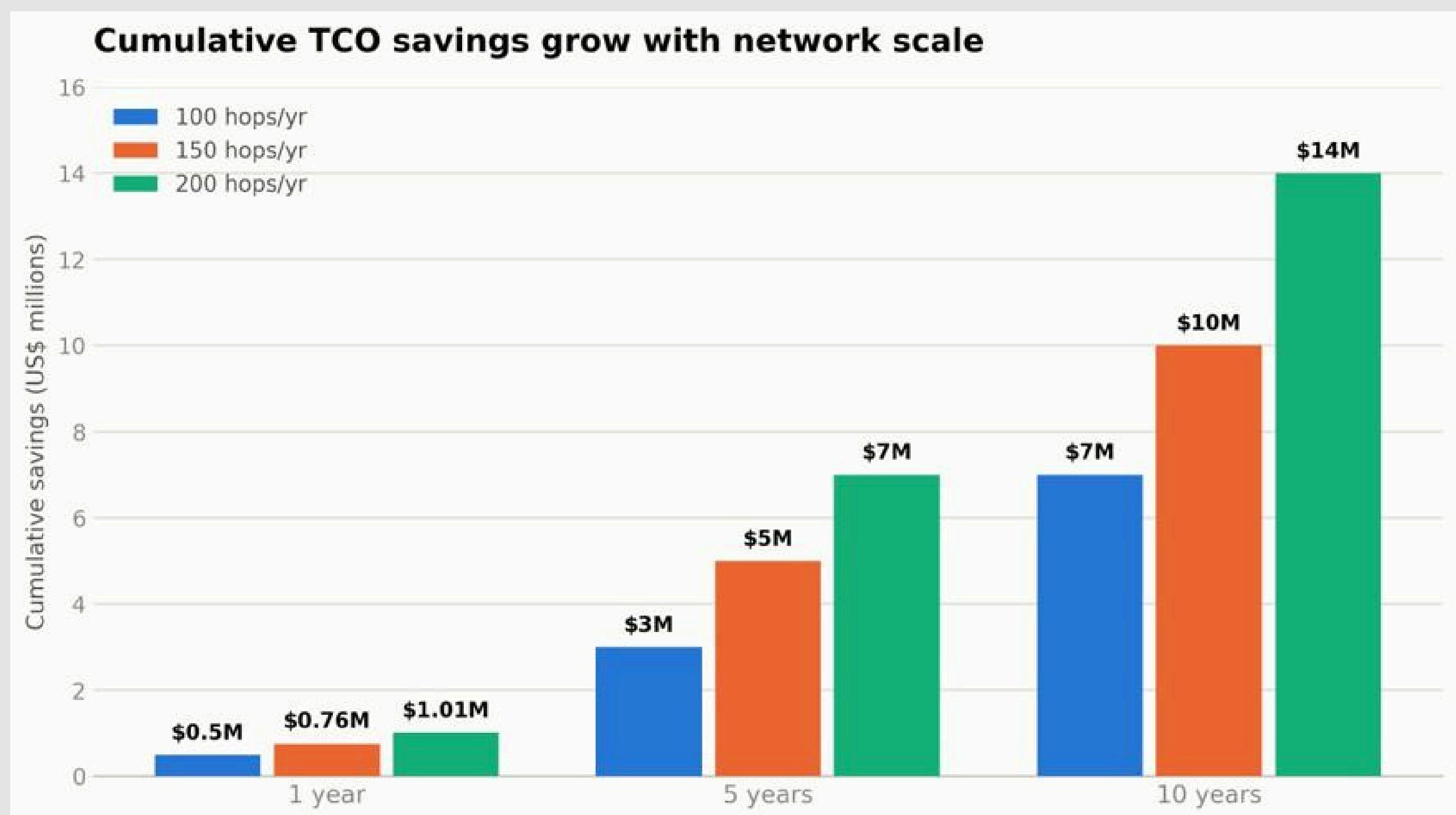
5. Quantifying the Savings

The value of bundling is easiest to see in dollar terms. The chart below breaks down the net annual savings from switching to a bundled hybrid cable at three representative deployment volumes: a network building 100, 150, or 200 new microwave hops per year. In each case, the modest incremental cost of the hybrid cable itself is more than offset by savings in annual operating expense and one-time installation cost, producing a positive net annual savings figure in every scenario — and a return on the incremental cable investment in well under a year.



At every deployment volume modeled, OPEX and installation savings outweigh the incremental cable investment within the first year

These per-hop savings compound as a network operates over multiple years. Because the OPEX savings recur every year a site remains in service, the gap between the two cabling approaches widens steadily over time. The chart below projects cumulative savings at one, five, and ten years for the same three deployment volumes.



