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AM Broadcast Radio in Motor Vehicles

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SUMMARY

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AM Broadcast Radio in Motor Vehicles

More than 4,000 U.S. broadcast radio stations use amplitude modulation (AM) frequencies—a technology more than 100 years old—to transmit audio programming containing news, music, and information to listeners. AM radio also supports national and local emergency alerting systems. Since 2014, several motor vehicle manufacturers have opted not to include broadcast AM radio in electric vehicles (EVs).

Because motor vehicles are the most popular location for people to listen to radio, losing access in vehicles poses an economic threat to broadcast radio stations. Broadcast radio stations generate most of their revenue from advertisers seeking to reach the stations' listeners. In addition to excluding AM broadcast radio, some original equipment manufacturers (OEMs) have opted to exclude equipment designed to receive satellite transmission from the 20-year-old radio service SiriusXM, which, similar to broadcast radio stations, has relied on access to drivers and passengers to generate revenue. In addition, the emergence of the infotainment interfaces from Apple Inc. (CarPlay) and Alphabet Inc. (Android Auto), which enable drivers to access audio news and entertainment via applications (apps), has led some OEMs to claim that listeners do not need broadcast receivers to listen to programming from AM stations that simulcast via mobile apps.

Several EV manufacturers assert that their vehicle models' electronic equipment interferes with the reception of AM broadcast signals, thereby obstructing the consumer benefits of AM broadcast receivers. The Federal Communications Commission (FCC) has statutory jurisdiction over electronic equipment that can interfere with broadcast reception. In 1980, the agency chose to exempt motor vehicle equipment from its licensing requirements, stating that including it would require further study. The exemption remains in place. The U.S. Department of Transportation's (DOT's) National Highway Traffic Safety Administration (NHTSA) establishes safety standards for, but does not preapprove, electronic equipment in vehicles.

Broadcasters and seven former administrators of the Federal Emergency Management Agency (FEMA) state that the lack of access to broadcast transmissions from AM radio stations could impede the ability of drivers and passengers to receive national and local emergency alerts. AM radio stations serve two roles during emergency alerts: (1) they are initial points of contact for presidential and nonpresidential emergency alerts in the broadcast-based transmission system regulated by the FCC, and (2) they provide one of several technology-based communications pathways for nonpresidential emergency alerts. Other pathways include communication by satellite transmissions and wireless transmission using cellular technology.

If Congress chooses to address the issue of the availability of AM radio in motor vehicles, it may consider one or more options, some of which are included in S. 315, the AM Radio for Every Vehicle Act of 2025, as reported, and H.R. 979, a bill "to require the Secretary of Transportation to issue a rule requiring access to AM broadcast stations in motor vehicles, and for other purposes." Both bills would sunset the rule and its enforcement rule 10 years after the date of enactment. In addition, both bills would direct DOT to study the role of and consider alternatives to AM radio in the transmission of national and emergency alerts, at least once every five years, in coordination with the FEMA Administrator and the FCC. Additional options include (1) increasing the FCC's jurisdiction over motor vehicle equipment to reduce the risk of interference with broadcast radio stations and (2) monitoring industry developments while conducting oversight.

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Introduction

Broadcast radio—a technology over 100 years old[1]—is a communications system that transmits soundwaves one-way, to many points at once, using radio frequency energy.[2] Other uses of radiofrequency (RF) energy are, for example, point-to-point telecommunications services, including mobile wireless services and satellite communications.[3]

The oldest form of commercial broadcast radio—broadcast radio programming interspersed with advertising[4]—is amplitude modulation (AM) radio.[5] The term *modulation* refers to the process of varying some characteristic of the electrical carrier when transmitting the soundwaves.[6] With AM radio, the *amplitude*, or overall strength of a signal, is varied to encode sound information.[7] As of March 31, 2025, 4,367 AM radio stations operate in the United States.[8]

Due to their technical characteristics, AM radio broadcasts are more susceptible than frequency modulation (FM)[9] radio broadcasts to interference from electronic devices, vehicle engines, power lines, phone chargers, light bulbs, computer monitors, and flat-screen television.[10] During the last 10 years, several motor vehicle manufacturers, known as "original equipment manufacturers" (OEMs),[11] have opted not to include broadcast AM radio in battery-powered electric vehicles (EVs).[12] Some OEMs claim that EVs' in-vehicle systems interfere with AM radio station signals. In addition, some OEMs maintain that listeners can receive the same programming via applications (apps) and mobile wireless communications.

