



Creating Infinite
Possibilities.

5G FWA Economics & Methodology

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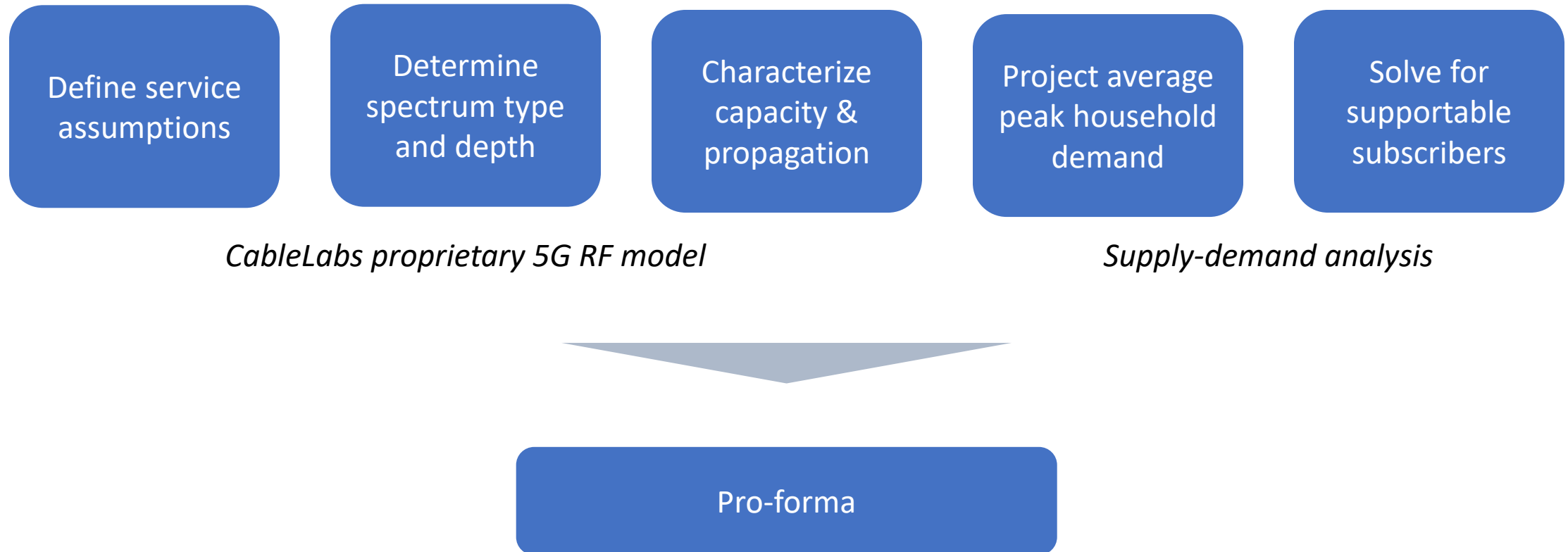
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How capable is FWA as a broadband service?

- What speeds can be offered?
- Is it reliable?
- How many subscribers can FWA serve?
- Can FWA support broadband household usage today and in the future?
- Is it profitable?

Note: This analysis focuses on a Rural scenario. The FCC defines rural areas as having a household density < 500 homes//Km².

Economics Framework for Return on Investment (ROI)