Cumulative savings scale with both time in service and network size, reaching an estimated \$14M over ten years for a network adding 200 hops annually

Two patterns are worth calling out. First, the payback period is short: because installation and product cost savings are realized immediately and OPEX savings begin accruing from month one, the breakeven point on the incremental hybrid-cable investment arrives in well under a year in every scenario modeled. Second, the benefit scales faster than the network itself. A network built at 200 hops per year does not simply save twice as much as one built at 100 hops per year, it saves substantially more than twice as much over a ten-year horizon, because OPEX savings compound across a larger and larger installed base of sites.

A Note on The Cost Model

The figures in this section follow a straightforward model: a one-time incremental cost for the hybrid cable itself, offset by one-time installation-labor savings and by recurring annual OPEX savings from consolidating four billed cable runs into one. Net annual savings is simply the OPEX and installation savings realized each year, less the amortized cable investment for that year's hops. Cumulative savings then compound that net figure across the number of years a network has been in service, which is why the gap between the three deployment volumes widens so markedly between the one-year and ten-year projections. Every operator's actual figure will differ based on local tower-lease pricing, labor rates, radio configuration, and the specific hybrid cable product selected, so the dollar values here should be read as illustrative of the shape of the savings curve rather than as a quote for any specific network.

6. Beyond the Balance Sheet: Reliability, Safety, and Speed

The financial case for bundling is compelling on its own, but the operational benefits are just as important to network quality and crew safety.

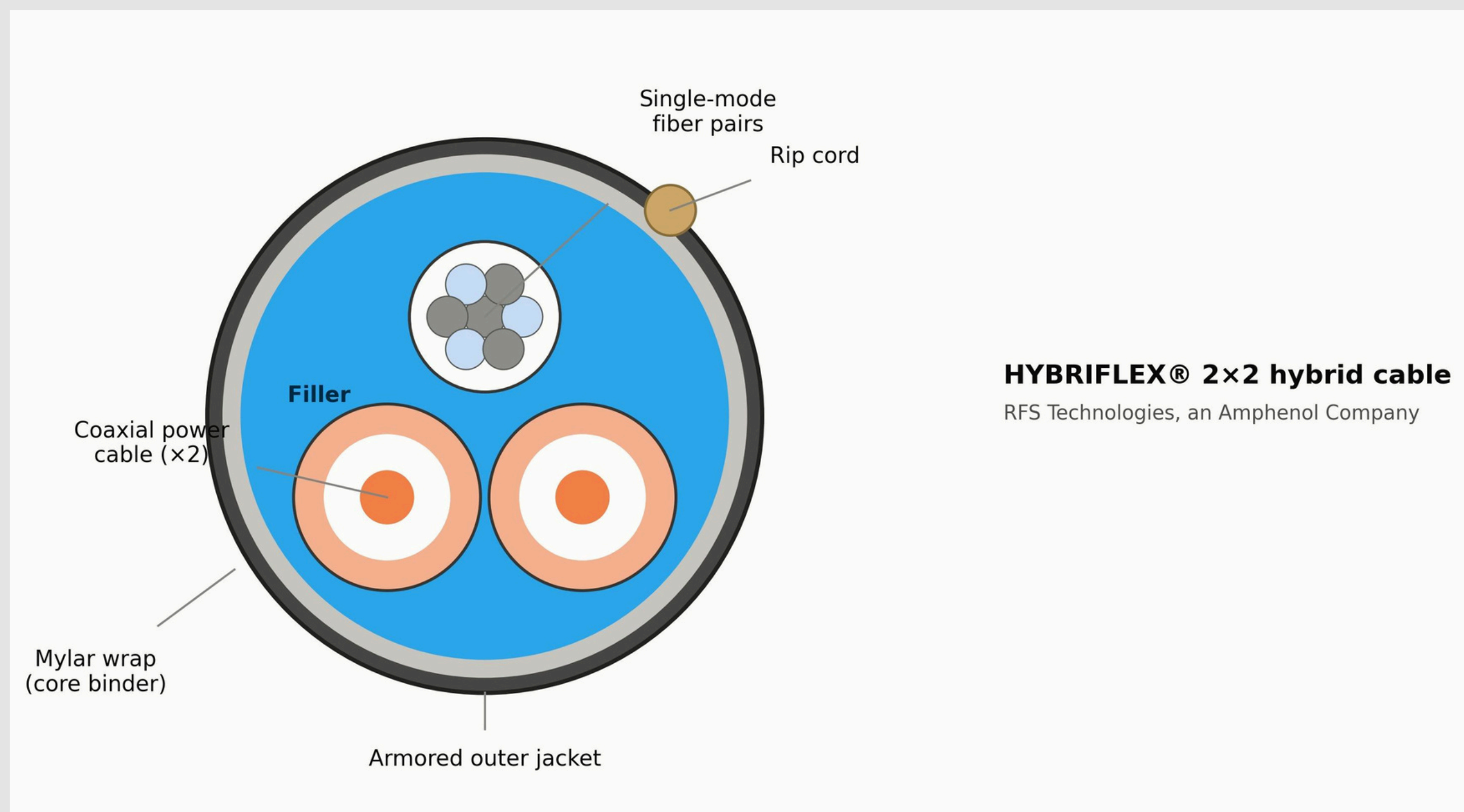
- **Faster deployment:** fewer connections to route, secure, and test on the tower means each installation crew can complete more hops per shift — a meaningful advantage when a build program is racing to hit a capacity or coverage deadline
- **Lower risk of outage-causing errors:** with one cable and one set of terminations instead of four, there are fewer opportunities to cross a connection, damage a jacket, or leave a termination improperly sealed against moisture.
- **Better performance in harsh environments:** the armored construction of a hybrid cable is built to withstand wind, ice, and UV exposure better than thinner, unshielded individual runs, reducing weather-related service calls.

