

FOR PUBLICATION

**UNITED STATES COURT OF APPEALS
FOR THE NINTH CIRCUIT**

CITY OF PORTLAND,
Petitioner,

v.

UNITED STATES OF AMERICA;
FEDERAL COMMUNICATIONS
COMMISSION,
Respondents,

CITY AND COUNTY OF SAN
FRANCISCO; CITY OF ARCADIA; CITY
OF BELLEVUE; CITY OF
BROOKHAVEN; CITY OF BURIEN;
CITY OF BURLINGAME; CITY OF
CHICAGO; CITY OF CULVER CITY;
CITY OF DUBUQUE; CITY OF GIG
HARBOR; CITY OF KIRKLAND; CITY
OF LAS VEGAS; CITY OF LINCOLN;
CITY OF MONTEREY; CITY OF
PHILADELPHIA; CITY OF PIEDMONT;
CITY OF PLANO; CITY OF SAN
BRUNO; CITY OF SAN JACINTO; CITY
OF SAN JOSE; CITY OF SANTA
MONICA; CITY OF SHAFTER; COUNTY
OF LOS ANGELES; HOWARD
COUNTY; MICHIGAN MUNICIPAL
LEAGUE; CTIA - THE WIRELESS

No. 18-72689

FCC No.
18-111

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ASSOCIATION; TOWN OF FAIRFAX;
TOWN OF HILLSBOROUGH,
Intervenors.

AMERICAN ELECTRIC POWER
SERVICE CORPORATION;
CENTERPOINT ENERGY HOUSTON
ELECTRIC, LLC; DUKE ENERGY
CORPORATION; ENTERGY
CORPORATION; ONCOR ELECTRIC
DELIVERY COMPANY, LLC;
SOUTHERN COMPANY; TAMPA
ELECTRIC COMPANY; VIRGINIA
ELECTRIC AND POWER COMPANY;
XCEL ENERGY SERVICES INC.,
Petitioners,

v.

FEDERAL COMMUNICATIONS
COMMISSION; UNITED STATES OF
AMERICA,
Respondents,

VERIZON; US TELECOM—THE
BROADBAND ASSOCIATION,
Respondents-Intervenors.

No. 19-70490

FCC No.
18-111

CITY OF PORTLAND V. UNITED STATES

SPRINT CORPORATION,
Petitioner,

v.

FEDERAL COMMUNICATIONS
COMMISSION; UNITED STATES OF
AMERICA,
Respondents,

No. 19-70123

FCC No.
18-133

CITY OF BOWIE, Maryland; CITY OF
EUGENE, Oregon; CITY OF
HUNTSVILLE, Alabama; CITY OF
WESTMINSTER, Maryland; COUNTY
OF MARIN, California; CITY OF
ARCADIA, California; CULVER CITY,
California; CITY OF BELLEVUE,
California; CITY OF BURIEN,
Washington; CITY OF BURLINGAME,
California; CITY OF GIG HARBOR,
Washington; CITY OF ISSAQUAH,
Washington; CITY OF KIRKLAND,
Washington; CITY OF LAS VEGAS,
Nevada; CITY OF LOS ANGELES,
California; CITY OF MONTEREY,
California; CITY OF ONTARIO,
California; CITY OF PIEDMONT,
California; CITY OF PORTLAND,
Oregon; CITY OF SAN JACINTO,
California; CITY OF SAN JOSE,
California; CITY OF SHAFTER,
California; CITY OF YUMA, Arizona;

COUNTY OF LOS ANGELES,
California; TOWN OF FAIRFAX,
California; CITY OF NEW YORK, New
York,
Intervenors.

VERIZON COMMUNICATIONS, INC.,
Petitioner,

v.

No. 19-70124

FCC No.
18-133

FEDERAL COMMUNICATIONS
COMMISSION; UNITED STATES OF
AMERICA,
Respondents,

CITY OF ARCADIA, California; CITY
OF BELLEVUE, California; CITY OF
BURIEN, Washington; CITY OF
BURLINGAME, California; CITY OF
GIG HARBOR, Washington; CITY OF
ISSAQUAH, Washington; CITY OF
KIRKLAND, Washington; CITY OF
LAS VEGAS, Nevada; CITY OF LOS
ANGELES, California; CITY OF
MONTEREY, California; CITY OF
ONTARIO, California; CITY OF
PIEDMONT, California; CITY OF
PORTLAND, Oregon; CITY OF SAN
JACINTO, California; CITY OF SAN
JOSE, California; CITY OF SHAFTER,

California; CITY OF YUMA, Arizona;
 COUNTY OF LOS ANGELES,
 California; CULVER CITY, California;
 CITY OF NEW YORK, New York;
 TOWN OF FAIRFAX, California,
Intervenors.

PUERTO RICO TELEPHONE
 COMPANY, INC.,
Petitioner,

v.

FEDERAL COMMUNICATIONS
 COMMISSION; UNITED STATES OF
 AMERICA,
Respondents,

No. 19-70125

FCC No.
18-133

CITY OF ARCADIA, California; CITY
 OF BELLEVUE, California; CITY OF
 BURIEN, Washington; CITY OF
 BURLINGAME, California; CITY OF
 GIG HARBOR, Washington; CITY OF
 ISSAQUAH, Washington; CITY OF
 KIRKLAND, Washington; CITY OF
 LAS VEGAS, Nevada; CITY OF LOS
 ANGELES, California; CITY OF
 MONTEREY, California; CITY OF
 ONTARIO, California; CITY OF
 PIEDMONT, California; CITY OF
 PORTLAND, Oregon; CITY OF SAN

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JACINTO, California; CITY OF SAN JOSE, California; CITY OF SHAFTER, California; CITY OF YUMA, Arizona; COUNTY OF LOS ANGELES, California; CULVER CITY, California; TOWN OF FAIRFAX, California; CITY OF NEW YORK, New York,
Intervenors.

CITY OF SEATTLE, Washington; CITY OF TACOMA, Washington; KING COUNTY, Washington; LEAGUE OF OREGON CITIES; LEAGUE OF CALIFORNIA CITIES; LEAGUE OF ARIZONA CITIES AND TOWNS,
Petitioners,

No. 19-70136
FCC No.
18-133

v.

FEDERAL COMMUNICATIONS COMMISSION; UNITED STATES OF AMERICA,
Respondents,

CITY OF BAKERSFIELD, California; CITY OF COCONUT CREEK, Florida; CITY OF LACEY, Washington; CITY OF OLYMPIA, Washington; CITY OF RANCHO PALOS VERDES, California; CITY OF TUMWATER, Washington; COLORADO COMMUNICATIONS AND

UTILITY ALLIANCE; RAINIER COMMUNICATIONS COMMISSION; COUNTY OF THURSTON, Washington; CITY OF ARCADIA, California; CITY OF BELLEVUE, Washington; CITY OF BURIEN, Washington; CITY OF BURLINGAME, California; CITY OF GIG HARBOR, Washington; CITY OF ISSAQUAH, Washington; CITY OF KIRKLAND, Washington; CITY OF LAS VEGAS, Nevada; CITY OF LOS ANGELES, California; CITY OF MONTEREY, California; CITY OF ONTARIO, California; CITY OF PIEDMONT, California; CITY OF PORTLAND, Oregon; CITY OF SAN JACINTO, California; CITY OF SAN JOSE, California; CITY OF SHAFTER, California; CITY OF YUMA, Arizona; COUNTY OF LOS ANGELES, California; CULVER CITY, California; TOWN OF FAIRFAX, California; CITY OF NEW YORK, New York,

Intervenors.

CITY OF SAN JOSE, California; CITY OF ARCADIA, California; CITY OF BELLEVUE, Washington; CITY OF BURIEN, Washington; CITY OF BURLINGAME, California; CULVER CITY, California; TOWN OF FAIRFAX, California; CITY OF GIG HARBOR,

No. 19-70144

FCC No.
18-133

Washington; CITY OF ISSAQUAH,
Washington; CITY OF KIRKLAND,
Washington; CITY OF LAS VEGAS,
Nevada; CITY OF LOS ANGELES,
California; COUNTY OF LOS
ANGELES, California; CITY OF
MONTEREY, California; CITY OF
ONTARIO, California; CITY OF
PIEDMONT, California; CITY OF
PORTLAND, Oregon; CITY OF SAN
JACINTO, California; CITY OF
SHAFTER, California; CITY OF YUMA,
Arizona,

Petitioners,

v.

FEDERAL COMMUNICATIONS
COMMISSION; UNITED STATES OF
AMERICA,

Respondents,

CTIA - THE WIRELESS ASSOCIATION;
COMPETITIVE CARRIERS
ASSOCIATION; SPRINT
CORPORATION; VERIZON
COMMUNICATIONS, INC.; CITY OF
NEW YORK, NEW YORK; WIRELESS
INFRASTRUCTURE ASSOCIATION,

Intervenors.

CITY OF PORTLAND V. UNITED STATES

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CITY AND COUNTY OF SAN
FRANCISCO,

Petitioner,

v.

FEDERAL COMMUNICATIONS
COMMISSION; UNITED STATES OF
AMERICA,

Respondents.

No. 19-70145

FCC No.
18-133

CITY OF HUNTINGTON BEACH,

Petitioner,

v.

FEDERAL COMMUNICATIONS
COMMISSION; UNITED STATES OF
AMERICA,

Respondents,

No. 19-70146

FCC No.
18-133

CITY OF ARCADIA, California; CITY
OF BELLEVUE, Washington; CITY OF
BURIEN, Washington; CITY OF
BURLINGAME, California; CITY OF
GIG HARBOR, Washington; CITY OF
ISSAQUAH, Washington; CITY OF
KIRKLAND, Washington; CITY OF
LAS VEGAS, Nevada; CITY OF LOS
ANGELES, California; CITY OF
MONTEREY, California; CITY OF

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ONTARIO, California; CITY OF
PIEDMONT, California; CITY OF
PORTLAND, Oregon; CITY OF SAN
JACINTO, California; CITY OF SAN
JOSE, California; CITY OF SHAFTER,
California; CITY OF YUMA, Arizona;
COUNTY OF LOS ANGELES,
California; CULVER CITY, California;
TOWN OF FAIRFAX, California; CITY
OF NEW YORK, New York,
Intervenors.

MONTGOMERY COUNTY, Maryland,
Petitioner,

v.

FEDERAL COMMUNICATIONS
COMMISSION; UNITED STATES OF
AMERICA,
Respondents.

No. 19-70147

FCC No.
18-133

AT&T SERVICES, INC.,
Petitioner,

v.

FEDERAL COMMUNICATIONS
COMMISSION; UNITED STATES OF
AMERICA,

No. 19-70326

FCC Nos.
18-133
83-fr-51867

Respondents,

CITY OF BALTIMORE, Maryland;
CITY AND COUNTY OF SAN
FRANCISCO, California; MICHIGAN
MUNICIPAL LEAGUE; CITY OF
ALBUQUERQUE, New Mexico;
NATIONAL LEAGUE OF CITIES; CITY
OF BAKERSFIELD, California; TOWN
OF OCEAN CITY, Maryland; CITY OF
BROOKHAVEN, Georgia; CITY OF
COCONUT CREEK, Florida; CITY OF
DUBUQUE, Iowa; CITY OF
EMERYVILLE, California; CITY OF
FRESNO, California; CITY OF LA
VISTA, Nebraska; CITY OF LACEY,
Washington; CITY OF MEDINA,
Washington; CITY OF OLYMPIA,
Washington; CITY OF PAPILLION,
Nebraska; CITY OF PLANO, Texas;
CITY OF RANCHO PALOS VERDES,
California; CITY OF ROCKVILLE,
Maryland; CITY OF SAN BRUNO,
California; CITY OF SANTA MONICA,
California; CITY OF SUGARLAND,
Texas; CITY OF TUMWATER,
Washington; CITY OF WESTMINSTER,
Maryland; COLORADO
COMMUNICATIONS AND UTILITY
ALLIANCE; CONTRA COSTA COUNTY,
California; COUNTY OF MARIN,
California; INTERNATIONAL

CITY/COUNTY MANAGEMENT ASSOCIATION; INTERNATIONAL MUNICIPAL LAWYERS ASSOCIATION; LEAGUE OF NEBRASKA MUNICIPALITIES; NATIONAL ASSOCIATION OF TELECOMMUNICATIONS OFFICERS AND ADVISORS; RAINIER COMMUNICATIONS COMMISSION; THURSTON COUNTY, Washington; TOWN OF CORTE MADERA, California; TOWN OF HILLSBOROUGH, California; TOWN OF YARROW POINT, Washington; CITY OF ARCADIA, California; CITY OF BELLEVUE, Washington; CITY OF BURIEN, Washington; CITY OF BURLINGAME, California; CITY OF CULVER CITY, California; CITY OF GIG HARBOR, Washington; CITY OF ISSAQUAH, Washington; CITY OF KIRKLAND, Washington; CITY OF LAS VEGAS, Nevada; CITY OF LOS ANGELES, California; CITY OF MONTEREY, California; CITY OF ONTARIO, California; CITY OF PIEDMONT, California; CITY OF PORTLAND, Oregon; CITY OF SAN JACINTO, California; CITY OF SAN JOSE, California; CITY OF SHAFTER, California; CITY OF YUMA, Arizona; COUNTY OF LOS ANGELES, California; TOWN OF FAIRFAX,

CITY OF PORTLAND V. UNITED STATES

California,
Intervenors.

AMERICAN PUBLIC POWER
ASSOCIATION,
Petitioner,

v.

FEDERAL COMMUNICATIONS
COMMISSION; UNITED STATES OF
AMERICA,
Respondents,

No. 19-70339

FCC Nos.
18-133
83-fr-51867

CITY OF ALBUQUERQUE, New Mexico; NATIONAL LEAGUE OF CITIES; CITY OF BROOKHAVEN, Georgia; CITY OF BALTIMORE, Maryland; CITY OF DUBUQUE, Iowa; TOWN OF OCEAN CITY, Maryland; CITY OF EMERYVILLE, California; MICHIGAN MUNICIPAL LEAGUE; TOWN OF HILLSBOROUGH, California; CITY OF LA VISTA, Nebraska; CITY OF MEDINA, Washington; CITY OF PAPILLION, Nebraska; CITY OF PLANO, Texas; CITY OF ROCKVILLE, Maryland; CITY OF SAN BRUNO, California; CITY OF SANTA MONICA, California; CITY OF SUGARLAND, Texas; LEAGUE OF

NEBRASKA MUNICIPALITIES;
NATIONAL ASSOCIATION OF
TELECOMMUNICATIONS OFFICERS
AND ADVISORS; CITY OF
BAKERSFIELD, California; CITY OF
FRESNO, California; CITY OF
RANCHO PALOS VERDES, California;
CITY OF COCONUT CREEK, Florida;
CITY OF LACEY, Washington; CITY
OF OLYMPIA, Washington; CITY OF
TUMWATER, Washington; TOWN OF
YARROW POINT, Washington;
THURSTON COUNTY, Washington;
COLORADO COMMUNICATIONS AND
UTILITY ALLIANCE; RAINIER
COMMUNICATIONS COMMISSION;
CITY AND COUNTY OF SAN
FRANCISCO, California; COUNTY OF
MARIN, California; CONTRA COSTA
COUNTY, California; TOWN OF
CORTE MADERA, California; CITY OF
WESTMINSTER, Maryland,

Intervenors.

CITY OF AUSTIN, Texas; CITY OF
ANN ARBOR, Michigan; COUNTY OF
ANNE ARUNDEL, Maryland; CITY OF
ATLANTA, Georgia; CITY OF
BOSTON, Massachusetts; CITY OF
CHICAGO, Illinois; CLARK COUNTY,
Nevada; CITY OF COLLEGE PARK,
Maryland; CITY OF DALLAS, Texas;

No. 19-70341

FCC Nos.
18-133
83-FR-51867

DISTRICT OF COLUMBIA; CITY OF
GAITHERSBURG, Maryland; HOWARD
COUNTY, Maryland; CITY OF
LINCOLN, Nebraska; MONTGOMERY
COUNTY, Maryland; CITY OF
MYRTLE BEACH, South Carolina;
CITY OF OMAHA, Nebraska; CITY OF
PHILADELPHIA, Pennsylvania; CITY
OF RYE, New York; CITY OF
SCARSDALE, New York; CITY OF
SEAT PLEASANT, Maryland; CITY OF
TAKOMA PARK, Maryland; TEXAS
COALITION OF CITIES FOR UTILITY
ISSUES; MERIDIAN TOWNSHIP,
Michigan; BLOOMFIELD TOWNSHIP,
Michigan; MICHIGAN TOWNSHIPS
ASSOCIATION; MICHIGAN COALITION
TO PROTECT PUBLIC RIGHTS-OF-
WAY,

Petitioners,

v.

FEDERAL COMMUNICATIONS
COMMISSION; UNITED STATES OF
AMERICA,

Respondents,

CITY OF ALBUQUERQUE, New
Mexico; NATIONAL LEAGUE OF
CITIES; CITY OF BROOKHAVEN,
Georgia; CITY OF BALTIMORE,

Maryland; CITY OF DUBUQUE, Iowa;
TOWN OF OCEAN CITY, Maryland;
CITY OF EMERYVILLE, California;
MICHIGAN MUNICIPAL LEAGUE;
TOWN OF HILLSBOROUGH,
California; CITY OF LA VISTA,
Nebraska; CITY OF MEDINA,
Washington; CITY OF PAPILLION,
Nebraska; CITY OF PLANO, Texas;
CITY OF ROCKVILLE, Maryland; CITY
OF SAN BRUNO, California; CITY OF
SANTA MONICA, California; CITY OF
SUGARLAND, Texas; LEAGUE OF
NEBRASKA MUNICIPALITIES;
NATIONAL ASSOCIATION OF
TELECOMMUNICATIONS OFFICERS
AND ADVISORS; CITY OF
BAKERSFIELD, California; CITY OF
FRESNO, California; CITY OF
RANCHO PALOS VERDES, California;
CITY OF COCONUT CREEK, Florida;
CITY OF LACEY, Washington; CITY
OF OLYMPIA, Washington; CITY OF
TUMWATER, Washington; TOWN OF
YARROW POINT, Washington;
THURSTON COUNTY, Washington;
COLORADO COMMUNICATIONS AND
UTILITY ALLIANCE; RAINIER
COMMUNICATIONS COMMISSION;
CITY AND COUNTY OF SAN
FRANCISCO, California; COUNTY OF
MARIN, California; CONTRA COSTA
COUNTY, California; TOWN OF

CITY OF PORTLAND V. UNITED STATES

CORTE MADERA, California; CITY OF WESTMINSTER, Maryland,

Intervenors.

CITY OF EUGENE, Oregon; CITY OF HUNTSVILLE, Alabama; CITY OF BOWIE, Maryland,

Petitioners,

v.

FEDERAL COMMUNICATIONS COMMISSION; UNITED STATES OF AMERICA,

Respondents,

No. 19-70344

FCC Nos.
18-133
83-FR-51867

OPINION

CITY OF ALBUQUERQUE, New Mexico; NATIONAL LEAGUE OF CITIES; CITY OF BROOKHAVEN, Georgia; CITY OF BALTIMORE, Maryland; CITY OF DUBUQUE, Iowa; TOWN OF OCEAN CITY, Maryland; CITY OF EMERYVILLE, California; MICHIGAN MUNICIPAL LEAGUE; TOWN OF HILLSBOROUGH, California; CITY OF LA VISTA, Nebraska; CITY OF MEDINA, Washington; CITY OF PAPILLION, Nebraska; CITY OF PLANO, Texas; CITY OF ROCKVILLE, Maryland; CITY

OF SAN BRUNO, California; CITY OF SANTA MONICA, California; CITY OF SUGARLAND, Texas; LEAGUE OF NEBRASKA MUNICIPALITIES; NATIONAL ASSOCIATION OF TELECOMMUNICATIONS OFFICERS AND ADVISORS; CITY OF BAKERSFIELD, California; CITY OF FRESNO, California; CITY OF RANCHO PALOS VERDES, California; CITY OF COCONUT CREEK, FLORIDA; CITY OF LACEY, Washington; CITY OF OLYMPIA, Washington; CITY OF TUMWATER, Washington; TOWN OF YARROW POINT, Washington; THURSTON COUNTY, Washington; COLORADO COMMUNICATIONS AND UTILITY ALLIANCE; RAINIER COMMUNICATIONS COMMISSION; CITY AND COUNTY OF SAN FRANCISCO, California; COUNTY OF MARIN, California; CONTRA COSTA COUNTY, California; TOWN OF CORTE MADERA, California; CITY OF WESTMINSTER, Maryland,

Intervenors.