FWA Service Assumptions

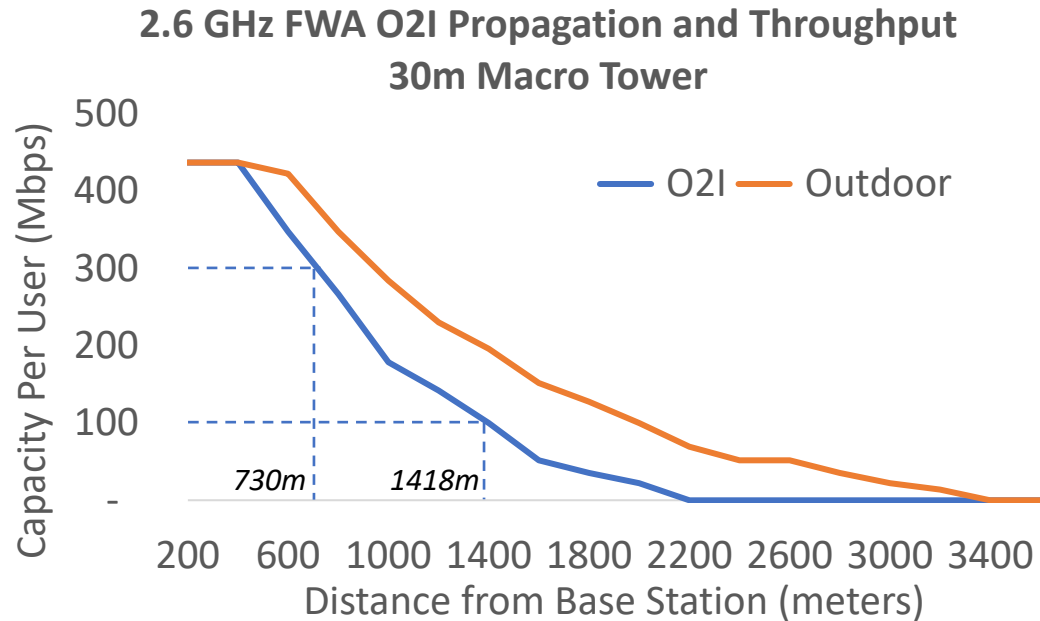
Suburban -Rural Macro Towers, Outdoor-to-Indoor (O2I) Propagation

Service	100 Mbps (target) 95% Availability (headline speed)
Spectrum	100 MHz of 2.6 GHz
Infrastructure	30m height macro towers
Antennas	2X2 MIMO 4 beams/sector, 2 users/beam
CPE	4G/5G Gateway In-home, self-install 2m high in-home placement 1m from closest exterior wall to BS