- Reduced tower-traffic conflicts: on shared towers, fewer cable runs mean less physical interference with other tenants' equipment and fewer coordination delays when a co-locator needs to access their own gear.
- Structural contribution: a single, reinforced cable can also contribute to the mechanical stability of the antenna mount, an advantage four thin, independently-secured cables do not offer.

Each of these factors has a cost dimension too — a faster install means fewer billable hours, a lower error rate means fewer truck rolls, and better weather resilience means fewer emergency maintenance visits — but they also matter independently as measures of network quality and technician safety. A crew spending less time working at height on a windswept tower, handling fewer separate terminations, is a crew exposed to less risk on every climb — a benefit that does not show up in a TCO spreadsheet but matters just as much to the teams building and maintaining these networks.

7. Inside the HYBRIFLEX® Hybrid Cable: A Technical Snapshot

The HYBRIFLEX® 2×2 hybrid cable from RFS Technologies combines two single-mode fiber pairs, bundled together in one fiber unit, with two power cables, all embedded in filler material inside a single armored, low-smoke, zero-halogen (LSZH) jacket. A mylar wrap binds the core together beneath the armor, and a rip cord embedded in the jacket wall lets installers open the cable cleanly without a blade. Factory-installed connectors at both ends are sized to standard cable lengths. The cross-section below illustrates the construction.



The HYBRIFLEX® 2×2 hybrid cable cross-section: a bundled fiber-pair unit and two coaxial power cables sit in filler material inside the armored jacket.

HYBRIFLEX® cables are available in a range of standard factory-terminated lengths to match common tower heights, with connectorization designed for tool-less, plug-and-play installation at both the radio and baseband ends. Element count, jacket construction, and length options vary by the specific power and fiber-count requirements of a given radio configuration.



8. Putting it into Practice

For network teams evaluating whether bundled hybrid cabling makes sense for a given build, three questions are worth asking early in the planning process:

- How many hops per year does the build program expect to deploy, and over what site lifetime? The savings shown in this paper scale directly with both variables, a higher hop count and a longer expected service life both increase the value of consolidating cable runs.
- How is tower or rooftop leasing structured? Where lease agreements bill per cable run rather than per radio, the OPEX case for bundling is typically the single largest component of the total savings.
- What are the site's environmental conditions? Sites in high-wind, high-ice, or otherwise harsh environments see an outsized benefit from the added mechanical and weather resilience of an armored hybrid cable.

None of these questions require a change to existing radio hardware, antenna configurations, or link designs. Bundling is a cabling decision, made independently of the radio equipment it supports, which is what makes it straightforward to evaluate against a specific network's own hop count, lease structure, and site conditions. RFS Technologies works with network teams through exactly this evaluation, matching HYBRIFLEX® cable configurations to a build program's radio pairing, power budget, and tower environment.

Conclusion

The cable connecting a microwave radio to its baseband equipment is easy to overlook in network planning, but it is a cost that recurs at every hop and compounds every month a site stays in service. Consolidating the traditional four-cable arrangement into a single bundled hybrid cable is a low-risk, high-return change: it requires no modification to the radio link itself, pays back its incremental cost in under a year, and continues delivering lower operating expense, faster installation, and improved reliability for as long as the network is in operation. For any operator scaling a point-to-point microwave build, RFS Technologies' HYBRIFLEX® hybrid cable is one of the more straightforward total-cost-of-ownership improvements available today.

Figures shown are illustrative, based on an RFS Technologies HYBRIFLEX® deployment model at 100/150/200 microwave hops per year. Actual costs and savings will vary by market, tower-lease structure, site conditions, and pricing. © RFS Technologies, an Amphenol Company.