CITY OF PORTLAND V. UNITED STATES 19

On Petitions for Review of Orders of the
Federal Communications Commission

Argued and Submitted February 10, 2020
Pasadena, California

Filed August 12, 2020

Before: Mary M. Schroeder, Jay S. Bybee, and
Daniel A. Bress, Circuit Judges.

Opinion by Judge Schroeder;
Partial Dissent by Judge Bress

SUMMARY*

Federal Communications Commission

The panel granted in part, and denied in part, petitions for review of three orders of the Federal Communications Commission (“FCC”) concerning the newest generation of wireless broadband technology known as “5G” that requires the installation of thousands of “small cell” wireless facilities.

Petitioners seeking review of the FCC orders are numerous local governments, public and private power utilities, and wireless service providers. The orders were promulgated under the authority of the Telecommunications Act of 1996 (the “Act”). The orders, issued in 2018, are

* This summary constitutes no part of the opinion of the court. It has been prepared by court staff for the convenience of the reader.

known as the Small Cell Order, the Moratoria Order, and the One Touch Make-Ready Order. The first two orders spelled out the limits on local governments' authority to regulate telecommunications providers. The third order was intended to prevent owners and operators of utility poles from discriminatorily denying or delaying 5G and broadband service providers access to the poles.

The panel held that, given the deference owed to the agency in interpreting and enforcing the Act, the Small Cell and Moratoria Orders were, with the exception of one provision, in accord with the congressional directive in the Act, and not otherwise arbitrary, capricious, or contrary to law. The exception was the Small Cell Order provision dealing with the authority of local governments in the area of aesthetic regulations. The panel held that to the extent that provision required small cell facilities to be treated in the same manner as other types of communications services, the regulation was contrary to the congressional directive that allowed different regulatory treatment among types of providers, so long as such treatment did not "unreasonably discriminate among providers of functionally equivalent services." 47 U.S.C. § 332(c)(7)(B)(i)(I). The panel also held that the FCC's requirement that all aesthetic criteria must be "objective" lacked a reasoned explanation. The panel rejected constitutional challenges under the Fifth and Tenth Amendments to both orders.

The panel upheld the One Touch Make-Ready Order. The panel concluded that the FCC reasonably interpreted Section 224 of the Act as a matter of law, and the Order was not otherwise arbitrary or capricious. The panel rejected petitioners' challenges to four secondary aspects of the Order: rules for overlashing, preexisting violations, self-help, and

rate reform. The panel held that the rules were an appropriate exercise of the FCC's regulatory authority under the Act.

The panel granted the petitions for review as to the FCC's requirement in the Small Cell Order that aesthetic regulations be "no more burdensome" than requirements applied to other infrastructure deployment, and the FCC's requirement that all local aesthetic regulations be "objective," vacated those portions of the rule, and remanded them to the FCC. The petition of Montgomery County was dismissed as moot. As to all other challenges, the panel denied the petitions for review.

Judge Bress joined the majority opinion except as to Part III.A.1, which upheld the FCC's decision to preempt any fees charged to wireless or telecommunications providers that exceed a locality's costs for hosting communications equipment. In Judge Bress's view, the FCC did not adequately explain how all above-cost fees amounted to an "effective prohibition" on telecommunications or wireless service under 47 U.S.C. §§ 253(a) and 332(c)(7)(B)(i)(I). Judge Bress would vacate this prohibition and remand.

COUNSEL*Petitioners/Intervenors*

Joseph Van Eaton (argued) and John Gasparini, Best Best & Krieger LLP, Washington, D.C.; Gail A. Karish, Best Best & Krieger LLP, Los Angeles, California; Michael J. Watza, Kitch Drutchas Wagner Valitutti & Sherbrook, Detroit, Michigan; for Petitioners/Intervenors Cities of San Jose, Arcadia, Bellevue, Burien, Burlingame, Culver City, Gig Harbor, Issaquah, Kirkland, Las Vegas, Los Angeles, Monterey, Ontario, Piedmont, Portland, San Jacinto, Shafter, Yuma, Albuquerque, Brookhaven, Baltimore, Dubuque, Emeryville, La Vista, Medina, Papillion, Plano, Rockville, San Bruno, Santa Monica, Sugarland, Austin, Ann Arbor, Atlanta, Boston, Chicago, College Park, Dallas, Gaithersburg, Lincoln, Myrtle Beach, Omaha, Philadelphia, Rye, Scarsdale, Seat Pleasant, and Takoma Park; Los Angeles, Anne Arundel, Clark, Howard, and Montgomery Counties; Towns of Fairfax, Ocean City, and Hillsborough; Townships of Meridian and Bloomfield, Michigan Townships Association; District of Columbia; Michigan Coalition to Protect Public Rights-of-Way, National League of Cities, Michigan Municipal League, League of Nebraska Municipalities, and Texas Coalition of Cities for Utility Issues.

Sean A. Stokes (argued) and James Baller, Baller Stokes & Lide PC, Washington, D.C., for Petitioner American Public Power Association.

Eric P. Gotting (argued), Keller and Heckman LLP, Washington, D.C., for Petitioners/Intervenors Montgomery County, Maryland; and International Municipal Lawyers

Association; International City/County Management Association.

Eric B. Langley (argued) and Robin F. Bromberg, Langley & Bromberg LLC, Birmingham, Alabama, for Petitioners American Electric Power Service Corporation, Duke Energy Corporation, Entergy Corporation, Oncor Electric Delivery Company, Southern Company, and Tampa Electric Company.

Joshua S. Turner (argued), Sara M. Baxenburg, and Boyd Garriott, Wiley Rein LLP, Washington, D.C.; Thomas Power, Senior Vice President and General Counsel, CTIA - The Wireless Association, Washington, D.C.; for Intervenor CTIA - The Wireless Association.

Claire J. Evans (argued) and Christopher S. Huther, Wiley Rein LLP, Washington, D.C., for Intervenor US Telecom—The Broadband Association.

Kenneth S. Fellman and Gabrielle A. Daley, Kissinger & Fellman PC, Denver, Colorado; Robert C. May III and Michael D. Johnston, Telecom Law Firm PC, San Diego, California; for Petitioners/Intervenors Cities of Bakersfield, Coconut Creek, Fresno, Lacey, Olympia, Rancho Palos Verdes, Seattle, Tacoma, Tumwater; Town of Yarrow Point; King and Thurston Counties; League of Oregon Cities, League of California Cities, League of Arizona Cities and Towns, Colorado Communications and Utility Alliance, and Rainier Communications Commission.

Brett H. Freedson, Charles A. Zdebski, and Robert J. Gastner, Eckert Seamans Cherin & Mellott LLC, Washington, D.C., for Petitioners CenterPoint Energy Houston Electric and Virginia Electric and Power Company.

David D. Rines and Kevin M. Cookler, Lerman Senter PLLC, Washington, D.C., for Petitioner Xcel Energy Services.

Christopher J. Wright and E. Austin Bonner, Harris Wiltshire & Grannis LLP, Washington, D.C., for Petitioner/Intervenor Sprint Corporation.

Sean A. Lev and Frederick Gaston Hall, Kellogg Hansen Todd Figel & Frederick P.L.L.C., Washington, D.C., for Petitioner AT&T Services.

Henry Weissmann, Munger Tolles & Olson LLP, Los Angeles, California; Jonathan Meltzer, Munger Tolles & Olson LLP, Washington, D.C.; for Petitioner/Intervenor Verizon Communications.

Megan L. Brown and Jeremy J. Broggi, Wiley Rein LLP, Washington, D.C., for Petitioner Puerto Rico Telephone Company.

Tillman L. Lay and Jeffrey M. Bayne, Spiegel & McDiarmid LLP, Washington, D.C., Dennis J. Herrera, City Attorney; Theresa L. Mueller, Chief Energy and Telecommunications Deputy; William K. Sanders, Deputy City Attorney; Office of the City Attorney, San Francisco, California; for Petitioners/Intervenors Cities of Eugene, Huntsville, Bowie, Westminster; Town of Corte Madera; and Counties of San Francisco, Marin, and Contra Costa.

Michael E. Gates, City Attorney; Michael J. Vigliotta, Chief Assistant City Attorney; Office of the City Attorney, Huntington Beach, California; for Petitioner City of Huntington Beach.

Nancy L. Werner, General Counsel, Alexandria, Virginia, as and for Intervenor National Association of Telecommunications Officers and Advisors.

Zachary W. Carter, Corporation Counsel; Richard Dearing, Claude S. Platton, and Elina Druker, Attorneys; Office of Corporation Counsel, New York, New York; for Intervenor City of New York.

Amanda Kellar and Charles W. Thompson Jr., Rockville, Maryland; for Intervenor International Municipal Lawyers Association and International City/County Management Association.

Jennifer P. Bagg, Harris Wiltshire & Grannis LLP, Washington, D.C., for Intervenor Competitive Carriers Association.

Thomas Scott Thompson and Patrick Curran, Davis Wright Tremaine LLP, Washington, D.C.; for Intervenor Wireless Infrastructure Association.

Respondents

Sarah E. Citrin (argued), Scott M. Noveck (argued), and James M. Carr (argued), Counsel; Richard K. Welch, Deputy Associate General Counsel; Jacob M. Lewis, Associate General Counsel; Thomas M. Johnson Jr., General Counsel; Federal Communications Commission, Washington, D.C.; Robert B. Nicholson, Adam D. Chandler and Patrick M. Kuhlmann, Attorneys; Michael F. Murray, Deputy Assistant Attorney General; Andrew C. Finch, Principal Deputy Assistant Attorney General; Makan Delrahim, Assistant Attorney General; United States Department of Justice,

Washington, D.C.; for Respondents United States of America and Federal Communications Commission.

Amici Curiae

James E. Moore and Tim R. Shattuck, Woods Fuller Shultz & Smith P.C., Sioux Falls, South Dakota, for Amicus Curiae Missouri Basin Municipal Power Agency.

Ellen F. Rosenblum, Attorney General; Benjamin Gutman, Solicitor General; Rolf C. Moan, Senior Assistant Attorney General; Office of the Attorney General, Salem, Oregon; for Amicus Curiae State of Oregon.

Thomas E. Montgomery, County Counsel; Jeffrey P. Michalowski, Senior Deputy; Office of County Counsel, San Diego, California; for Amicus Curiae County of San Diego.

Spencer Q. Parsons, Beery Elsner & Hammond LLP, Portland, Oregon, for Amici Curiae Nebraska Municipal Power Pool and Lincoln Electric System.

Gerit F. Hull, Jennings Strouss & Salmon PLC, Washington, D.C.; Lisa G. McAlister, SVP & General Counsel for Regulatory Affairs; American Municipal Power Inc., Columbus, Ohio; for Amicus Curiae American Municipal Power Inc.

Emily Fisher, Aryeh Fishman, and Amanda Aspatore, Edison Electric Institute, Washington, D.C.; Brett Kilbourne, Vice President Policy and General Counsel, Utilities Technology Council, Arlington, Virginia; Jeffrey L. Sheldon and Stephen J. Rosen, Levine Blaszak Block & Boothby LLP, Washington, D.C.; Brian O'Hara, Senior Director Regulatory

Issues, National Rural Electric Cooperative Association, Arlington, Virginia; for Amici Curiae Edison Electric Institute, Utilities Technology Council, and National Rural Electric Cooperative Association.

Matthew A. Love, Van Ness Feldman LLP, Seattle, Washington, for Amicus Curiae Northwest Public Power Association.

Sblend A. Sblendorio, Mallory L. Homewood, and Cara Mae Acibo, Hoge Fenton Jones & Appel Inc., Pleasanton, California, for Amicus Curiae Berkshire-Litchfield Environmental Council.

Terry M. Jarrett, Healy Law Offices LLC, Jefferson City, Missouri, for Amici Curiae Iowa Association of Municipal Utilities Association, Missouri Association of Municipal Utilities, and Arkansas Municipal Power Association.

W. Scott Snyder, Ogden Murphy Wallace, Seattle, Washington, for Amicus Curiae Association of Washington Cities.

David A. Rosenfeld, Weinberg Roger & Rosenfeld, Alameda, California, for Amici Curiae Communications Workers of America, National Digital Inclusion Alliance, and Public Knowledge.

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Washington, D.C.; for Amici Curiae Northern California Power Agency; Municipal Electric Power Association of Virginia; Florida Municipal Electric Association, Inc.; City of Fort Meade; Fort Pierce Utilities Authority; City of Jacksonville Beach (Beaches Energy Services); Utility Board of the City of Key West, Florida (Keys Energy Services); Kissimmee Utility Authority; City of Lakeland (Lakeland Electric); City of Mount Dora; Utilities Commission, City of New Smyrna Beach; Orlando Utilities Commission; and City of Wauchula.

OPINION

SCHROEDER, Circuit Judge:

I. INTRODUCTION

These matters arise out of the wireless revolution that has taken place since 1996 when Congress passed amendments to the Telecommunications Act to support the then nascent technology. The revolution now represents the triumph of cellular technology over just about everything else in telecommunications services.

The newest generation of wireless broadband technology is known as “5G” and requires the installation of thousands of “small cell” wireless facilities. These facilities have become subject to a wide variety of local regulations. The Federal Communications Commission (FCC) in 2018 therefore promulgated orders relating to the installation and management of small cell facilities, including the manner in which local governments can regulate them. The principal orders we review here thus constitute the FCC’s contemporary response to these technological and regulatory developments. These orders were promulgated under the authority of a statute Congress enacted very early in the era of cellular communication, the Telecommunications Act of 1996, to encourage the expansion of wireless communications.

That expansion has been met with some resistance where 5G is concerned, however, particularly from local governments unhappy with the proliferation of cell towers and other 5G transmission facilities dotting our urban landscapes. Petitioners seeking review of the FCC orders

thus include numerous local governments, the lead Petitioner being the City of Portland, Oregon. Also unhappy with the expanded installation of 5G technology contemplated by the FCC's orders are public and private power utilities, whose utility poles are often used for wireless facility deployment. Here as well are wireless service providers, who largely support the FCC's orders, but argue the FCC should have gone even further in restricting the authority of state and local governments.

Before us are three FCC orders, issued in 2018, that deal with myriad issues arising from the application of a twentieth century statute to twenty-first century technology. The two orders we deal with first are known as the Small Cell Order and the Moratoria Order. *Accelerating Wireless Broadband Deployment by Removing Barriers to Infrastructure Inv.*, 33 FCC Rcd. 9088 (2018) [hereinafter *Small Cell Order*]; *Accelerating Wireless Broadband Deployment by Removing Barriers to Infrastructure Inv.*, 33 FCC Rcd. 7705, 7775–91 (2018) [hereinafter *Moratoria Order*]. The Orders spell out the limits on local governments' authority to regulate telecommunications providers.

The FCC's statutory authority for limiting local regulation on the deployment of this technology is contained in Sections 253(a) and 332(c)(7) of the Act and reflects congressional intent in 1996 to expand deployment of wireless services. Those provisions authorize the FCC to preempt any state and local requirements that "prohibit or have the effect of prohibiting" any entity from providing telecommunications services. *See* 47 U.S.C. § 253(a), (d).

Many of the issues before us concern whether challenged provisions constitute excessive federal regulation outside the

scope of that congressional preemption directive, as understood by our Circuit’s leading case interpreting the statute, *Sprint Telephony PCS, L.P. v. County of San Diego*, 543 F.3d 571 (9th Cir. 2008) (en banc). We conclude that, given the deference owed to the agency in interpreting and enforcing this important legislation, the Small Cell and Moratoria Orders are, with the exception of one provision, in accord with the congressional directive in the Act, and not otherwise arbitrary, capricious, or contrary to law. *See* 5 U.S.C. § 706(2)(A).

The exception is the Small Cell Order provision dealing with the authority of local governments in the area of aesthetic regulations. We hold that to the extent that provision requires small cell facilities to be treated in the same manner as other types of communications services, the regulation is contrary to the congressional directive that allows different regulatory treatment among types of providers, so long as such treatment does not “unreasonably discriminate among providers of functionally equivalent services.” 47 U.S.C § 332(c)(7)(B)(i)(I). We also hold that the FCC’s requirement that all aesthetic criteria must be “objective” lacks a reasoned explanation.

The third FCC order before us is intended to prevent owners and operators of utility poles from discriminatorily denying or delaying 5G and broadband service providers access to the poles. *Accelerating Wireless Broadband Deployment by Removing Barriers to Infrastructure Inv.*, 33 FCC Rcd. 7705, 7705–91 (2018). Known as the “One-Touch Make-Ready Order,” it was issued pursuant to the Pole Attachment Act originally passed in 1978 and expanded in the wake of the Telecommunications Act of 1996. 47 U.S.C. § 224. Section 224 of that Act allows utilities to deny access

to pole attachers under some circumstances. Several utilities object to discrete aspects of the One-Touch Make-Ready Order. We uphold the Order, concluding that the FCC reasonably interpreted Section 224 as a matter of law, and the Order is not otherwise arbitrary or capricious.

II. STATUTORY AND INTERPRETIVE FRAMEWORK AND BACKGROUND

What we know as 5G technology is so named because it is the fifth generation of cellular wireless technology. It is seen as transformational because it provides increased bandwidth, allows more devices to be connected at the same time, and is so fast that connected devices receive near instantaneous responses from servers.

Although 5G transmits data at exceptionally fast speeds, it does so over relatively short distances. For this reason, wireless providers must use smaller power-base stations in more locations, as opposed to the fewer, more powerful base stations used for 4G data transmission. These smaller base stations, known as “small cells,” are required in such numbers that 5G technology is currently being deployed on a city-by-city basis. *See generally* Brian X. Chen, *What You Need to Know About 5G in 2020*, N.Y. Times (Jan. 8, 2020), <https://www.nytimes.com/2020/01/08/technology/personalt ech/5g-mobile-network.html?searchResultPosition=1>; Clare Duffy, *What Is 5G? Your Questions Answered*, CNN Business (Mar. 6, 2020), <https://www.cnn.com/interactive/2020/03/business/what-is-5g/index.html>; Sascha Segan, *What Is 5G?*, PCMag (Apr. 6, 2020), <https://www.pcmag.com/news/what-is-5g>. The prospective proliferation of “small cell” structures throughout our cities, coupled with the inevitable efforts of local governments to regulate their looks and

location, gave rise to the FCC’s Small Cell and Moratoria Orders—with which local governments are not entirely happy and which were issued under the general provisions of a decades-old statute.

The heart of these proceedings therefore lies in the early efforts of Congress, and now the FCC, to balance the respective roles of the federal government and local agencies in regulating telecommunications services for a rapidly changing technological world. A key statute in these proceedings is Section 253 of the Act. Entitled “Removal of Barriers to Entry,” it reflects Congress’s intent to encourage expansion of telecommunication service. Section 253(a) provides that “[n]o state or local statute or regulation . . . may prohibit or have the effect of prohibiting . . . telecommunications service.” 47 U.S.C. § 253(a). At the same time Section 253(c) provides that state or local governments can manage public rights-of-way and require reasonable compensation for their use. 47 U.S.C. § 253(c).