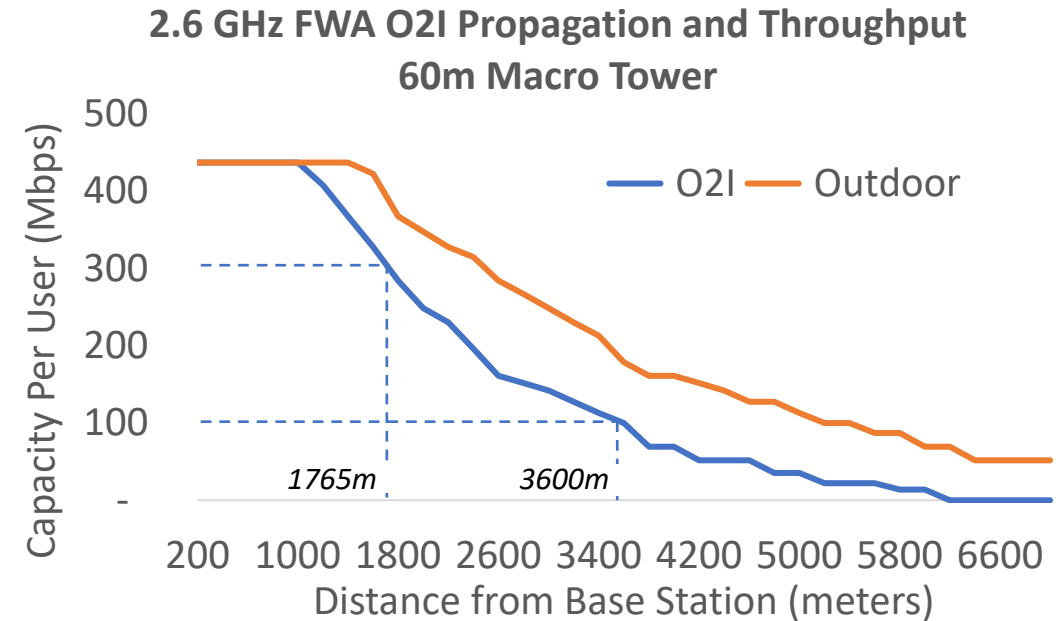


Estimated Propagation & Capacity

Suburban



Rural

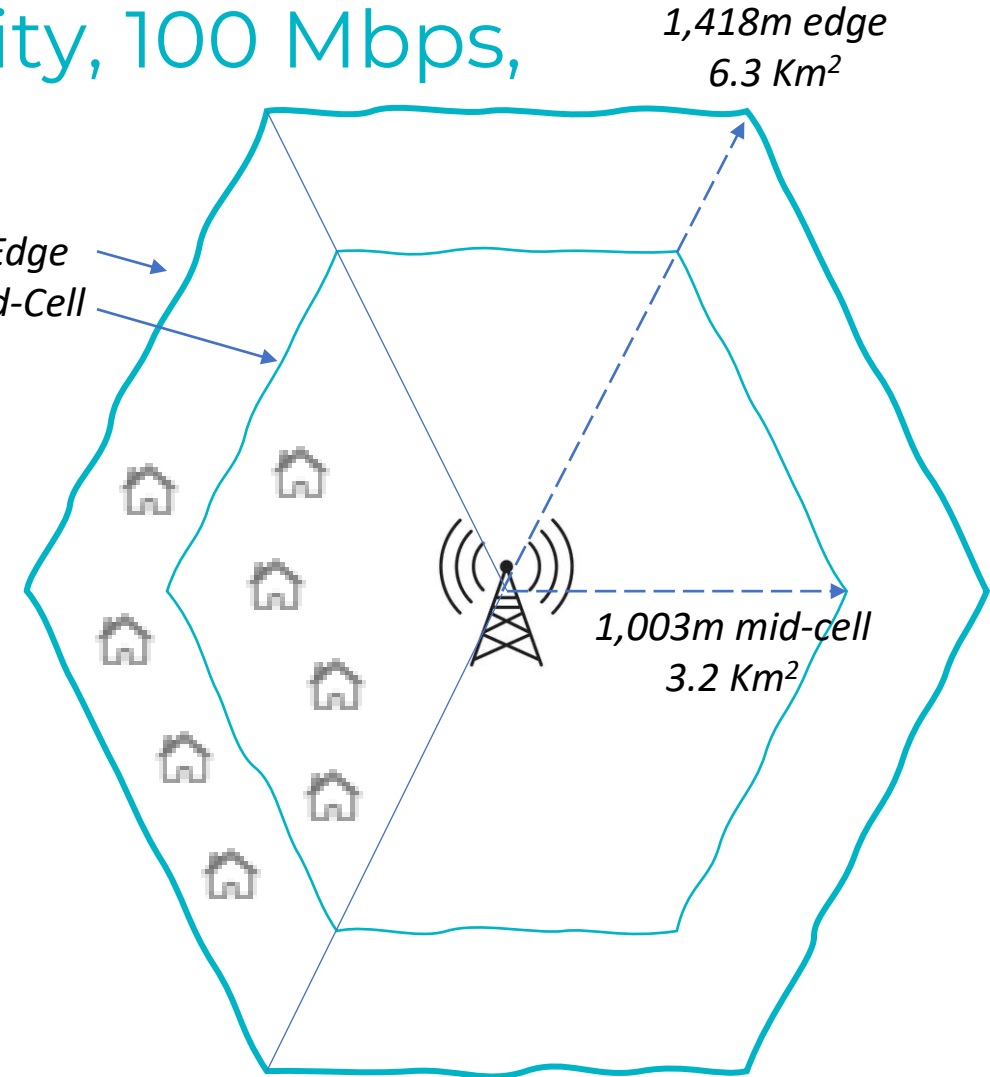


Estimated Propagation & Capacity, 100 Mbps, 30m Macro Tower

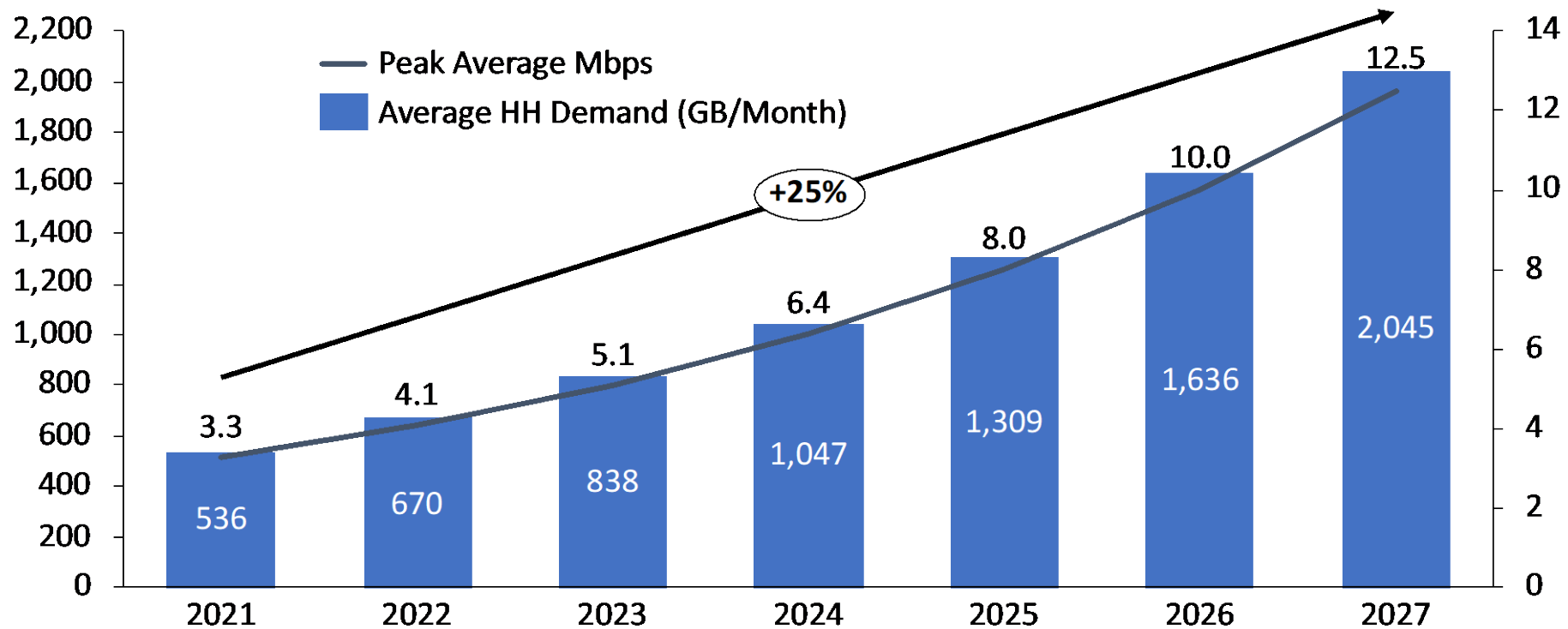
Cell Capacity/Sector:

- 800 Mbps at Cell-Edge
- 1,429 Mbps at Mid-Cell

- Assumption that households are distributed evenly across the cell and 3 sectors
- Mid-Cell is the point where half of households are towards the base station and half are towards the cell-edge



Projected Household Broadband Demand



Supportable Subscribers per Macro Cell

Available Capacity at Mid-Cell

1,429 Mbps * 50%
Max Fill-Rate

=

715 Mbps of total
available capacity
per sector



715 Mbps / 12.5 Peak
Mbps (in 2027) = 57
supportable
households/sector or
171 per cell

Service area for 100
Mbps is 6.3 Km²
171 / 6.3 =
27 Subscribers/Km²

Market Penetration Considerations

Rural ← | → Suburban

Market Penetration	Household Density/Square Km							
	100	200	300	400	500	750	1,000	1,250
2.5%	3	5	8	10	13	19	25	32
5.0%	5	10	15	20	25	38	50	63
7.5%	8	15	23	30	38	57	75	94
10.0%	10	20	30	40	50	75	100	125
12.5%	13	25	38	50	63	94	125	157
15.0%	15	30	45	60	75	113	150	188
17.5%	18	35	53	70	88	132	175	219
20.0%	20	40	60	80	100	150	200	250
22.5%	23	45	68	90	113	169	225	282
25.0%	25	50	75	100	125	188	250	313

Pro-Forma

Revenue Impacting	Variable Cost Impacting	Fixed Cost & Other
Household Density	Customer Acquisition & Promotions	Existing Macro Towers
Target FWA Service	Cash Cost to Serve	Service Coverage Area
Market Penetration	CPE Cost	Spectrum Cost to Carry
Subscriber Ramp	CPE Replacement Life	RAN Equipment & Installation
Churn	Incremental Tower Costs (lease, power, backhaul, maintenance)	Tower Make-Ready (power, backhaul, wind load)
ARPU, Annual Escalator	Annual Cost Escalator	RAN Replacement Life
CPE		Core Networking
Installation Cost		Amortization of Spectrum and Capex
		Cash Tax Savings
		Internal Cost Allocations
		WACC



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Thank You!

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