In dealing with mobile services, Section 332(c)(7) similarly preserves local zoning authority while recognizing some specific limitations on traditional authority to regulate wireless facilities. 47 U.S.C. § 332(c)(7); *see City of Rancho Palos Verdes v. Abrams*, 544 U.S. 113, 115 (2005) (explaining that section 332(c)(7) “imposes specific limitations on the traditional authority of state and local governments to regulate the location, construction, and modification of . . . facilities”). Section 332(c)(7) also contains a limitation on local authority nearly identical to Section 253(a). *See* 47 U.S.C. § 332(c)(7)(B)(i)(II) (“The regulation of the placement, construction, and modification of personal wireless service facilities by any State or local government . . . shall not prohibit or have the effect of

prohibiting the provision of personal wireless services.”). The other major limitation on local authority relates to ensuring fair treatment of different services. *See* 47 U.S.C. § 332(c)(7)(B)(i)(I). Under that limitation, local governments “shall not unreasonably discriminate among providers of functionally equivalent services.” *Id.* Section 332(c)(7) further requires that state or local governments act on requests for placement of personal wireless service facilities “within a reasonable period of time.” 47 U.S.C. § 332(c)(7)(B)(ii). We deal with issues pertaining to all of these provisions in the challenges to the Small Cell and Moratoria Orders.

In the One-Touch Make-Ready Order, the FCC was concerned with facilitating attachment of new cellular facilities to existing utility poles. The FCC’s authority to regulate pole attachments is found in Section 224 of the Act. That section provides that the FCC “shall regulate the rates, terms, and conditions” imposed upon pole attachments by utilities to ensure that such rates are “just and reasonable,” 47 U.S.C. § 224(b)(1), but expressly exempts entities “owned by the Federal Government or any State” from its definition of “utility,” *id.* § 224(a)(1). Section 224 also requires utilities to allow service providers “nondiscriminatory access” to its poles, *id.* § 224(f)(1), permitting utilities to deny access “on a non-discriminatory basis where there is insufficient capacity and for reasons of safety, reliability and generally applicable engineering purposes,” *id.* § 224(f)(2).

In their petitions, private utilities contend several provisions of the One-Touch Make-Ready Order violate Section 224 or are otherwise arbitrary or capricious in restricting a utility’s ability to deny access to attachers. We uphold this Order in all respects.

As relevant to this litigation, the most disputed provision of the Act has been Section 253(a). The provision says that “[n]o State or local statute or regulation, or other State or local legal requirement, may prohibit or have the effect of prohibiting the ability of any entity to provide any interstate or intrastate telecommunications service.” 47 U.S.C. § 253(a). Soon after the Act’s passage, the FCC decided *California Payphone Association*, concerning the location of the now antiquated, but formerly ubiquitous, payphone technology. 12 FCC Rcd. 14,191 (1997). The FCC considered a local regulation that prohibited the installation of payphones on private property outdoors, and held it was not an actual or effective prohibition of services, because phones could still be installed indoors on public or private property, and outdoors on public property. *Id.* at 14,210. The FCC therefore held the requirement did not “materially inhibit[]” payphone service. *Id.* at 14,210.

This court’s leading case interpreting Section 253 is our en banc decision in *Sprint*, 543 F.3d 571. We there straightened out an errant panel decision that had been concerned with the phrase “no State or local statute or regulation . . . may prohibit . . .” in Section 253. That decision read the phrase to mean that Section 253 preempted any state or local regulation that “might possibly” have the effect of prohibiting service. *Id.* at 578. We held in *Sprint* that more than “the mere possibility” of prohibition was required to trigger preemption. *Id.* There must be an actual effect, and we recognized the continuing validity of the material inhibition test from *California Payphone*. *See id.* (“[W]e note that our interpretation is consistent with the FCC’s.”).

Many of the issues we must decide here involve contentions by Petitioners that various provisions of the Small Cell and Moratoria Orders limit state and local regulatory authority to a greater degree than that contemplated in the Act, as interpreted by *California Payphone* and *Sprint*. The application of the FCC’s “material inhibition” standard thus comes into play when we consider a number of the challenged provisions.

As a threshold issue, Local Government Petitioners argue that the FCC must demonstrate that an “actual prohibition” of services is occurring before preempting any municipal regulations, and that anything less than that showing is contrary to Section 253(a) and our decision in *Sprint*. We must reject this argument. The FCC’s application of its standard in the Small Cell and Moratoria Orders is consistent with *Sprint*, which endorsed the material inhibition standard as a method of determining whether there has been an effective prohibition. The FCC here made factual findings, on the basis of the record before it, that certain municipal practices are materially inhibiting the deployment of 5G services. Nothing more is required of the FCC under *Sprint*.

Local Government Petitioners raise a corollary general objection to the Small Cell and Moratoria Orders, contending that the FCC, without a reasoned explanation, has departed from its prior approach in *California Payphone*, and has made it much easier to show an effective prohibition. *California Payphone*’s material inhibition standard remains controlling, however. The FCC has explained that it applies a little differently in the context of 5G, because state and local regulation, particularly with respect to fees and aesthetics, is more likely to have a prohibitory effect on 5G technology than it does on older technology. The reason is that when

compared with previous generations of wireless technology, 5G is different in that it requires rapid, widespread deployment of more facilities. *See, e.g., Small Cell Order* ¶ 53 (explaining that “even fees that might seem small in isolation have material and prohibitive effects on deployment, particularly when considered in the aggregate given the nature and volume of anticipated Small Wireless Facility deployment” (footnote omitted)). The differences in the FCC’s new approach are therefore reasonably explained by the differences in 5G technology.

We therefore turn to Petitioners’ challenges to specific provisions of the Orders. We deal with the Small Cell and Moratoria Orders together. Both Orders relate to the ways state and local governments can permissibly regulate small cell facilities.

III. SMALL CELL AND MORATORIA ORDERS

The FCC initiated proceedings leading to the Small Cell and Moratoria Orders in response to complaints from wireless service providers. They reported that a variety of state and local regulations and practices were delaying and inhibiting small cell deployment nationwide in violation of Section 253. Those state and local governments now seek review of the Orders. We here summarize the challenged provisions of each Order.

The FCC issued the Moratoria Order in August 2018, and the Small Cell Order the following month. Two principal types of state and local regulation the agency considered relate to fees and aesthetic requirements. The FCC concluded such requirements frequently materially inhibit 5G deployment. The FCC found that when state and local

governments charge excessive fees for wireless facility applications, the cumulative impact of such charges amounts to an effective prohibition of deployment in other parts of the country. The FCC therefore limited the fees that a state or local government can assess, above a safe harbor amount, to the government’s approximate costs. Specifically, the fee is permissible only if it is a “reasonable approximation of the state or local government’s costs” of processing applications and managing the rights-of-way. *Small Cell Order* ¶ 50.

With respect to local aesthetic requirements, the FCC concluded such regulations were materially inhibiting small cell deployment within the meaning of the *California Payphone* standard. A key provision of the Small Cell Order sets out the applicable criteria: aesthetic restrictions are preempted unless they are (1) reasonable, (2) no more burdensome than requirements placed on other facilities, and (3) objective and published in advance. *Id.* ¶ 86. To qualify as a “reasonable” aesthetic requirement, an ordinance must be both “technically feasible and reasonably directed to avoiding or remedying the intangible public harm of unsightly or out-of-character deployments.” *Id.* ¶ 87.

Another important provision of the Small Cell Order modified the rules for when local jurisdictions have to act on wireless permitting requests, the so-called “shot clock” rules. Nearly a decade earlier, the FCC adopted the first shot clock rules, requiring zoning authorities to decide applications for wireless facility deployment on existing structures within ninety days, and all other applications for zoning permits within 150 days. *Petition for Declaratory Ruling*, 24 FCC Rcd. 13,994 (2009) [hereinafter *2009 Order*]; see *City of Arlington v. FCC*, 668 F.3d 229, 235–36 (5th Cir. 2012), *aff’d*, 569 U.S. 290 (2013). Under the 2009 Order, when a

local zoning authority exceeded a shot clock, it was presumed that the municipality violated the statutory requirement to respond within a reasonable time. *City of Arlington*, 668 F.3d at 236. When a local zoning authority failed to act within the proscribed time, the permit applicant could then file a lawsuit seeking a declaration that the city’s delay was unreasonable, and the city would have the opportunity to rebut the presumed statutory violation. *2009 Order* ¶¶ 37–38.

The 2018 Small Cell Order broadens the application of these shot clocks to include all telecommunications permits, not just zoning permits, and it shortens the shot clocks. State and local governments now have sixty days to decide applications for installations on existing infrastructure, and ninety days for all other applications. *Small Cell Order* ¶¶ 104–05, ¶ 132, ¶ 136. The Order does not add enforcement mechanisms. If a state or local government misses a permitting deadline, the applicant still must seek an injunction.

In the Moratoria Order, the FCC found that municipal actions that halt 5G deployment, deemed “moratoria,” violate Section 253(a) of the Act when they effectively prohibit the deployment of 5G technology. The FCC recognized two general moratoria categories: express and de facto. As with the Small Cell Order, the Moratoria Order does not specifically preempt or invalidate any particular state or local requirement. *See Moratoria Order* ¶ 150. (“[W]e do not reach specific determinations on the numerous examples discussed by parties in our record . . .”). It lays out the applicable standards.

A. Challenges to the Small Cell Order

Following the publication of the Small Cell Order, Local Government and Public Power Petitioners filed these petitions for review, asserting a number of legal challenges. We evaluate these challenges under the Administrative Procedure Act by examining whether “an agency’s decreed result [is] within the scope of its lawful authority,” and whether “the process by which it reaches [a given] result [is] logical and rational.” *Michigan v. EPA*, 135 S. Ct. 2699, 2706 (2015) (internal quotation marks omitted); *see* 5 U.S.C. § 706(2)(A), (C). Where terms of the Telecommunications Act are ambiguous, we defer to the FCC’s reasonable interpretations. *City of Arlington*, 569 U.S. at 296–97; *see Chevron v. Nat. Res. Def. Council*, 467 U.S. 837 (1984). And where the FCC is departing from prior policy, we look to see if it acknowledged that it was changing positions, and gave “good reasons for the new policy.” *FCC v. Fox Television Stations, Inc.*, 556 U.S. 502, 515 (2009).

To the extent that Petitioners challenge factual findings, we review them for substantial evidence, that is, evidence “a reasonable mind might accept as adequate to support a conclusion.” *Biestek v. Berryhill*, 139 S. Ct. 1148, 1154 (2019) (internal quotation marks omitted). “[W]hatever the meaning of substantial in other contexts, the threshold for such evidentiary sufficiency is not high.” *Id.* (internal quotation marks omitted).

The Small Cell Order covers three major subjects and sets out the standards by which local regulations will be judged in determining whether they are preempted. Local Government Petitioners are not happy with any of them. The subjects are

fees, aesthetics, and the time for approving permit applications (shot clocks). We deal with each of them in turn.

1. Fees

State and local governments generally charge a wireless service provider fees to deploy facilities in their jurisdictions. These fees include one-time fees for new wireless facility deployment, as well as recurring annual fees on existing facilities in the public rights-of-way. The FCC concluded in the Small Cell Order that some of these fees were so excessive that they were effectively prohibiting the nationwide deployment of 5G technology and were therefore preempted. The Order places conditions on fees above a certain level to avoid preemption: fees must be: “(1) a reasonable approximation of the state or local government’s costs, (2) [with] only objectively reasonable costs . . . factored into those fees, and (3) . . . no higher than the fees charged to similarly-situated competitors in similar situations.” *Small Cell Order* ¶ 50 (footnote omitted).

The Small Cell Order does not require a cost basis for all fees to avoid preemption. There is a safe harbor. Fees are presumptively lawful if, for each wireless facility, application fees are less than \$500, and recurring fees are less than \$270 per year. *Id.* ¶ 79. If fees exceed those levels, they are not automatically preempted, but can be justified. Localities may charge fees above these levels where they can demonstrate that their actual costs exceed the presumptive levels. *Id.* ¶ 80 & n.234.

The FCC offers two principal rationales for limiting fees above the safe harbor to costs. When local governments charge fees in excess of their costs, they take funds of

wireless service providers that would otherwise be used for additional 5G deployment in other jurisdictions. Statements in the record from wireless service providers, and an empirical study, are cited to support the conclusion that limiting fees will lead to additional, faster deployment of 5G technology throughout the country. *See Small Cell Order* ¶¶ 61–64. The FCC explained that high fees also reduce the availability of service in the jurisdiction charging the fee. *Id.* ¶ 53. The FCC points to numerous, geographically diverse cities, where excessive fees are delaying deployment of 5G services. In one example, deployment had to be completely halted when a city tried to charge a one-time fee of \$20,000 per small cell, with an additional recurring annual fee of \$6000.

Local Government Petitioners challenge the fee limitations on a number of grounds. Their primary argument is that there is no rational connection between whether a particular fee is higher than that particular city’s costs, and whether that fee is prohibiting service.

The FCC did not base its fee structure on a determination that there was a relationship between particular cities’ fees and prohibition of services. The FCC instead found that above-cost fees, in the aggregate, were having a prohibitive effect on a national basis. *See id.* ¶ 53 (explaining that “even fees that might seem small in isolation have material and prohibitive effects on deployment, particularly when considered in the aggregate given the nature and volume of anticipated Small Wireless Facility deployment” (footnote omitted)).

The FCC found there was no readily-available alternative. *See id.* ¶ 65 n.199 (explaining that “the record does not reveal

an alternative, administrable approach to evaluating fees without a cost-based focus”). Administrability is important. In *Mayo Foundation for Medical Education & Research v. United States*, 562 U.S. 44, 58–59 (2011), the Supreme Court explained that an agency’s rule “easily” satisfies *Chevron*’s step two, reasonable interpretation requirement, when the agency concluded that its new approach would “improve administrability.” As the FCC explained here, its cost-based standard would prevent excessive fees and the effective prohibition of 5G services in many areas across the country.

Local Government Petitioners are implicitly suggesting an alternative approach that would require an examination of the prohibitive effect of fees in each of the 89,000 state and local governments under the FCC’s jurisdiction, a nearly impossible administrative undertaking. Local Government Petitioners do not contend that this is required by statute, nor do they offer any other workable standard. The FCC here made the requisite “rational connection between the facts found and the choice made.” *Burlington Truck Lines v. United States*, 371 U.S. 156, 168 (1962).

Our colleague’s partial dissent offers one legal objection to the fee regulation. The dissent quotes language from our decision in *Qwest Communications Inc. v. City of Berkeley*, 433 F.3d 1253, 1257 (9th Cir. 2006), *overruled on other grounds by Sprint Telephony*, 543 F.3d at 578, to suggest that the FCC’s cost based fee regulation should be vacated because it contravenes our precedent. In *Qwest*, however, we considered a challenge to a particular city’s fee that was not based on costs. On the basis of then-binding authority we held that city’s fee was preempted, but cautioned that we were not holding that “all non-cost based fees are automatically preempted.” *Id.* at 1257. Instead we said that

in reviewing a particular city's ordinance "courts must consider substance of the particular regulation at issue." *Id.*

The *Qwest* language has no relevance in this case where we review a nationwide administrative regulation the FCC has adopted, after careful study and notice and comment, that invokes Section 253(a) to preempt only those fees above the safe harbor that exceed municipalities' costs. There has been no "automatic preemption" of "all non-cost based fees."

Local Government Petitioners also attack the FCC's key factual finding, that high fees were inhibiting deployment both within and outside the jurisdictions charging the fees. Yet, the FCC had statements from wireless service providers, which explained that the providers have been unable to deploy small cells in many cities because both original application and annually recurring fees were excessive. For example, AT&T reported it has been unable to deploy in Portland due to recurring annual fees ranging from \$3500 to \$7500 per node.

The record also supports the FCC's factual conclusion that high fees in one jurisdiction can prevent deployment in other jurisdictions. In addition to relying on firsthand reports of service providers, the FCC looked to an academic study, known as the Corning Study. A group of economists there estimated that limiting 5G fees could result in carriers reinvesting an additional \$2.4 billion in areas "previously not economically viable." The FCC reasonably relied upon this study to support its conclusion that a nationwide reduction in fees in "must-serve," heavily-populated areas, would result in significant additional deployment of 5G technology in other less lucrative areas of the country. The FCC therefore has easily met the standard of offering "more than a mere

scintilla” of evidence to support its conclusions regarding the prohibitive effect of above-cost fees. *See Biestek*, 139 S. Ct. at 1154.

We also conclude that the FCC’s fee limitation does not violate Section 253(c) of the Act, which ensures that cities receive “fair and reasonable” compensation for use of their rights-of-way. The FCC explained that the calculation of actual, direct costs is a well-accepted method of determining reasonable compensation, and further, that a standard lacking a cost anchor would “have left providers entirely at the mercy of effectively unconstrained requirements of state or local governments.” *Small Cell Order* ¶ 74. The statute requires that compensation be “fair and reasonable;” this does not mean that state and local governments should be permitted to make a profit by charging fees above costs. 47 U.S.C. § 253(c). The FCC’s approach to fees is consistent with the language and intent of Section 253(c) and is reasonably explained.

Moreover, the FCC did not require local jurisdictions to justify all fees with costs. The FCC adopted presumptively permissible fee levels. In setting those levels, the FCC looked to a range of sources, including state laws that limit fees. *See Small Cell Order* ¶ 78, ¶ 79 n.233. Local Government Petitioners argue that the FCC was in effect, setting rates, and that it was arbitrary and capricious to do so, when it could reference only a few state laws. The FCC was not setting rates, however; it was determining a level at which fees would be so clearly reasonable that justification was not necessary, and litigation could be avoided. The presumptive levels are not arbitrary and capricious.

2. *Aesthetics*

Local governments have always been concerned about where utilities’ infrastructure is placed and what it looks like. When Congress enacted the 1996 Telecommunications Act, it wanted to ensure state and local governments grant fair access to new technologies, and not prefer incumbent service providers over new entrants. Congress recognized that state and local governments could effect such preferential treatment through a wide array of regulations, including regulations on aesthetics. An important provision to prevent this is Section 332(c)(7)(B)(i)(I). It requires that “[t]he regulation of . . . personal wireless service facilities by any State or local government . . . shall not unreasonably discriminate among providers of functionally equivalent services.” 47 U.S.C. § 332(c)(7)(B)(i)(I). The legislators who drafted this limitation on local regulation sought to ensure that state and local governments did not “unreasonably favor one competitor over another” in exercising their regulatory authority over facility deployments—including authority to regulate aesthetics. S. Rep. No. 104-230, at 209 (1996) (Conf. Rep.).

Because it recognized that state and local governments often have legitimate aesthetic reasons for accepting some deployments and rejecting others, Congress preempted only regulations that “unreasonably discriminate” among providers. 47 U.S.C. § 332(c)(7)(B)(i)(I). Because there were differences among providers, those who crafted Section 332(c) sought to preserve state and local governments’ “flexibility to treat facilities that create different . . . aesthetic . . . concerns differently, . . . even if those facilities provide functionally equivalent services.” S. Rep. No. 104-230, at 209 (1996) (Conf. Rep.).

The provisions of the Small Cell Order dealing with aesthetics are among the most problematic. The Order says, “aesthetics requirements are not preempted if they are (1) reasonable, (2) no more burdensome than those applied to other types of infrastructure deployments, and (3) objective and published in advance.” *Small Cell Order* ¶ 86.

In the Small Cell Order, the FCC does not use Section 332’s unreasonable discrimination standard in describing the limits on local regulation of small cell infrastructure. The Small Cell Order says instead that small cell aesthetic requirements must be “no more burdensome” than those imposed on other providers. *Id.* For example, the FCC explained that its standard would prohibit a requirement that small cell carriers “paint small cell cabinets a particular color when like requirements were not imposed on similar equipment placed in the [right-of-way] by electric incumbents, competitive telephone companies, or cable companies.” *Id.* ¶ 84 n.241.

Local Government Petitioners point out that the FCC’s standard amounts to requiring similar treatment and does not take into account the differences among technologies. The FCC’s own justification for its provision bears this out. The FCC asserts that any application of different aesthetic standards to 5G small cells necessarily “evidences that the requirements are not, in fact, reasonable and directed at remedying the impact of the wireless infrastructure deployment.” *Id.* ¶ 87. Thus, in the FCC’s view, when a state or local government imposes different aesthetic requirements on 5G technology, those requirements are pretextual, unrelated to legitimate aesthetic goals, and must be preempted.

Yet the statute expressly permits some difference in the treatment of different providers, so long as the treatment is reasonable. Indeed, we have previously recognized that Section 332(c)(7)(B)(i)(I) of the Telecommunications Act “explicitly contemplates that some discrimination among providers . . . is allowed.” *MetroPCS, Inc. v. City & Cty. of S.F.*, 400 F.3d 715, 727 (9th Cir. 2005) (internal quotation marks omitted), *abrogated on other grounds by T-Mobile S., LLC v. City of Roswell*, 574 U.S. 293 (2015). We explained that to establish unreasonable discrimination, providers “must show that they have been treated differently from other providers whose facilities are *similarly situated* in terms of the *structure, placement or cumulative impact* as the facilities in question.” *Id.* (citation and internal quotation marks omitted). We explained that this “similarly-situated” standard is derived from the text of Section 332, and “strike[s] an appropriate balance between Congress’s twin goals of promoting robust competition and preserving local zoning authority.” *Id.* at 728.

The FCC’s regulation here departs from the carefully crafted balance found in Section 332 in at least two critical respects. Unlike Section 332, the regulation does not permit even reasonable regulatory distinctions among functionally equivalent, but physically different services. Under this Order, any local regulation of 5G technology that creates additional costs is necessarily preempted. The FCC’s limitation on local zoning authority differs from Section 332 in another respect. The Order requires the comparison of the challenged aesthetic regulation of 5G deployments to the regulation of any other infrastructure deployments, while the statute only requires a comparison with the regulation of functionally equivalent infrastructure deployments. *Small Cell Order* ¶ 87. The prohibition on local regulatory

authority in the regulation is in that respect broader than that contemplated by Congress.

The Supreme Court has told us that “an agency may not rewrite clear statutory terms” and that this is a “core administrative-law principle.” *Util. Air Regulatory Grp. v. EPA*, 573 U.S. 302, 328 (2014). The FCC has contravened this principle here by placing a limitation on local zoning authority that departs from the explicit directive of Congress in Section 332.

Congress prohibited unreasonable discrimination, but permitted state and local governments to differentiate in the regulation of functionally equivalent providers with very different physical infrastructure. Members of Congress, in writing Section 332, recognized that applying different standards for physically different infrastructure deployments may, in some situations, be a reasonable use of local zoning authority. *See* S. Rep. No. 104-230, at 208 (1996) (Conf. Rep.) (“For example, the conferees do not intend that if a state or local government grants a permit in a commercial district, it must also grant a permit for a competitor’s 50-foot tower in a residential district.”). Requirements imposed on 5G technology are not always preempted as unrelated to legitimate aesthetic concerns just because they are “more burdensome” than regulations imposed on functionally equivalent services. We therefore conclude that the requirement in Paragraph 86 of the Small Cell Order, that limitations on small cells be “no more burdensome” than those applied to other technologies, must be vacated.

The other problematic limitation in the Small Cell Order is that locally-imposed aesthetic requirements be “objective and published in advance.” *Small Cell Order* ¶ 86. The

Order defines “objective” to mean the local regulation “must incorporate clearly-defined and ascertainable standards, applied in a principled manner.” *Id.* ¶ 88.

The FCC explained that it adopted this requirement in response to wireless service providers’ complaints that they were being kept in the dark about what requirements they had to meet, and that those requirements were often so subjective that they had no readily ascertainable meaning. As the Order explained, the providers complained that they are unable to “design or implement rational plans for deploying Small Wireless Facilities if they cannot predict in advance what aesthetic requirements they will be obligated to satisfy to obtain permission to deploy a facility at any given site.” *Id.* The FCC responded by requiring aesthetic regulations to be “objective and published in advance.” *Id.* ¶ 86. The condition of advance publication is not seriously challenged, but the requirement that all local aesthetic regulation be “objective” gives rise to serious concerns.

Although the FCC was apparently responding to complaints of vague standards, Local Government Petitioners point out that the provision the FCC adopted bars any regulation other than one related to color, size, shape, and placement. It targets for preemption regulations focused on legitimate local objectives, such as ordinances requiring installations to conform to the character of the neighborhood. We do not see how all such regulations, designed like traditional zoning regulations to preserve characteristics of particular neighborhoods, materially inhibit, materially limit, or effectively prohibit the deployment of 5G technology.

We have previously expressed considerable doubt about the view that “malleable and open-ended,” aesthetic criteria

per se prohibit service. *Sprint*, 543 F.3d at 580. In *Sprint*, we recognized that “[a] certain level of discretion is involved in evaluating any application for a zoning permit,” and that while “[i]t is certainly true that a zoning board *could* exercise its discretion to effectively prohibit” service, “it is equally true (and more likely) that a zoning board would exercise its discretion only to balance the competing goals of an ordinance,” including “valid public goals such as safety and aesthetics.” *Id.*

The FCC’s position that all subjective aesthetic regulations constitute a *per se* material inhibition must therefore be viewed with considerable skepticism. Its justification for this limitation is that all subjective aesthetic requirements “substantially increase providers’ costs without providing any public benefit or addressing any public harm.” *Small Cell Order* ¶ 88. This conclusion, that all subjective standards are without public benefit and address no public harm, is unexplained and unexplainable.

The FCC says that its objectivity requirement is “feasible” because some states have adopted laws that prevent cities from applying subjective aesthetic requirements. *See id.* nn.246–47. As the FCC itself recognizes in its brief, aesthetic regulation of small cells should be directed to preventing the “intangible public harm of unsightly or out-of-character deployments.” Such harm is, at least to some extent, necessarily subjective. The fact that certain states have prohibited municipalities from enacting subjective aesthetic standards does not demonstrate that such standards never serve a public purpose. We conclude that the FCC’s requirement that all aesthetic regulations be “objective” is arbitrary and capricious. At the very least, the agency must explain the harm that it is addressing, and the extent to which

it intends to limit regulations meant to serve traditional zoning objectives of preventing deployments that are unsightly or out of neighborhood character.

The only remaining argument of Local Government Petitioners with which we must deal is a challenge to the FCC’s requirement that aesthetic regulations be “reasonable.” Petitioners contend that it is unduly vague and overbroad. We read this requirement as the FCC does, however, and conclude that it should be upheld. The FCC explains that the reasonableness requirement results in preemption only if aesthetic regulations are not “technically feasible and reasonably directed” at remedying aesthetic harms. *Id.* ¶ 87. We recognized in *Sprint* that imposing an aesthetic requirement that is not technically feasible would constitute an effective prohibition of service under the Act. 543 F.3d at 580. The FCC’s justification for adopting this rule is therefore consistent with our case law, as well as congressional intent in enacting Sections 253 and 332, and is not unduly vague or overbroad.

In sum, the requirement that aesthetic regulations be “no more burdensome” than those imposed on other technologies is not consistent with the more lenient statutory standard that regulations not “unreasonably discriminate.” The requirement that local aesthetic regulations be “objective” is neither adequately defined nor its purpose adequately explained. On its face, it preempts too broadly. We therefore hold those provisions of Paragraph 86 of the Small Cell Order must be vacated.

3. *Shot Clocks*

Since 2009, the FCC has set time limits, known as shot clocks, for local authorities to act on applications to deploy wireless facilities. In the Small Cell Order, the FCC made two major changes from the shot clocks provisions in the 2009 Order. It expanded the application of shot clock timing requirements from zoning applications to include all permitting decisions. It shortened the shot clock time. State and local governments now have sixty days to decide applications for installation on existing infrastructure, and ninety days for all other applications. *Small Cell Order* ¶¶ 104–05, ¶ 132, ¶ 136. The previous shot clocks were ninety days and 150 days respectively. *Id.* ¶ 104.

To remedy a violation of the 2009 requirements, the applicant had to seek an injunction. During this rulemaking, providers urged the FCC to adopt a “deemed granted” remedy, i.e. where, at the expiration of a shot clock, a permit would be “deemed granted” and the city would have to file a lawsuit to prevent the wireless service provider from beginning construction. The FCC ultimately did not change the remedy, so under the Small Cell Order, when a state or local government misses a shot clock deadline for deciding an application, the applicant must still seek injunctive relief. Wireless Service Provider Petitioners (Sprint et al.) now challenge the FCC’s refusal to adopt a deemed granted remedy for shot clock violations.

Local Government Petitioners are unhappy with the shortened time limits for decisions on applications, and with the expansion of shot clocks beyond zoning applications to all applications for deployment of wireless services. We consider their challenges first.

Local Government Petitioners attack the shortened shot clock time frames, contending they arbitrarily restrict municipalities' ability to conduct traditional zoning review that may take longer than the prescribed shot clock requirements. Petitioners criticize the FCC's reliance on a limited survey of state and local laws, contending that those laws had unusual, shorter time frame requirements. Petitioners contend that most state and local governments will be unable to decide permits within the time limits prescribed under the Small Cell Order.

The FCC's reliance on the survey of local laws and practices was reasonable, however, because it served only a limited purpose. The FCC used the survey only to support its unremarkable assertion that some municipalities "can complete reviews more quickly than was the case when the existing Section 332 shot clocks were adopted" in 2009. *Small Cell Order* ¶ 106. It must be remembered that the shot clock requirements create only presumptions. As under the 2009 Order, if permit applicants seek an injunction to force a faster decision, local officials can show that additional time is necessary under the circumstances. *Id.* ¶ 137; *see id.* ¶ 109, ¶ 127; *see also City of Arlington*, 668 F.3d at 259–61 (upholding previous FCC shot-clock presumptions).

The Telecommunications Act itself supports the expansion of shot clocks to all permitting decisions. Section 332(c)(7)(B)(ii) requires a decision to be made within a "reasonable period of time," and applies both to applications "to place" wireless facilities as well as requests to "construct, or modify" such facilities. 47 U.S.C. § 332(c)(7)(B)(ii). Together, these enumerations of the categories of applications can reasonably be interpreted to authorize the application of

shot clocks to building and construction permits, as well as zoning permits.

The FCC also provided sound reasons for this expansion. It explained that limiting shot clocks to zoning permits could lead states and localities to “delay their consideration of other permits (e.g., building, electric, road closure or other permits) to thwart the proposed deployment.” *Small Cell Order* ¶ 134 n.390. Courts interpreting Section 332 have reached a similar conclusion for the same reason. *See, e.g., Ogden Fire Co. No. 1 v. Upper Chichester Twp.*, 504 F.3d 370, 395–96 (3d Cir. 2007) (rejecting the argument that the Act only applies to zoning permits, because the city could use other permits to delay construction of telecommunications infrastructure). The FCC acted well within its authority, and in accordance with the purpose of the Act, when it broadened the application of the shot clocks to encompass all permits, in order to prevent unreasonable delays.

For their part, Wireless Service Provider Petitioners contend that the FCC did not go far enough in modifying the shot clock requirements. Petitioners contend that the FCC should have adopted a deemed granted remedy for shot clock violations, and argue that the *Small Cell Order*’s factual findings compel the adoption of such a remedy.

This argument relies on a mischaracterization of the FCC’s factual findings. It is true that the FCC found that delays under the old shot clock regime were so serious they would “virtually bar providers from deploying wireless facilities.” *Small Cell Order* ¶ 126. But the FCC concluded that under its new shot clock rules, which shorten the time frames and expand the applicability of the rules, there will be no similar bar to wireless deployment. *Id.* ¶ 129. Because

the FCC reasonably explained it has taken measures to reduce delays that would otherwise have occurred under its old regime, the factual findings here do not compel the adoption of a deemed granted remedy.

Wireless Service Providers next argue that the failure to adopt a deemed granted remedy is arbitrary and capricious because the FCC adopted the remedy in a different statutory context, the Spectrum Act, *see* 47 U.S.C. §§ 1451–57, and never explained why it did not do so here. It is understandable that the FCC gave no explanation of the difference because no comments raised any such disparity during the regulatory process. *See Perez v. Mortg. Bankers Ass’n*, 575 U.S. 92, 96 (2015) (explaining that an agency has an obligation to respond to significant comments received). There are critical differences between the language of the Telecommunications Act and the language of the Spectrum Act. The Telecommunications Act requires cities make a decision on applications within a reasonable period of time. *See* 47 U.S.C. § 332(c)(7)(B)(ii) (“A State or local government or instrumentality thereof *shall act* on any request for authorization to place, construct, or modify personal wireless service facilities within a reasonable period of time . . .” (emphasis added)). The Spectrum Act provides that the local government must grant all qualifying applications. 47 U.S.C. § 1455(a)(1) (“[A] State or local government may not deny, and *shall approve*, any eligible facilities request for a modification of an existing wireless tower or base station . . .” (emphasis added)). The deemed granted remedy in the FCC’s Spectrum Act order was in accordance with the text of the statute. There is no similar language in the Telecommunications Act. The FCC’s conclusion that a different remedy was appropriate here was therefore not arbitrary and capricious.

4. *Regulation of Property in the Public Rights of Way*

Local governments generally exercise control over public rights-of-way for purposes of determining where installations such as utility poles and traffic lights should be placed. Some of these installations are owned by the municipalities themselves and some are owned by other entities, such as public and private utilities. Local Government and Public Power Petitioners (American Public Power Association et al.) argue that under Supreme Court authority, the preemption provision of Section 253(a) cannot apply to the municipal regulation of access to municipally-owned installations.

The Supreme Court has considered whether a provision of the National Labor Relations Act that preempts local regulation of labor relations prevented a municipality that was running a construction project from enforcing an otherwise valid collective bargaining agreement. *Bldg. & Constr. Trades Council of Metro. Dist. v. Associated Builders & Contractors of Mass./R.I. Inc.*, 507 U.S. 218, 231–32 (1993). The Court explained that when a municipality is acting like a private business, and not acting as a regulator or policymaker, there can be no preemption by the NLRA because the municipality was not engaged in regulation of labor relations. *Id.* It was acting as a property owner.

Local Government Petitioners and Public Power Petitioners here contend that the municipalities are acting like private property owners in controlling access to, and construction of, facilities in public rights-of-way and that the Act's preemption provision therefore does not apply. They thus contend the FCC lacks authority to regulate the fees they charge for access to the rights-of-way and to the property on

the rights-of-way. They emphasize that the provisions of the Small Cell Order are intended to preempt not only regulation of installations owned by non-municipal entities but also regulation of installations owned by the municipalities themselves.

The issue thus becomes whether the FCC reasonably concluded that local jurisdictions are acting like private property owners when the jurisdictions charge fees or otherwise control the access to public rights-of-way. The FCC's regulations in the Small Cell Order were premised on the agency's determination that municipalities, in controlling access to rights-of-way, are not acting as owners of the property; their actions are regulatory, not propriety, and therefore subject to preemption. *Small Cell Order* ¶ 96. This is a reasonable conclusion based on the record. The rights-of-way, and manner in which the municipalities exercise control over them, serve a public purpose, and they are regulated in the public interest, not in the financial interests of the cities. As the FCC explained, the cities act in a regulatory capacity when they restrict access to the public rights-of-way because they are acting to fulfill regulatory objectives, such as maintaining aesthetic standards. *Id.*

This conclusion is supported by case law in this Circuit, where we have held that cities operate in a regulatory capacity when they manage access to public rights-of-way and public property thereon. *See Olympic Pipe Line Co. v. City of Seattle*, 437 F.3d 872, 881 (9th Cir. 2006). For example, in *Olympic Pipe Line*, we concluded that the City of Seattle operated in a regulatory capacity when it made certain demands of an oil pipeline that operated under city-owned streets in the public rights-of-way. *Id.*; *see also Shell Oil Co. v. City of Santa Monica*, 830 F.2d 1052, 1057–58 (9th Cir.

1987) (holding that the City of Santa Monica does not act as a market participant when it sets franchise fees for pipelines that run under its streets).

The FCC's conclusions here about the Order's scope are reasonably explained, and do not violate any presumption against preemption of proprietary municipal conduct. Municipalities do not regulate rights-of-way in a proprietary capacity.

5. *Section 224*

The FCC adopted the Small Cell Order to remove barriers that would prevent 5G providers from accessing existing facilities for installation of small cells. These existing facilities often include utility poles. Public Power Petitioners, representing the interests of public power utilities, contend the Order cannot affect poles owned by public utilities, because Section 224 of the Telecommunications Act, relating to regulation of utility pole attachment rates, contains an express exclusion for government-owned utilities. *See* 47 U.S.C. § 224(a)(1).

The Small Cell Order is not a regulation of rates pursuant to Section 224, however. It is promulgated under the authority of Section 253 to ensure that state and local statutes do not have a prohibitory effect on telecommunications services. *See* 47 U.S.C. § 253(a); The FCC responded appropriately when it said, “[n]othing in Section 253 suggests such a limited reading, nor does Section 224 indicate that other provisions of the Act do not apply. We conclude that our interpretation of effective prohibition extends to fees for all government-owned property in the [right-of-way], including utility poles.” *See Small Cell Order* ¶ 92 n.253.

Because Section 253 does not exempt public power utilities from its terms, the FCC reasonably relied on Section 253 to regulate such utilities.

6. *Radiofrequency Exposure*

More than twenty years ago, the FCC first adopted “radiofrequency standards,” (RF standards) which limit the amount of radiation that can be emitted from wireless transmitters. *Guidelines for Evaluating the Env'tl. Effects of Radiofrequency Radiation*, 11 FCC Rcd. 15,123 (1996). The FCC is obligated to evaluate the potential impacts of human exposure to radiofrequency emissions under the National Environmental Policy Act. *See* Pub. L. 104-104, 110 Stat. 56 (1996); 47 C.F.R. § 1.1310. In the Telecommunications Act, Congress preempted all municipal regulation of radiofrequency emissions to the extent that such facilities comply with federal emissions standards. 47 U.S.C. § 332(c)(7)(B)(iv).

In 2013, the FCC opened a “Notice of Inquiry,” requesting comments on whether it should reassess its RF standards. *See Reassessment of Fed. Comm'ncs Comm'n Radiofrequency Exposure Limits and Policies*, 28 FCC Rcd. 3498 (2013). The agency did not take immediate action on that docket. During the later process leading up to the adoption of the Small Cell Order, Petitioner Montgomery County requested that the Commission complete its 2013 RF proceeding before adopting the Small Cell Order, and that it examine the potential effects of 5G technology on its RF standards. The FCC did not address its RF standards or close the 2013 docket before adopting the Small Cell Order.

Petitioner Montgomery County now challenges the FCC’s Small Cell Order as unlawful because the FCC did not complete the 2013 docket review before adopting the Small Cell Order. After its petition was filed, however, the FCC adopted a new order examining radiofrequency exposure in the 5G environment, and concluded that it did not warrant changes to its 1996 standards. Challenges to the FCC’s failure to perform updated radiofrequency analysis, as contemplated by the 2013 docket, are therefore moot. *See, e.g., Alliance for the Wild Rockies v. U.S. Dep’t of Agr.*, 772 F.3d 592, 601 (9th Cir. 2014).

There is no merit to Montgomery County’s further suggestion that we should penalize the FCC for what the County calls evasive litigation tactics in not acting earlier. The Supreme Court has emphasized that agencies have “significant latitude as to the manner, timing, content, and coordination of [their] regulations.” *Massachusetts v. EPA*, 549 U.S. 497, 533 (2007); *see also Mobil Oil Expl. & Producing Se. Inc. v. United Distrib. Cos.*, 498 U.S. 211, 230–31 (1991) (“An agency enjoys broad discretion in determining how best to handle related, yet discrete, issues in terms of procedures and priorities. . . . [A]n agency need not solve every problem before it in the same proceeding.” (citations omitted)). More important, Montgomery County now has what it wanted; the FCC has examined the effects of 5G technology on its RF standards, and closed the 2013 docket. Any challenges to the adequacy of that final agency action must now be brought in a new proceeding.

B. Challenges to the Moratoria Order

The FCC adopted the Moratoria Order in response to complaints from a “broad array of large and small . . .

wireless providers” that state and local ordinances and practices were either explicitly or having the effect of barring small cell deployment. *Moratoria Order* ¶ 143. In the Order, the FCC concluded that ordinances and practices were materially inhibiting small cell deployment, and the agency provided general standards to differentiate between permissible municipal regulations and impermissible “moratoria.” The Moratoria Order describes two general categories of moratoria: express and de facto. *See id.* ¶ 144. It defined express moratoria as “statutes, regulations, or other written legal requirements” in which state or local governments “expressly . . . prevent or suspend the acceptance, processing, or approval of applications or permits necessary for deploying telecommunications services.” *Id.* ¶ 145. The Order provided such bars to 5G deployment qualify as moratoria even though they are of a limited duration. *Id.*

The FCC then defined de facto moratoria as “state or local actions that are not express moratoria, but that effectively halt or suspend the acceptance, processing, or approval of applications or permits for telecommunications services or facilities in a manner akin to an express moratorium.” *Id.* ¶ 149. De facto moratoria violate Section 253 only when they unreasonably or indefinitely delay deployment. *Id.* ¶ 150.

The Order provides a new definition of Section 253(b)’s exemption for local regulations that protect “the public safety and welfare.” The Order permits what it describes as “emergency” bans on the construction of 5G facilities to protect public safety and welfare, but only where those laws are (1) “competitively neutral”, (2) necessary to address the emergency, disaster, or related public needs, and (3) target

only those geographic areas affected by the disaster or emergency. *Id.* ¶ 157.

The City of Portland, not joined by the other Local Government Petitioners, challenges the Order with a handful of criticisms. The City’s primary contention is that the Order’s definitions of moratoria are overly broad, and therefore unreasonable, because, in the City’s view, the Moratoria Order preempts even benign seasonal restrictions on construction, such as freeze-and-frost laws. The City also contends that the Moratoria Order is an invalid application of Section 253, and self-contradictory in its definitions. None of these contentions have merit.

As an initial matter, we do not read the Moratoria Order as broadly as the City does in arguing that it would preempt all restrictions on construction, even seasonal ones that cause some delay in small cell deployment. The FCC carefully explained in the Order that municipal ordinances of general applicability will qualify as de facto moratoria only where the delay caused by the ordinances “continues for an unreasonably long or indefinite amount of time such that providers are discouraged from filing applications.” *Id.* ¶ 150. Municipal regulations on construction are therefore not preempted if they “simply entail some delay in deployment.” *Id.* The explanation is supported by the FCC’s assurance in the Order that municipalities retain authority over “construction schedul[ing].” *Id.* ¶ 160. The City’s concerns about the breadth of the Moratoria Order are therefore unfounded. The Order does not preempt necessary and customary restrictions on construction.

The City argues that the Moratoria Order preempts laws of general applicability, while Section 253 preempts only

those that specifically target the provision of telecommunications services. By its terms, however, Section 253(a) is not so limited. It looks to both the language and impact of local regulations. It preempts all “local statute[s] or regulation[s], or other . . . legal requirement[s]” that prohibit or have the effect of prohibiting telecommunications services. 47 U.S.C. § 253(a).

Nor is the Moratoria Order contradictory in its definitions of express and de facto prohibitions. After examining the factual record, the FCC found that some localities had repeatedly re-authorized temporary bans on 5G installation to prohibit the installation of 5G cells indefinitely. *Moratoria Order* ¶ 148 n.546. The FCC therefore clarified that such explicit bans on 5G deployment qualify as express moratoria, even if they have a “limited, defined duration.” *Id.* ¶ 148. In a separate paragraph dealing with de facto prohibitions resulting from more general laws, the FCC explained that generally applicable laws, i.e. those that do not facially target small cells, are not preempted unless they cause a delay that “continues for an unreasonably long or indefinite amount of time.” *Id.* ¶ 150. There is nothing inconsistent or unexplained in the FCC’s separate definitions of express and de facto moratoria.

Finally, the City challenges the FCC’s purportedly narrow construction of Section 253(b)’s preemption exception for laws regulating safety and welfare. The FCC reasonably interpreted the phrase “public safety and welfare” in this context to permit emergency bans on 5G deployment where the regulations are competitively neutral and intended to remedy an ongoing public safety concern. The FCC explained such an interpretation was necessary to prevent the pretextual use of safety “as a guise for” preventing

deployment. *Id.* ¶ 157. The Order is consistent with the FCC’s earlier interpretations of Section 253(b). *See, e.g., New Eng. Pub. Commc’ns Council Petition for Preemption*, 11 FCC Rcd. 19,713 (1996) (rejecting a broad interpretation of Section 253(b)).

The Moratoria Order is not arbitrary, capricious, or contrary to law on a facial basis. As the FCC has recognized, objections to specific applications of the Moratoria Order may be made on a case-by-case basis.

C. Constitutional Challenges to Both Orders

Local Government Petitioners also argue that the Small Cell and Moratoria Orders violate the Fifth and Tenth Amendments. First, Petitioners argue that the Small Cell Order is a physical taking in violation of the Fifth Amendment because it requires municipalities to grant providers access to municipal property, including rights-of-way, thereby creating a physical taking without just compensation. Petitioners compare the Small Cell Order to the New York state law at issue in *Loretto v. Teleprompter Manhattan CATV Corp.*, 458 U.S. 419, 421 (1982), which required landlords to permit cable television companies to install cables on their property. In *Loretto*, the Court held the law to be a physical taking because the installation resulted in “permanent occupations of land.” *Id.* at 430. Here, on the other hand, the Small Cell Order precludes state and local governments from charging unreasonable fees when granting applications, and it continues to allow municipalities to deny access to property for a number of reasons. *See Small Cell Order* ¶ 73 n.217. It does not compel access to property in a manner akin to *Loretto*. *See id.* Once again, challenges to

particular applications of the Small Cell Order must be made on an as-applied basis.

Petitioners also argue that the Small Cell Order constitutes a regulatory taking by limiting cost recovery. The Supreme Court rejected a similar argument in *FCC v. Florida Power Corp.*, 480 U.S. 245 (1987), holding that limiting cost recovery to actual costs did not result in a regulatory taking. *Id.* at 254. Because the Small Cell Order allows for the recovery of actual costs as well, the Order does not constitute a regulatory taking. See *Small Cell Order* ¶ 50 (explaining that the Small Cell Order continues to allow for fees that “are a reasonable approximation of the state or local government’s costs”).

Finally, Local Government Petitioners argue that, by requiring municipalities to respond to applications for use from 5G and broadband installers within a prescribed period of time or risk immediate control of its property, the Small Cell and Moratoria Orders compel Petitioners to enforce federal law in violation of the Tenth Amendment. In support, they cite *National Federation of Independent Businesses v. Sebelius*, 567 U.S. 519, 579–80 (2012) (plurality opinion), where the Court held that financial inducement had the effect of compelling states to enforce a federal program. Nothing like that is happening here. Instead, the FCC is interpreting and enforcing the 1996 Telecommunications Act, adopted by Congress pursuant to its delegated authority under the Commerce Clause, to ensure that municipalities are not charging small cell providers unreasonable fees. “If a power is delegated to Congress in the Constitution, the Tenth Amendment expressly disclaims any reservation of that power to the States.” *New York v. United States*, 505 U.S. 144, 156 (1992). In addition, by preempting certain State

and local policies, the FCC did not commandeer State and local officials in violation of the Tenth Amendment. Although their “language might appear to operate directly on the States,” the Orders—as applications of the Telecommunications Act—simply “confer[] on private entities . . . a federal right to engage in certain conduct subject only to certain (federal) constraints.” *See Murphy v. Nat’l Collegiate Athletic Ass’n*, 138 S. Ct. 1461, 1480 (2018) (citing *Morales v. Trans World Airlines, Inc.*, 504 U.S. 374, 378 (1992)). The Orders do not violate the Constitution.

IV. ONE-TOUCH MAKE-READY ORDER

In adopting the One-Touch Make-Ready Order, the FCC intended to make it faster and cheaper for broadband providers to attach to already-existing utility poles. *See Accelerating Wireline Broadband Deployment by Removing Barriers to Infrastructure Inv.*, 33 FCC Rcd. 7705, ¶ 1 (2018) [hereinafter *One-Touch Make-Ready Order*]. Previously, only the pole owners could perform the preparatory work necessary for attachment. The main purpose of the Order is to create a new process, called one-touch make-ready, that allows new attachers themselves to do all the preparations. *Id.* ¶ 2.

Petitioners American Electric Power Service Corporation et al., a group of private utility companies, do not challenge the most important aspects of the One-Touch Make-Ready Order. Instead, they challenge four secondary aspects of the Order: rules for overlashing, preexisting violations, self-help, and rate reform. For the following reasons, we uphold them all.

A. Overlashing

Overlashing is the process by which attachers affix additional cables or other wires to ones already attached to a pole. The overlashing rule prohibits a utility from requiring overlashers to conduct pre-overlashing engineering studies or to pay the utility's cost of conducting such studies. *Id.* ¶ 119 n.444.

Petitioner utility companies first contend the overlashing rule contradicts the text of Section 224(f)(2), because the rule does not expressly say that a utility can exercise its statutory authority to deny access to poles for safety, capacity, reliability, or engineering reasons. *See* 47 U.S.C. § 224(f)(2). But the overlashing rule does not prevent utilities from exercising their statutory rights, nor has the FCC interpreted the overlashing rule to do so. It is speculative to suggest that it might do so in the future. *See Texas v. United States*, 523 U.S. 296, 300 (1998) (declining to consider claim because “it rests upon contingent future events that may not occur as anticipated, or indeed may not occur at all.” (internal quotation marks omitted)). The rule allows overlashers and utilities to negotiate the details of the overlashing arrangement, and is thus consistent with FCC's longstanding policy. *See Amendment of Comm'n's Rules & Policies Governing Pole Attachments*, 16 FCC Rcd. 12,103, ¶ 74 (2001).

Petitioners also argue that the overlashing rule undermines a utility's Section 224(f)(2) authority to deny pole access, because it prevents utilities from requiring overlashers to provide certain information. We conclude that the overlashing rule does not impede a utility's exercise of its statutory authority to deny access to poles. The rule

authorizes utilities to require that overlashers give fifteen days' notice to utilities prior to overlashing so that safety concerns can be addressed. *One-Touch Make-Ready Order* ¶¶ 115–16. The record shows that such notice provisions were frequently negotiated in the past on a voluntary basis and supports the FCC's conclusion that such "an advance notice requirement has been sufficient to address safety and reliability concerns." *Id.* ¶ 117. Indeed, in evaluating similar rules, the D.C. Circuit has already held that there is "no merit" to the claim that utilities cannot effectively exercise their rights under Section 224(f)(2) without "prior notice" of overlashing. *See S. Co. Servs., Inc. v. FCC*, 313 F.3d 574, 582 (D.C. Cir. 2002).

Finally, Petitioners argue that by prohibiting the utilities from charging overlashers for the cost of conducting pre-overlashing studies, the overlashing rule contradicts Section 224(d)(1). That section ensures cost recovery, but it does so only for attachments by cable television providers. *See* 47 U.S.C. § 224(d)(1)–(3). It does not apply here. The overlashing rule is thus a reasonable attempt by the FCC to prevent unnecessary costs for attachers.

B. Preexisting Violation Rule

The preexisting violation rule prohibits utilities from denying access to a new attacher solely because of a preexisting safety violation that the attacher did not cause. *One-Touch Make-Ready Order* ¶ 122. Petitioners contend that this is contrary to Section 224(f)(2), which allows utilities to deny access for "reasons of safety." There is no conflict.

The rule defines the term “reasons of safety” as preventing a utility from denying access to a new attacher because of a safety hazard created by a third party. *Id.* ¶ 122. Such denials have the effect of forcing an innocent would-be attacher to fix the violation. This rule prevents the utilities from passing the costs off on entities that did not cause the safety problem in the first place. The FCC confirmed at oral argument that the preexisting violation rule would not prevent utilities from rejecting proposed attachments that increase safety risks on a utility pole. The rule thus operates to prevent utilities from relying on preexisting violations pretextually to deny pole access to attachments that pose no greater safety risk than existing attachments. Because the preexisting violation rule reasonably defines the term “reasons of safety,” the FCC’s interpretation is reasonable.

C. Self-Help Rule

Prior to the One-Touch Make-Ready Order, attachers could hire contractors to perform preparatory work only on the lower portion of a pole. The self-help rule lets the utility-approved contractors prepare the entire pole for attachment. *Id.* ¶¶ 97–99. Petitioners argue that this expansion is contrary to Section 224(f)(2) because permitting attachers to hire contractors to work on the upper portion of poles jeopardizes safety. Yet, the rule has a number of provisions designed to mitigate any increased safety risks. For example, the rule gives a utility a ninety-day window to complete the pre-attachment work itself (thereby circumventing the rule’s contractor provisions entirely). *Id.* ¶ 99. The rule also requires new attachers to use a utility-approved contractor to perform the self-help work, and it requires the attacher to give the utility advanced notice of when the self-help work will

occur so that the utility can be present if it wishes. *Id.* ¶¶ 99–106.

The rule represents a change from earlier rules on what self-help measures an attacher could perform, and the FCC explained that use of approved contractors would improve efficiency. *Id.* ¶ 97. A complaint process in the old self-help rule allowed new attachers to file complaints when a utility was not preparing the pole in a timely fashion. This did not encourage efficiency. It was an “insufficient tool for encouraging [a utility’s] compliance with [the FCC’s] deadlines.” *Id.* ¶ 98. The FCC reasonably views the deployment of new 5G technology to be a matter of “national importance,” justifying extension of the self-help rule to promote timely installations. *Id.* ¶ 97. The self-help rule is thus not arbitrary or capricious.

Petitioners also argue that the FCC lacks authority to regulate utility-owned pole attachments, since Section 224 defines “pole attachments” to include attachments *to* a utility-owned or -controlled pole. But the FCC has authority to promulgate “regulations to carry out the provisions of” Section 224, 47 U.S.C. § 224(b)(2), which includes regulations addressing “nondiscriminatory access” to utility poles, *id.* § 224(f)(1). It was reasonable for the FCC to conclude that it could not ensure nondiscriminatory access to poles without allowing make-ready work that would reposition utility attachments; otherwise, utilities could simply deny access to attachers based on pretextual reasons of insufficient capacity. *See S. Co. v. FCC*, 293 F.3d 1338, 1348 (11th Cir. 2002) (“[T]he FCC must have some way of assessing whether these needs are bona fide; otherwise, a utility could arbitrarily reserve space on a pole . . . and

proceed to deny attachers space on the basis of ‘insufficient capacity.’”). Petitioners’ statutory challenge thus fails.

Petitioners mount a procedural challenge to the rule, arguing that the FCC did not comply with the APA’s notice requirement, 5 U.S.C. § 553, because it had not issued a proposed rule before announcing the final self-help rule. In raising the issue in a single footnote, petitioners have waived any challenge to the APA’s notice requirement. *See Idaho Conservation League v. Bonneville Power Admin.*, 826 F.3d 1173, 1178 (9th Cir. 2016). In any event, the FCC’s Notice of Proposed Rulemaking (NPRM) sought proposals to speed up access to poles by allowing new attachers to prepare poles for attachment, and several commenters proposed expanding an attacher’s ability to perform preparatory work on the entire pole. We conclude that, at the very least, the self-help rule is a logical outgrowth of the NPRM. *See Rybachek v. EPA*, 904 F.2d 1276, 1288 (9th Cir. 1990) (explaining that an agency need not provide a new NPRM as long as the final published rule is “a logical outgrowth of the notice and comments received”). There is no reason to force the agency to begin the self-help rulemaking process anew.

D. Rate-Reform Rule

The rate reform rule continues regulatory efforts to remove rate disparities between telecommunications carriers who historically owned utility poles (so-called incumbent local exchange carriers, or ILECs) and telecommunications carriers who do not own utility poles (so-called competitive local exchange carriers, or CLECs). *See Am. Elec. Power Serv. Corp. v. FCC*, 708 F.3d 183, 185–86 (D.C. Cir. 2013). This rule establishes a presumption that all telecommunication carriers are similarly situated and thus

entitled to the same rates. *One-Touch Make-Ready Order* ¶ 123. But if a utility successfully rebuts the presumption by showing that an ILEC continues to retain “net benefits” that other telecommunications providers do not enjoy, then the rate reform rule imposes a maximum rate that ILECs and utilities may negotiate. *See id.* ¶¶ 128–29.

Section 224(e)(1) authorizes the FCC to prescribe rates for pole attachments used by CLECs, but not ILECs. *See* 47 U.S.C. § 224(e)(1); *see also id.* § 224(a)(5). Petitioners therefore argue that the FCC lacks the authority to prescribe the same rates for ILECs. Section 224(b)(1), however, requires the FCC to set just and reasonable rates for all telecommunications carriers, and the FCC interpreted that to include ILECs as well as CLECs. *See id.* § 224(b)(1). The FCC has interpreted Section 224(b)(1) this way since 2011, and the D.C. Circuit upheld this interpretation some years ago. *See Am. Elec. Power Serv. Corp.*, 708 F.3d at 188. And the Supreme Court has made clear that Section 224(e)(1) “work[s] no limitation” on the FCC’s more general ratemaking authority under Section 224(b)(1), which is the statutory provision that the agency invoked here. *See Nat’l Cable & Telecomm. Ass’n, Inc. v. Gulf Power Co.*, 534 U.S. 327, 335–36 (2002).

This rule does, for the first time, set the same presumptive rates for ILECs and CLECs, and the FCC explained why its record supported such a rule. *See One-Touch Make-Ready Order* ¶ 126. A study by US Telecom showed that earlier efforts to decrease rate disparities between ILECs and CLECs had not been successful, and that historic differences between ILECs and CLECs that supported different rates in the past are now disappearing. *See id.* ¶¶ 124–26. The FCC provided

an adequate justification for setting the same presumptive rates for all telecommunications providers.

Finally, Petitioners argue that the rate reform rule may result in their incomplete recovery of costs, because if a utility successfully rebuts the presumption that an ILEC should have the same rates as CLECs, the rule imposes a maximum rate ILECs and utilities may negotiate. *See id.* ¶ 129. The maximum negotiable rate is not arbitrary or capricious, however, because FCC set the rate at a value that is higher than both CLEC and cable operator rates, and the FCC had previously determined those rates were just, reasonable, and allowed full cost recovery. *Id.* ¶ 129 n.483; *see also Implementation of Section 224 of the Act*, 26 FCC Rcd. 5240, ¶ 183 (2011).

The rate reform rule, like the overlashing, preexisting violations, and self-help rules, is an appropriate exercise of the FCC’s regulatory authority under the Telecommunications Act.

V. CONCLUSION

We therefore hold that the FCC’s requirement in the Small Cell Order that aesthetic regulations be “no more burdensome” than regulations applied to other infrastructure deployment is contrary to the controlling statutory provision. *See* 47 U.S.C. § 332(c)(7)(B)(i)(II). We also hold that the FCC’s requirement that all local aesthetic regulations be “objective” is not adequately explained and is therefore arbitrary and capricious. We therefore **GRANT** the petitions as to those requirements, **VACATE** those portions of the rule and **REMAND** them to the FCC. The petition of Montgomery County is **DISMISSED** as moot. As to all

other challenges, the petitions are **DENIED**. Each party to bear its own costs.

BRESS, Circuit Judge, dissenting in part:

The majority opinion carefully addresses an array of legal challenges to a series of FCC *Orders* designed to accelerate the deployment of 5G service. I join the court’s fine opinion except as to Part III.A.1, which upholds the FCC’s decision to preempt any fees charged to wireless or telecommunications providers that exceed a locality’s costs for hosting communications equipment. In my view, the FCC on this record has not adequately explained how all above-cost fees amount to an “effective prohibition” on telecommunications or wireless service under 47 U.S.C. §§ 253(a) and 332(c)(7)(B)(i)(II).

The Telecommunications Act of 1996 provides that “[n]o State or local statute or regulation, or other State or local legal requirement, may prohibit or have the effect of prohibiting the ability of any entity to provide any interstate or intrastate telecommunications service.” 47 U.S.C. § 253(a). The Act contains a similar provision for wireless service. *See id.* § 332(c)(7)(B)(i)(II) (“The regulation of the placement, construction, and modification of personal wireless service facilities by any State or local government or instrumentality thereof . . . shall not prohibit or have the effect of prohibiting the provision of personal wireless services.”).

The Act does not define what it means for a local policy to “have the effect of prohibiting” service. Since 1997,

however, the FCC has interpreted the phrase to preempt local policies that “materially inhibit” the ability of providers “to compete in a fair and balanced legal and regulatory environment.” See *Small Cell Order* ¶ 35 (quoting *Cal. Payphone Ass’n*, 12 FCC Rcd. 14191, 14206 (1997)). This standard does not require a “complete or insurmountable” barrier to service. *Id.* But it does require that a local rule materially inhibit the ability to provide service based upon the “actual effects” of a state or local ordinance,” “not [] what effects the ordinance *might possibly* allow.” *Sprint Telephony PCS, L.P. v. Cty. of San Diego*, 543 F.3d 571, 578 (9th Cir. 2008) (en banc) (emphasis in original); see also *id.* (the statute requires an “actual or effective prohibition, rather than the mere possibility of prohibition”) (quotations omitted).

In the *Small Cell Order*, the FCC concluded that state and local fees materially inhibit telecommunications and wireless service when they exceed a locality’s reasonable cost of accommodating communications facilities. *Small Cell Order* ¶¶ 50, 53. The FCC cited evidence that certain exorbitant fees have stopped providers from offering service in certain locales. See, e.g., AT&T Aug. 10, 2018 *Ex Parte* Letter (AT&T “has not deployed any small cell sites in Portland, Oregon” due to the city’s \$7,500 attachment fee and recurring fee of \$3,500 to \$5,500). The agency also found that “even fees that might seem small in isolation have material and prohibitive effects on deployment particularly considered in the aggregate.” *Small Cell Order* ¶ 53. This latter finding was based on the FCC’s determination that reduced fees generate cost-savings for providers, which enables them to use the newfound savings to expand wireless and telecommunications coverage. See *id.* ¶ 50, 55–56, 64–65 & nn.194–95. The agency estimated aggregate cost-savings

from a reduction in fees to be over \$2 billion, relying on a 2018 study by Corning, Inc. *Id.* ¶¶ 7, 60 & n.169.

The FCC carved out a safe harbor from the *Order*'s broad preemption rule for pole construction fees up to \$1,000, attachment fees up to \$500 (or \$100 after a provider's first five 5G facilities), and recurring fees up to \$270. *Id.* ¶ 79. Fees may exceed the levels in the *Small Cell Order*'s safe harbor only if they reasonably approximate a locality's costs, which include expenses "related to processing an application," street closures, issuing "building or construction permits," and access to and maintenance of public rights of way. *Id.* ¶¶ 32 n.71, 50 n.131, 79.¹

No one doubts that exorbitant fees can impede the deployment of communications infrastructure. *See, e.g., P.R. Tel. Co. v. Mun. of Guayanilla*, 450 F.3d 9, 17–19 (1st Cir. 2006). But fees are prohibitive because of their financial effect on service providers, not because they happen to exceed a state or local government's costs. Consider a \$500 fee in Small Town A that exceeds the town's costs by 1¢, and a \$2,000 cost-based fee in Big City B. By the *Small Cell Order*'s logic, the lower fee is preempted, but the higher fee is not. It is hard to rationalize the former under the statute, which requires an actual and material inhibition of telecommunications or wireless service. *Sprint Telephony*, 543 F.3d at 578.

¹ The *Small Cell Order* also interpreted the phrase "fair and reasonable compensation" in 47 U.S.C. § 253(c) to limit state and local fees to cost-recovery. *Small Cell Order* ¶ 55. But the agency declined to use this savings clause "as an independent prohibition on conduct that is not itself prohibited by [§] 253(a)." *Id.* ¶ 53 n.143; *see also id.* ¶ 50 n.132.

Perhaps for this reason, this court over a decade ago “decline[d]” to hold “that all non-cost based fees are automatically preempted” under the Telecommunications Act. See *Qwest Commc’ns Inc. v. City of Berkeley*, 433 F.3d 1253, 1257 (9th Cir. 2006), *overruled on other grounds by Sprint Telephony*, 543 F.3d at 578.² The FCC was aware of this precedent when it issued the *Small Cell Order*, but expressly “reject[ed] the view of those courts that have concluded that [§] 253(a) necessarily requires some additional showing beyond the fact that a particular fee is not cost-based.” See *Small Cell Order* ¶ 53 n.143 (citing *Qwest*, 433 F.3d at 1257).

On this record, the FCC has not adequately explained its basis for concluding, contra our precedent, that there is an intrinsic relationship between a fee’s approximation of costs and its prohibitive effect on service providers. The FCC’s reliance on individual fees it considers “excessive” tells us that fees can work effective prohibitions. But this does not on its own justify a blanket prohibition on all above-cost fees. A \$7,500 fee in Portland may well prohibit service, but that is because of the financial toll it inflicts, not because it exceeds the city’s costs. And the FCC has not identified in the administrative record the frequency of above-cost fees or the amounts that localities have generally charged above cost.

² *Qwest* applied a lenient standard that more easily allowed the FCC to show an effective prohibition, 433 F.3d at 1256, a standard our en banc court later rejected. See *Sprint Telephony*, 543 F.3d at 576–78. If above-cost fees were not *per se* prohibitions under the less stringent *Qwest* standard, it is hard to see how they would be under the stricter approach of *Sprint Telephony*. I do not suggest that *Qwest* imposes a “legal” bar to the FCC’s contrary determination, Maj. Op. 43, but rather that the FCC has not adequately explained the basis for its conclusion here.

The FCC has instead determined that a prohibition on all above-cost fees is justified because all above-cost fees, in the aggregate, effectively prohibit 5G deployment. The linchpin of the agency's aggregation theory is a 2018 study by Corning, Inc., which estimates at over \$2 billion the cost-savings and reinvestment from reduced fees. *Small Cell Order* ¶¶ 7, 60 & n.169. But the Corning Study is not about fees above costs. And the FCC has not explained how this study tells us about the prevalence of above-cost fees or the burden such fees place on service providers.

Instead, the Corning Study calculated “the cost savings from capping fees at a level in line with the median of recent state regulations,” estimating that amount at over \$2 billion. Because this is not a measure of fees above costs, the Corning Study does not say whether the caps it used to measure savings approximate costs. Indeed, the Corning Study notes that “[t]here is still significant uncertainty around what ‘typical’ rates are.” The study further states that “attachment and application fees” are “lesser drivers” of 5G deployment economics, raising questions about the extent to which all fees above costs necessarily effectively prohibit service.

At bottom, what the Corning Study conveys is that if fees are reduced, it will produce cost savings to those who pay the fees. *Small Cell Order* ¶¶ 50, 53, 55–56, 60 & n.169, 64–65 & nn.194–95. But that commonsense observation would be true of any fee considered in the aggregate. And it would seemingly mean that any fee in any amount could qualify as an effective prohibition, once aggregated. The same would be true of the aggregate effects of any form of regulation that localities would apply outside the fee context. I am therefore concerned that on the record as it stands, the FCC's approach lacks a limiting principle. At least absent some estimated

quantification of above-cost fees in the aggregate (which the Corning Study does not provide) or some further estimate tied to the rule it adopted, the FCC’s logic would appear to justify the preemption of any state or local rule.

The FCC’s “reinvestment” theory invites similar concerns. It may be true that every fee imposes some cost that, if avoided, could potentially be reinvested to expand 5G coverage. But it does not follow that every type of fee rises to the level of an “effective prohibition,” which is the line Congress drew in the Telecommunications Act. *See Cal. Payphone*, 12 F.C.C. Rcd. at 14209 (stating that, “standing alone,” the fact that providers “would generate less revenue . . . does not necessarily mean that [services] are impractical and uneconomic”) (quotations omitted); *cf. AT&T Corp. v. Iowa Utils. Bd.*, 525 U.S. 366, 390 n.11 (1999) (disagreeing “that a business can be impaired in its ability to provide services—even impaired in that ability in an ordinary, weak sense of impairment—when the business receives a handsome profit but is denied an even handsomer one”). A provider reinvestment theory, without more, would similarly appear to justify the preemption of any local policy that imposes costs on providers.

On this record, the FCC thus has not shown that above-cost fees effectively prohibit service in many, most, or a plurality of cases. I therefore cannot conclude that the agency has articulated “a rational connection between the facts found and the choice made.” *Motor Vehicle Mfgs. Ass’n v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983) (quotations omitted).

The FCC itself recognizes that “in theory, a sufficiently small departure from actual and reasonable costs might not

have the effect of prohibiting service,” but concludes its cost-based standard is still appropriate because “the record does not reveal an alternative, administrable approach to evaluating fees.” *Small Cell Order* ¶ 65 n.199. Concerns about administrability, though important as a policy matter, must still be operationalized under the statute’s effective prohibition standard. A rule prohibiting fees that exceed cost by \$1 would be equally administrable, but that does not mean such fees are invariably effective prohibitions on service, which is the relevant question under §§ 253(a) and 332(c)(7).

The *Order*’s safe harbors underscore my concerns. The FCC concedes that its safe harbors, which are not based on estimated costs, tolerate fee levels “in excess of costs in many cases.” *Small Cell Order* ¶ 79 n.233. That makes it more difficult to credit the agency’s finding that above-cost fees are *per se* effective prohibitions on service. The safe harbor also allows local governments to charge recurring fees of \$270, which is substantially greater than the \$150 cap on recurring fees used to calculate cost-savings in the Corning Study. There are also discrepancies between the FCC’s safe harbors for application fees and the Corning Study’s caps. The FCC does not estimate how much of the over \$2 billion in cost-savings from the Corning Study would be left over under its more expansive safe harbors. Nor has the agency explained what portion of that figure can be attributed to above-cost fees.

I would have vacated and remanded the *Small Cell Order*’s prohibition on above-cost fees. *See* 5 U.S.C. § 706(2)(A), (E). While the FCC’s objective of advancing 5G service is undoubtedly an important one, Congress set limits on when local actions can be preempted. While a prohibition on all above-cost fees may well be justifiable, I do

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not believe the FCC has sufficiently justified it on the present record. With the exception to its references to legislative history, I otherwise join the court's opinion in full.



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TECH FIX

What You Need to Know About 5G in 2020

*cited in City of Portland v. USA
No. 18-72689 archived on August 6, 2020*

After years of hype, carriers like AT&T and Verizon are giving consumers clarity on what their next-generation cellular networks will realistically do.



Glenn Harvey

By **Brian X. Chen**

Published Jan. 8, 2020 Updated April 10, 2020



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No. 18-72689 archived on August 6, 2020*

LAS VEGAS — Like many consumers, Kathryn Schipper, an attorney in Seattle, doesn't have a landline. She relies on her smartphone for calls and videoconferencing, but reception is spotty.

So she is excited about the arrival of [5G, the fifth-generation wireless network](#) that has been the subject of breathless speculation over the last few years. The new cellular standard, carriers have said, will reduce network congestion and pump out data so fast that smartphone users could download all the “Avengers” movies in a few minutes. It might even eventually [help cars drive themselves](#).

“[5G](#) seems like orders-of-magnitude improvement,” Ms. Schipper said. “I’ve also heard it’s much more reliable, so that matters to me.”

Yet the shift to [5G](#) feels like a tech revolution happening in slow motion. In

2019, AT&T and Verizon, the two largest American carriers, lit up their 5G networks in a small number of cities. Handset makers released only a handful of phones compatible with the new standard. The overwhelming majority of us saw no meaningful improvement to our cellular networks.

At [CES](#), the big consumer electronics show in Las Vegas this week, the carriers are insisting that 2020 will be a turning point for 5G. AT&T and Verizon say they expect their 5G networks to be accessible nationwide this year. In addition, the carriers say at least 15 smartphones will be 5G compatible this year, more than triple the number last year.

“2020 is pivotal because you’ve got a good foundation built, and the ecosystem starts to form,” said Kevin Petersen, a marketing executive for AT&T.

So what does that even mean? A major technology shift is underway, which may have an impact on your personal technology in the coming years. And unlike its predecessors, 5G is complex and more confusing.

Here’s what you need to know:

What is 5G?

In the simplest terms, 5G is a new cellular standard. Phone carriers have jumped to a new wireless standard roughly every decade. About 10 years ago, 4G, the fourth-generation network, arrived with significantly faster speeds and stronger reliability than 3G. About a decade before that, 3G arrived and was much faster and more robust than 2G. You get the picture.

Unfortunately, 5G is more complicated. There are a few flavors of 5G described with deeply technical jargon.

To make 5G easier to swallow, let’s rename the jargon into ice cream flavors:

The much-hyped, ultrafast variant of 5G is known as “millimeter wave,” but let’s call it rocky road. It lets carriers

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transmit data at incredibly fast speeds — the kind that would let you download an entire movie in a few seconds.

The problem with rocky road is that its signals travel shorter distances, covering a park in New York but not a broad swath of the city, for example. It also has trouble penetrating obstacles like walls. So Verizon and AT&T have focused deployment of rocky road in large spaces like sports stadiums and outdoor amphitheaters.

Because of the technical limitations of rocky road, we are unlikely to see it deployed nationwide anytime soon (if ever), meaning we won't be getting these incredible speeds in the vast majority of places.

Instead, this year our cellular networks will broadly shift to a version of 5G that is less exciting. Let's call this vanilla 5G.

Vanilla 5G will have speeds that are only slightly faster than current 4G networks. The main benefit will be a reduction of lag known as latency. For example, when you do a web search on your phone, the results usually won't load immediately; the lag can often last hundreds of milliseconds. In theory, 5G technology will shave this latency down to a few milliseconds. (To be clear, rocky road offers low-latency benefits, too.)

AT&T and Verizon say their 5G networks, which will be made up of mostly vanilla 5G and small scoops of rocky road, should be activated nationwide this year. T-Mobile, which put a priority on deploying vanilla 5G over rocky road, said its 5G network was available nationwide last year.

In short, the broad shift to 5G won't be mind blowing, but you will probably notice a marked improvement.

Will 5G be faster than Wi-Fi?

In some cases, yes. While Wi-Fi is also very fast, it pulls data from a

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broadband connection, which is susceptible to degraded performance when others nearby are using it. By design, 5G transmits high amounts of data more efficiently, so it is expected to significantly mitigate network congestion. There is a high likelihood that you will get a consistently strong, faster connection on 5G.

Do I need a new phone to get 5G?

Yes. You will have to buy a new phone with a 5G modem to connect with the new network technologies.

Most current 5G-compatible phones are expensive: [Samsung's Galaxy Note 10 Plus 5G](#), for example, costs \$1,300. But as the technology becomes more common in the next few years, prices should drop.

How much will 5G data plans cost?

The carriers are still tinkering with pricing.

Verizon's earliest 5G plans charged an extra \$10 a month for people with compatible smartphones to gain access to 5G. (It is currently waiving that fee as it builds out its 5G network.) However, Ronan Dunne, a Verizon executive, said the carrier was planning different types of packages. Some with access to both vanilla 5G and rocky road 5G could be priced higher, while plans with only vanilla 5G might be priced lower. (He declined to share specific prices.)

"Here's a plan which says this plan comes with ultralow latency, and it's part of a gamers' package, or it might be part of a movie and entertainment package," Mr. Dunne said. "Because of this ability to separate components of the network, you can see an evolution of a new type of pricing and plan model."

AT&T's so-called unlimited extra plan, which includes 5G access, costs \$75 a month for an individual line.

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T-Mobile said access to its 5G network was available to its subscribers at no additional cost.

What about 5GE?

AT&T, unfortunately, made 5G extra confusing for its customers. In late 2018, it rebranded parts of its existing 4G network as “5GE.” So AT&T customers with older 4G-compatible phones started seeing a “5GE” status icon on their screens.

For the sake of simplicity, let’s ignore 5GE altogether. It’s not real 5G.

AT&T’s vanilla version of 5G is branded 5G, and its rocky-road version is labeled 5G Plus.

Will I get 5G when I travel outside the United States?

It depends on where you go. (Some countries still lack thorough 4G coverage.) China is poised to have the largest 5G network in the world, and 5G is well underway in Japan and South Korea. The European Union’s goal is to release 5G in at least one major city in each member state this year, according to a study conducted for the [European Commission](#).

What will I do with 5G?

The benefits will probably feel subtle and significant.

Lower latency is crucial to future mobile applications. It could make virtual reality work more smoothly — like if you were watching a virtual-reality broadcast of a live sports game and wanted to look around the stadium.

Reduced lag may also improve gaming: If you were playing a shooting game with friends online, there would be less delay between button presses and your actions in the game.

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A reduction in latency will also help internet-connected devices talk to one another immediately. That is why technologists are looking to 5G deployment as a crucial step toward a world of autonomous cars. If one car is 5G equipped and so is the other, they can tell each other when they are braking. Or if the vehicle is signaling to turn right, it can communicate the turn to cars behind it so they can slow down or switch lanes.

“You can see why that’s not very relevant today but very useful tomorrow,” said Frank Gillett, a technology analyst for Forrester Research.

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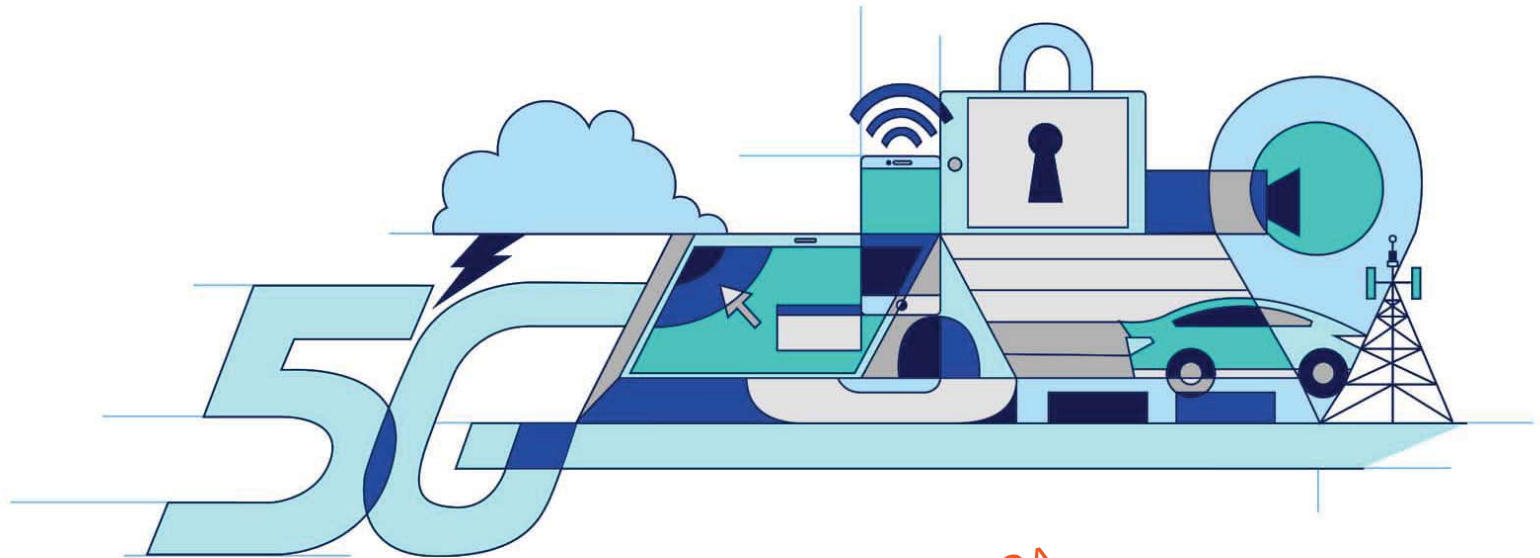
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What is 5G?

Your questions answered

By [Clare Duffy](#), [CNN Business](#)

Illustrations by Leah Abucayan

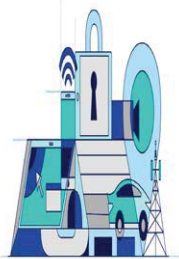
Published March 6, 2020

What is 5G?



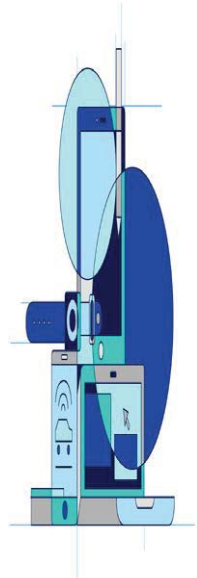
5G is next generation wireless network technology that's expected to change the way people live and work. It will be faster and able to handle more connected devices than the existing 4G LTE network, improvements that will enable a wave of new kinds of tech products. 5G networks began rolling out in the United States and around the world in 2018 and are still in their early days, but experts say the potential is huge.

Why 5G?



Companies are racing to have the fastest or largest 5G networks. And countries are competing to be the first to deploy fully functional, nationwide 5G. That's because the benefits of the new technology are expected to fuel transformative new technologies, not just for consumers but also for businesses, infrastructure and defense applications.

Benefits of 5G?



Much of the hype around 5G has to do with speed. But there are other perks, too. 5G will have greater bandwidth, meaning it can handle many more connected devices than previous networks. That means no more spotty service when you're in a crowded area. And it will enable even more connected devices like smart toothbrushes and self-driving cars.

5G will also reduce latency — the time it takes for a cell phone (or other connected device) to make a request from a server and get a response — to virtually zero. And it will make communication with cloud platforms (think Amazon Web Services and Microsoft Azure) faster and easier.

How does it work?

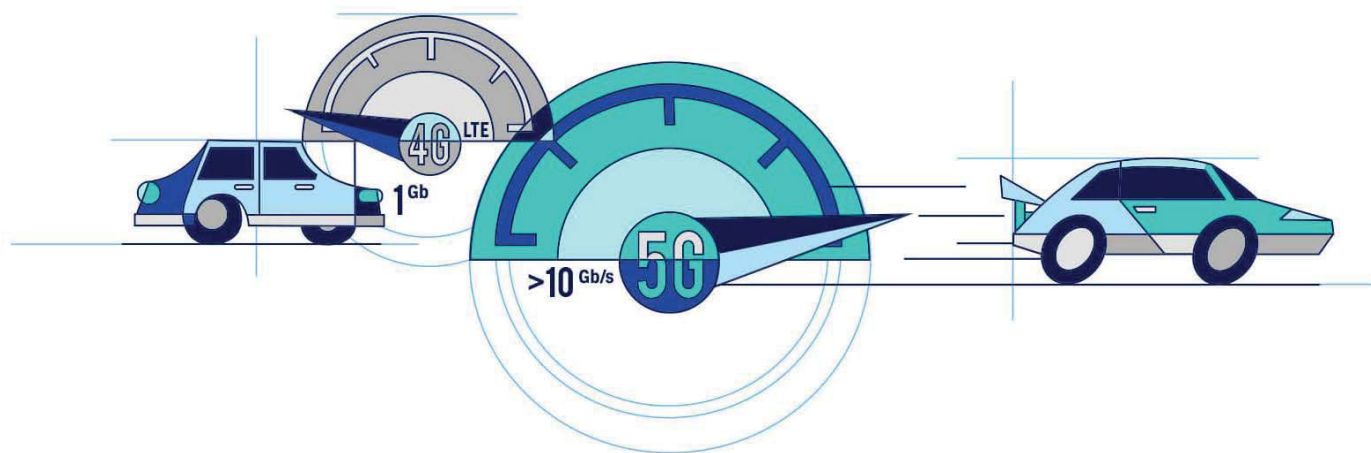


With 5G, signals run over new radio frequencies, which requires updating radios and other equipment on cell towers. There are three different methods for building a 5G network, depending on the type of assets a wireless carrier has: low-band network (wide coverage area but only about 20% faster than 4G), high-band network (superfast speeds but signals don't travel well and struggle to move through hard surfaces) and mid-band network (balances speed and coverage).

Carriers building superfast 5G networks must install tons of small cell sites — about the size of pizza boxes — to light poles, walls or towers, often in relatively small proximity to one another. For that reason, superfast networks are mostly being deployed city by city. Eventually, most US carriers will have a mix of the different network types that will enable both broad coverage and fast speeds.

Just how fast will download speeds be?

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The fastest 5G networks are expected to be at least 10 times faster than 4G LTE, according to wireless industry trade group GSMA. Some experts say they could eventually be 100 times faster. That's fast enough to download a two hour movie in fewer than 10 seconds, versus around 7 minutes with 4G. Actual download speeds will depend on a number of factors, including location and network traffic.

How can you use it?

In order to connect to and get the benefits of a 5G network, consumers have to have 5G-enabled devices. Samsung, Motorola, Huawei, LG, OnePlus and several other device makers have released 5G phones. Apple is widely expected to release a 5G iPhone later in fall 2020. Some companies — including manufacturers and the NFL — are also working with carriers to install personal 5G networks so they can reap the benefits without waiting for the nationwide rollout.

Are there drawbacks?

Significant adoption of 5G is going to take years — industry trade group GSMA estimates that by 2025, around half of mobile connections will be 5G (the rest will be older tech, like 4G and 3G). There are also concerns among regulators and others about the security of 5G, especially since crucial technologies such as self-driving cars and healthcare systems will be built on top of the network.

Development by Ivory Sherman

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What Is 5G?

All of the US carriers have now launched some form of 5G cellular network. But what exactly is 5G, and how fast is it compared with 4G? Here are the facts we know so far.

By [Sascha Segan](#)

Updated April 6, 2020



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The race to 5G is on. All four major US carriers now have some form of 5G wireless. We're tracking the rollouts monthly on our [Race to 5G](#) page.

But 5G is currently very confusing. Three major flavors of 5G have come out: low-band, mid-band, and high-band, all of which perform very differently from each other. We've been testing all of them as they appear. The most widespread version, low-band, operates and performs pretty much like 4G.

5G is an investment for the next decade, and in previous mobile transitions, we've seen most of the big changes happening years after the first announcement. Take 4G, for instance. The first 4G phones in the

US appeared in 2010, but the sorts of 4G applications that changed our world didn't appear until later. Snapchat came in 2012, and Uber became widespread in 2013. Video calls over LTE networks also became widespread in the US around 2013.

So following that plan, while we're getting a little bit of 5G right now, you should expect the big 5G applications to crop up around 2021 or 2022. Until then, things are going to be confusing as wireless carriers jockey for customers and mindshare.

5G stands for fifth-generation cellular wireless, and the initial standards for it were set at the end of 2017. Let us take you down the 5G rabbit hole to give you a picture of what the upcoming 5G world will be like.

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1G, 2G, 3G, 4G, 5G

First of all, if you're hearing about 5G Wi-Fi or AT&T's "5G E" phones, they aren't 5G cellular. Here's a full explainer on [5G vs. 5G E vs. 5GHz: What's the Difference?](#)

And if you're hearing that 5G means millimeter-wave towers on every lamppost, that's not true. That's only one of the three main forms of 5G we're seeing right now.

The G in this 5G means it's a generation of wireless technology. While most generations have technically been defined by their data transmission speeds, each has also been marked by a break in encoding methods, or "air interfaces," that make it incompatible with the previous generation.

1G was analog cellular. 2G technologies, such as CDMA, GSM, and TDMA, were the first generation of digital cellular technologies. 3G technologies, such as EVDO, HSPA, and UMTS, brought speeds from 200kbps to a few megabits per second. 4G technologies, such as WiMAX and LTE, were the next incompatible leap forward, and they are now scaling up to hundreds of megabits and even gigabit-level speeds.

5G brings three new aspects to the table: bigger channels (to speed up data), lower latency (to be more responsive), and the ability to connect a lot more devices at once (for sensors and smart devices).

The actual 5G radio system, known as 5G-NR, isn't the same as 4G. But all 5G devices in the US, for now, need 4G because they'll lean on it to make initial connections before trading up to 5G where it's available. That's technically known as a "non standalone," or NSA, network. Later this year, our 5G networks will become "standalone," or SA, not requiring 4G coverage to work.

It turns out that SA 5G is much more important than we thought it was in 2019. Except on Sprint, carriers' 5G cells are shaped differently than their 4G ones, so they're losing coverage where the 4G signal cuts out but the 5G one continues. When the networks evolve into standalone mode, we may see a sudden growth in urban coverage.

4G will continue to improve with time, as well. The Qualcomm X24 modem, which is built into most 2019 and 2020 Android flagship phones, supports 4G speeds up to 2Gbps. The real advantages of 5G will come in massive capacity and low latency, beyond the levels 4G technologies can achieve.

That symbiosis between 4G and 5G has caused AT&T to get a little overenthusiastic about its 4G network. The carrier has started to call its 4G network "5G Evolution," because it sees improving 4G as a major step to 5G. It's right, of course. But the phrasing is designed to confuse less-informed consumers into thinking 5G Evolution is 5G, when it isn't.

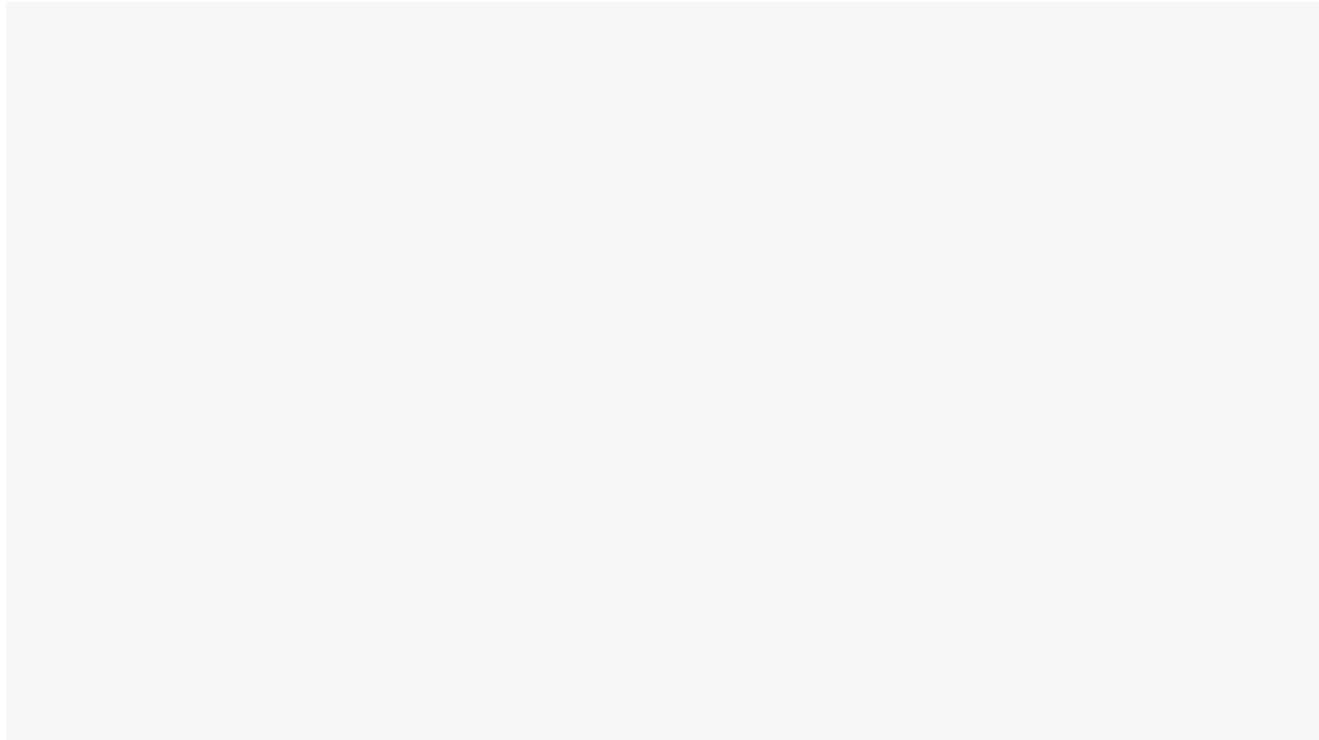
Low, Middle, and High

5G gives carriers more options in terms of airwaves than 4G did. Most notably, it opens up "high-band," short-range airwaves that didn't work with 4G technology. But 5G can run on any frequency, leading to three very different kinds of 5G experiences—low, middle, and high.

The key thing to understand here is that 5G speeds are directly related to how wide the available channels are, and how many are available. With 4G, you can combine up to seven, 20MHz channels to use a total of 140MHz of spectrum. Most of the time, though, phones are using 60MHz or less.

With current phones in low- and mid-band 5G, you can combine two 100MHz channels, for 200MHz usage—and stack three more 20MHz 4G channels on top of that. In high-band 5G, you can use up to *eight* 100MHz channels. The great speeds 5G carriers promise are just about leveraging more airwaves at once. But if you don't have the airwaves available, you don't get the speeds.

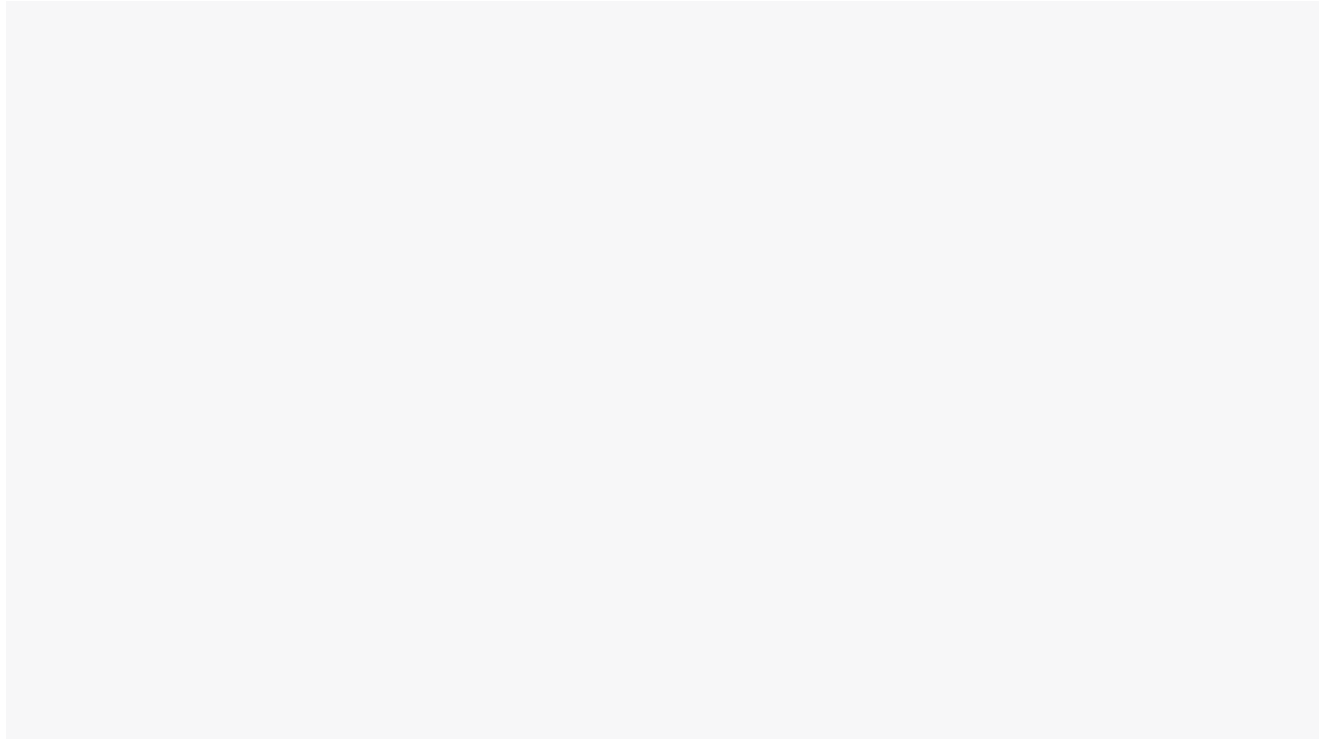
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Average 5G download speeds, December 2019—AT&T is high-band only

Right now, networks need to put up 'walls' between their 4G and 5G channels. The two can't coexist closely. Later in 2020, that will change with a technology called dynamic spectrum sharing, or **DSS**. DSS makes the walls flexible and movable, so carriers can dynamically split channels between 4G and 5G based on demand. AT&T and Verizon will both be using DSS heavily, and that will require DSS-compatible phones.

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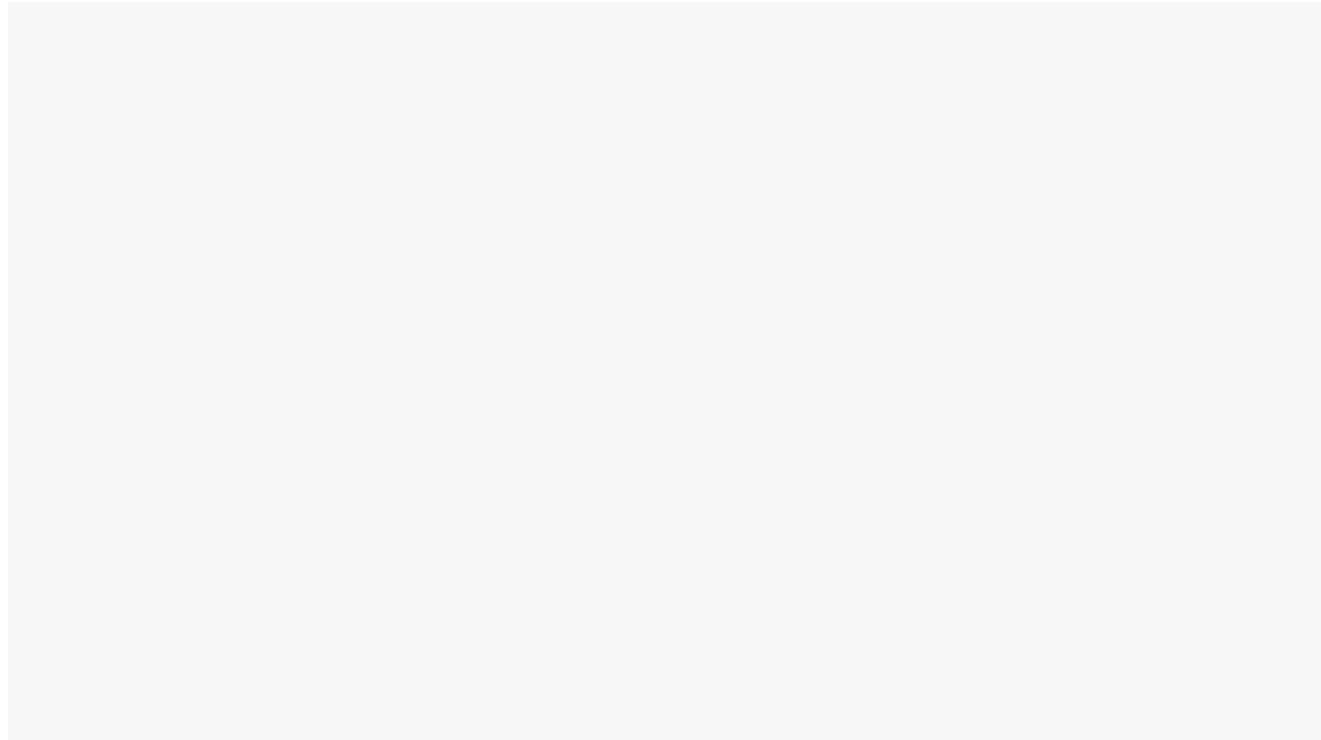
T-Mobile's low-band 5G airwaves have excellent coverage

Low-band 5G operates in frequencies below 2GHz. These are the oldest cellular and TV frequencies. They go great distances, but there aren't very wide channels available, and many of those channels are being used for 4G. So low-band 5G is slow. It acts and feels like 4G, for now. Low-band 5G channels are from 5MHz in width (for AT&T) up to 20MHz (for T-Mobile), so you can see they aren't roomier than 4G.

Complicating things, AT&T and T-Mobile low-band phones sometimes show 5G icons when they aren't even using 5G, making it hard to tell any difference.

Mid-band 5G is in the 2-10GHz range. That covers most current cellular and Wi-Fi frequencies, as well as frequencies slightly above those. These networks have decent range from their towers, often about half a mile, so in most other countries, these are the workhorse networks carrying most 5G traffic. Most other countries have offered around 100MHz to each of their carriers for mid-band 5G. Here in the US, New T-Mobile will use Sprint's spectrum for a mid-band network, using up to 120MHz per city. AT&T and Verizon will shave off little bits of their 4G spectrum using DSS for mid-band 5G, 10MHz here and 10 there.

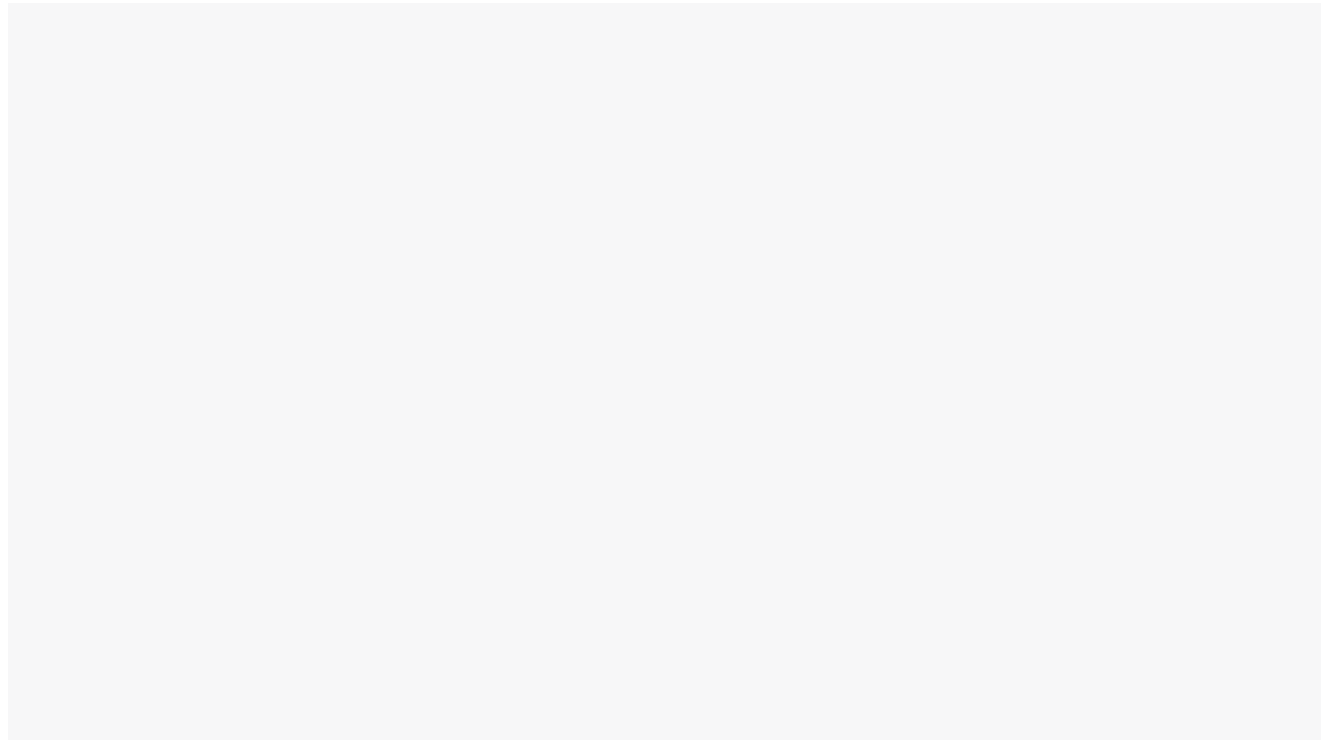
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High-band 5G is much faster than 4G

High-band 5G, or millimeter-wave, is the really new stuff. So far, this is mostly airwaves in the 20-100GHz range. These airwaves haven't been used for consumer applications before. They're very short range; our tests have shown about 800-foot distances from towers. But there's vast amounts of unused spectrum up there, which means very fast speeds using up to 800MHz at a time. Verizon relies extensively on high-band, which it calls "ultra wideband." AT&T has some, in small parts of 35 cities. T-Mobile has a bit, more broadly in 7 cities.

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T-Mobile describes the three forms of 5G as a 'layer cake'

High bands have been used before for backhaul, connecting base stations to remote internet links. But they haven't been used for consumer devices before, because the handheld processing power and miniaturized antennas weren't available. Millimeter-wave signals also drop off faster with distance than lower-frequency signals do, and the massive amount of data they transfer will require more connections to landline internet. So cellular providers will have to use many smaller, lower power base stations (generally outputting 2-10 watts) rather than fewer, more powerful macrocells (which output 20-40 watts) to offer the multi-gigabit speeds that millimeter-wave networks promise. Because of the very fast drop-off, the waves are quite weak when they get to you.

In many major cities, the carriers installed these "small cells" to increase 4G capacity starting in 2017. (From my office window in New York, I can see several small cell sites.) In those cities, they just need to bolt an extra radio onto the existing site to make it 5G. There's a struggle going on elsewhere, though, where carriers are having trouble convincing towns to let them add small cells to suburban neighborhoods. That's similar to previous struggles over establishing cellular service at all in many of these towns.

How 5G Works

Like other cellular networks, 5G networks use a system of cell sites that divide their territory into sectors and send encoded data through radio waves. Each cell site must be connected to a network backbone, whether through a wired or wireless backhaul connection.

5G networks use a type of encoding called OFDM, which is similar to the encoding that 4G LTE uses. The air interface is designed for much lower latency and greater flexibility than LTE, though.

With the same airwaves as 4G, the 5G radio system can get about 30 percent better speeds thanks to more efficient encoding. The crazy gigabit speeds you hear about are because 5G is designed to use much larger channels than 4G does. While most 4G channels are 20MHz, bonded together into up to

140MHz at a time, 5G channels can be up to 100MHz, with Verizon using as much as 800MHz at a time. That's a much broader highway, but it also requires larger, clear blocks of airwaves than were available for 4G.

That's where the higher, short-distance millimeter-wave frequencies come in. While lower frequencies are occupied by 4G, by TV stations, by satellite firms, or by the military, there had been a huge amount of essentially unused higher frequencies available in the US, so carriers could easily construct wide roads for high speeds.

5G networks need to be much smarter than previous systems, as they're juggling many more, smaller cells that can change size and shape. But even with existing macro cells, Qualcomm says 5G will be able to boost capacity by four times over current systems by leveraging wider bandwidths and advanced antenna technologies.

The goal is to have far higher speeds available, and far higher capacity per sector, at far lower latency than 4G. The standards bodies involved are aiming at 20Gbps speeds and 1ms latency, at which point very interesting things begin to happen.

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AT&T (left) and T-Mobile (right) cover much of the Providence area with low-band 5G

Where Is 5G Available?

5G is now "nationwide," although with the very different approaches to 5G, you're going to have very different experiences in different places.

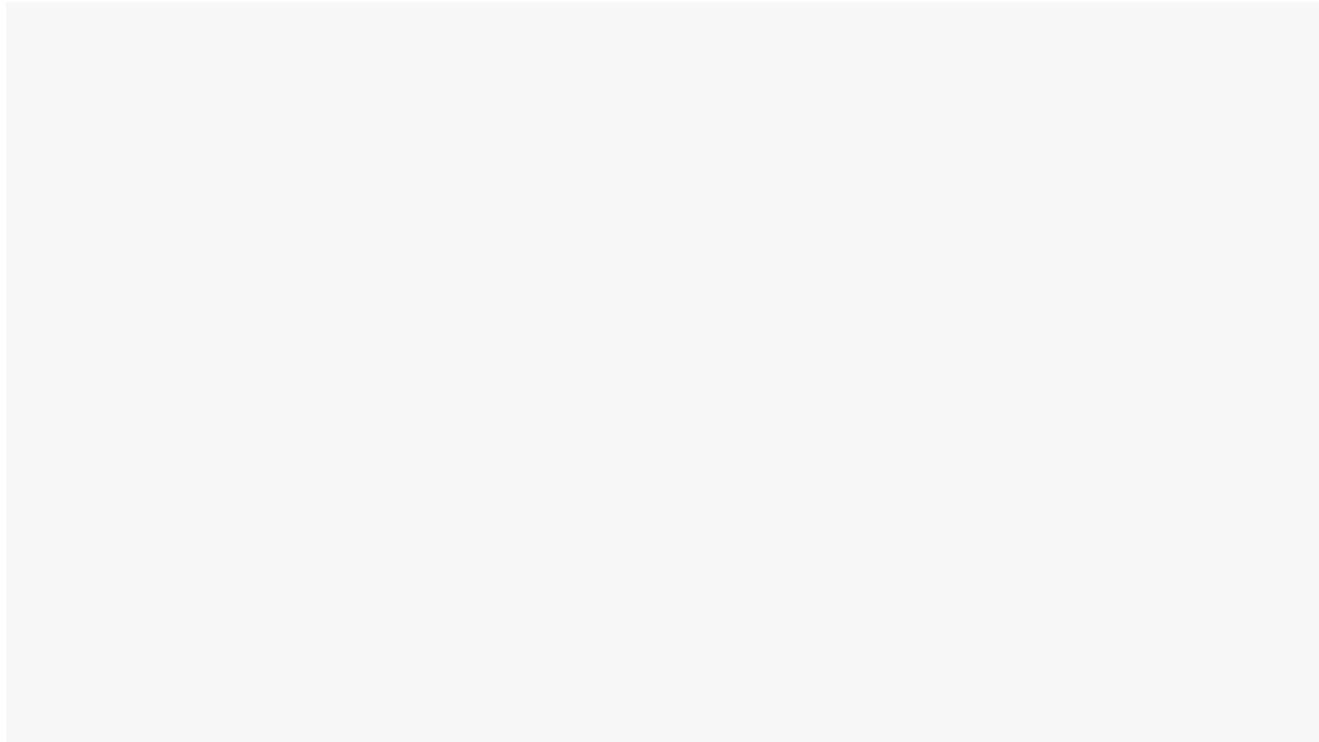
Verizon has fast, high-band 5G in parts of 34 cities, with [online coverage maps here](#).

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Verizon has 5G in more than 30 cities nationwide

New T-Mobile currently has a slow nationwide low-band 5G network that covers most of the country; Sprint mid-band in 10 cities, with a [coverage finder here](#); and T-Mobile high-band in [seven cities](#) (the ones listed in that link, plus Miami).

AT&T has slow low-band across about a third of the country and high-band in 35 cities, which it doesn't give maps for and is unnecessarily confusing about the coverage of. It calls the low-band "5G" and the high-band "5G+." The company has low-band maps and a high-band city list [here](#).



Verizon 5G is fast, if you can find it

Which 5G Phones Are Coming Out?

We're currently on the second generation of 5G phones. The first generation, using the Qualcomm X50 modem, didn't support the US low-band networks or DSS, and overheated during the summer. We do not recommend those any more. The second generation, using the X55 modem, appears to be doing better, but we haven't tested them in summer yet.

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The first truly all-carrier, all-band 5G phones hit the US market in 2020. The Samsung Galaxy S20+ and S20 Ultra work on low, middle, and high bands, on all three major US carriers.

The LG V60 also features 5G, although it's low- and mid-band only on AT&T and T-Mobile, and high-band on Verizon. The OnePlus 8 and OnePlus 8 Pro will both support 5G, OnePlus CEO Pete Lau promised, but he didn't give details on what frequencies. The Nokia 8.3 will have low- and mid-band 5G for US networks when it appears this summer.

The OnePlus 7T Pro 5G McLaren, on T-Mobile, and the Samsung Galaxy Note 10+, on various carriers, also feature the X55 modem.

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The Samsung Galaxy S20 Ultra can handle all forms of 5G

Other countries have many more 5G phones, with models from Oppo, Huawei, Xiaomi, Realme and others hitting shelves around the world. They generally don't work on US 5G networks because they don't support our frequency bands; they use European and Asian mid-band systems we don't have here.

The first 5G iPhone is widely understood to have been planned to come out this September, although there are conflicting reports on whether or not it will be delayed because of the coronavirus crisis. It's not even just that virus lockdowns are messing up the supply chain; some reports have said Apple doesn't think the demand will be there if the world is still locked down.

You can check out our current rundown of The Best 5G Phones here.

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- What Will 5G Do for Rural Areas?
- T-Mobile 5G Secrets Revealed: Here's Where It Doesn't Work Well

Is 5G Safe?

Yes. Online conspiracy theories have blamed 5G for everything from cancer to coronavirus, but they tend to fall apart at the slightest tap of actual facts. Low-band and mid-band 5G are based on radio frequencies that have been used for decades. Low-band 5G uses UHF TV bands, which have been in use since 1952. Sprint's mid-band has been in use since 2007.

The greatest 5G worries in the US tend to be around high-band, or millimeter-wave, 5G. This is the short-range type that requires a lot of small cell sites, so the infrastructure is more visible than it was before. The ironic thing about worrying that millimeter-wave will fry your cells isn't that it's too strong, but that it's too weak—it's blocked by leaves, walls, glass, cars, clothing, and skin.

Power levels are extremely important. Bluetooth and microwave ovens run on the same frequency. Because millimeter-wave signals are technically called microwave, some people are convinced they are literal microwave ovens that will fry us. But a firefly isn't a blowtorch—and the 5G systems are more on the firefly end of things.

Studies of mmWave have shown that it doesn't penetrate human skin well and that its strongest effect, at levels of power higher than any 5G network uses, is that it makes things slightly warmer. At the levels 5G networks use, there's no perceptible effect on people.

But the most self-condemning thing about the mutable 5G conspiracists is that they don't care about any of these details. A popular petition in the UK claimed that 5G runs at "60 megahertz" and is "sucking all of the oxygen out of the air." It got more than 114,000 signatures on change.org before being deleted. 60 megahertz is much lower than any wireless network frequency; they might mean 60GHz, but no 5G

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network is using that, either. As for the oxygen, well, there's a network of pseudo-scientists with degrees in things like "natural health" who are claiming all sorts of complete nonsense on YouTube.

Here's a good UK story that digs into the [details about 5G safety](#). [Phone Scoop](#) also has a strong article on the issue from the US perspective.

What's 5G For?

Most of the real-world 5G demos we've seen just involve people downloading Netflix very quickly on their phones. That kind of usage is table stakes, just to get the networks built so more interesting applications can develop in the future.

On phones, OnePlus CEO Pete Lau said that 5G could [make onboard storage irrelevant](#), which dovetails with ideas I heard around the launch of the Samsung Galaxy S20. The Galaxy S20 takes huge 108-megapixel photos and 8K videos, which quickly eat up your storage and are difficult to upload, unless you have a fast 5G connection. On a trip to Korea, I found that [high-quality video chat](#) was a major driver for wanting 5G.

5G home internet shows one major advantage over 4G: huge capacity. Carriers can't offer competitively priced 4G home internet because there just isn't enough capacity on 4G cell sites for the 190GB of monthly usage most homes now expect. This could really increase home internet competition in the US, where, according to a 2016 FCC report, 51 percent of Americans only have one option for 25Mbps or higher home internet service. For its part, Verizon says its 5G service will be [truly unlimited](#).

5G home internet is also much easier for carriers to roll out than house-by-house fiber optic lines. Rather than digging up every street, carriers just have to install fiber optics to a cell site every few blocks, and then give customers wireless modems. Verizon chief network officer Nicki Palmer said the home internet

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service would eventually be offered wherever Verizon has 5G wireless, which will give it much broader coverage than the carrier's fiber optic Fios service.

Verizon has dragged its feet on bringing 5G home internet to more than the five cities it serves right now, largely because it's waiting for home modems that use the newer Qualcomm QTM527 antenna. This antenna module can greatly extend the range of high-band 5G networks. It's too big and power-hungry to go into phones, but it's perfect for home units. The last I heard from Verizon, these modems will come out in the latter half of this year. Inseego, among others, wants to make these home modems.

On a trip to Oulu, Finland, where there's a 5G development center, we attended a 5G hackathon. The top ideas included a game streaming service; a way to do stroke rehab through VR; smart bandages that track your healing; and a way for parents to interact with babies who are stuck in incubators. All of these ideas need either the high bandwidth, low latency, or low-power-low-cost aspects of 5G.

We also surveyed the 5G startups that Verizon is nurturing in New York. At the carrier's Open Innovation Lab, we saw high-resolution wireless surveillance cameras, game streaming, and virtual reality physical therapy.

Our columnist Michael Miller thinks that 5G will be most important for industrial uses, like automating seaports and industrial robots.

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Driverless cars might need 5G

Driverless cars may need 5G to really kick into action, our editor Oliver Rist explains. The first generation of driverless cars will be self-contained, but future generations will interact with other cars and smart roads

to improve safety and manage traffic. Basically, everything on the road will be talking to everything else.

To do this, you need extremely low latencies. While the cars are all exchanging very small packets of information, they need to do so almost instantly. That's where 5G's sub-one-millisecond latency comes into play, when a packet of data shoots directly between two cars, or bounces from a car to a small cell on a lamppost to another car. (One light-millisecond is about 186 miles, so most of that 1ms latency is still processing time.)

Another aspect of 5G is that it will connect many more devices. Right now, 4G modules are expensive, power-consuming, and demand complicated service plans, so much of the Internet of Things has stuck with Wi-Fi and other home technologies for consumers, or 2G for businesses. 5G will accept small, inexpensive, low-power devices, so it'll connect a lot of smaller objects and different kinds of ambient sensors to the internet.

The biggest change 5G may bring is in virtual and augmented reality. As phones transform into devices meant to be used with VR headsets, the very low latency and consistent speeds of 5G will give you an internet-augmented world, if and when you want it. The small cell aspects of 5G may also help with in-building coverage, as it encourages every home router to become a cell site.

We're continuing to track all of the rollouts, testing them city by city, on our [Race to 5G page](#).

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About Sascha Segan



PCMag.com's lead mobile analyst, Sascha Segan, has reviewed more than 1,100 smartphones, tablets and other gadgets in more than 15 years with PCMag. He's the head of our Fastest Mobile Networks projects in the US and Canada, runs our Race to 5G tracker, and writes opinions on tech and society. Segan is also a multiple award-winning travel writer. Other than his home town of New York, his favorite cities are Barcelona and Hong Kong. While he's a fourth-generation Manhattanite, he now lives in Queens with his wife and daughter.

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