In addition to providing news, information, music, and entertainment programming, AM radio stations serve two roles in the transmission of national presidential and local emergency alerts. AM stations are (1) the initial points of contact for messages from national and local offices that

[1] Federal Communications Commission (FCC), "History of Commercial Radio: Celebrating 100 Years of Commercial Radio," https://www.fcc.gov/media/radio/history-of-commercial-radio. The FCC defines an *AM broadcast station* as "a broadcast station licensed for the dissemination of radio communications intended to be received by the public and operated on a channel in the band of frequencies extending from 535 to 1705 kHz." 47 C.F.R. §74.14.

[2] According to the FCC, "Electromagnetic radiation consists of waves of electric and magnetic energy moving together (i.e., radiating) through space at the speed of light. Taken together, all forms of electromagnetic energy are referred to as the electromagnetic 'spectrum.' Radio waves and microwaves emitted by transmitting antennas are one form of electromagnetic energy. They are collectively referred to as 'radiofrequency' or 'RF' energy or radiation." FCC, Electromagnetic Compatibility Division, "RF Safety FAQ," https://www.fcc.gov/engineering-technology/electromagnetic-compatibility-division/radio-frequency-safety/faq/rf-safety.

[3] FCC, "RF Safety FAQ."

[4] FCC, Media Bureau, Video Division, "The Public and Broadcasting, The Licensing of TV and Radio Stations, Commercial and Noncommercial Educational Stations," revised September 2021, https://www.fcc.gov/media/radio/public-and-broadcasting#NCECOMM.

[5] FCC, "AM Radio," https://www.fcc.gov/general/am-radio/.

[6] Newton, *Newton's Telecom Dictionary*, 2016, p. 759.

[7] Public Broadcasting System, WGBH, "Radio Transmission: FM vs. AM: What's the Difference?," https://www.pbs.org/wgbh/aso/tryit/radio/radiorelayer.html. FCC, "FM Radio," https://www.fcc.gov/general/fm-radio.

[8] FCC, "Broadcast Station Totals as of March 31, 2025," April 4, 2025, https://docs.fcc.gov/public/attachments/DA-25-296A1.pdf.

[9] FCC, "FM Radio," https://www.fcc.gov/general/fm-radio.

[10] FCC, "Revitalization of the AM Radio Service, Notice of Proposed Rulemaking, FCC 13-139," 28 *FCC Record* 15221, 15223 (hereinafter 2013 FCC AM Radio NPRM). See also Newton, *Newton's Telecom Dictionary*, 2016, p. 514.

[11] Garrett Nelson and Xiong Jun Goon, "Automobile Manufacturers," CFRA, *Industry Surveys*, November 2024, p. 10.

[12] Joey Caparella, "Electric Cars vs. Gas Cars: Everything You Need to Know," *Car & Driver*, August 8, 2022, https://www.caranddriver.com/research/a32781943/electric-cars-vs-gas-cars/.

are retransmitted to other electronic media and (2) the foundations of backup communications systems for wireless and internet services in the event natural disasters disrupt them.[13]

Citing a national interest in ensuring motorists can receive emergency alerts via AM broadcast stations, some Members of the 119th Congress introduced the AM for Every Vehicle Act of 2025 (S. 315, as reported, and H.R. 979). Both bills would direct the U.S. Department of Transportation (DOT) to require OEMs to include broadcast AM radio receivers in future motor vehicles made and sold in the United States. DOT's authority to implement and enforce this provision would expire 10 years after the bill's enactment.

This report provides background information and analysis of the technological, public safety, economic, and jurisdictional issues related to the availability of broadcast AM radio receivers in motor vehicles. For context, this report begins with a description of the developments in the broadcast radio and motor vehicle industries that affect broadcasters' and some OEMs' positions regarding these issues.

Audio Entertainment in Motor Vehicles

In its *2022 Communications Marketplace Report*, the Federal Communications Commission (FCC) stated that, for several decades, broadcast radio offered advertisers a unique opportunity to reach listeners in vehicles.[14] In the 21st century, other in-vehicle audio entertainment options—specifically satellite digital audio radio services (SDARS) and apps accessible through consumers' smartphones—began to emerge, creating competition for broadcast radio. Between 1998 and 2023, broadcast radio station industry revenue, when adjusted for inflation, declined. The drop in revenue coincided with both the nationwide decline in advertising spending during economic recessions,[15] as well as the emergence of competition for audience attention and advertising dollars from SiriusXM and apps available via Apple CarPlay and Android Auto.

Broadcast Radio

Broadcast radio stations depend on advertising revenue derived from their ability to reach listeners broadly. In the 20th century, technological developments and consumer demand led OEMs to install radios as standard equipment in most motor vehicle models. By the mid-1970s, 90% of motor vehicles had radios.[16] Of the 100 top-selling newly manufactured motor vehicles surveyed between November 2023 and January 2024, 98 reportedly included AM radio

[13] The Integrated Public Alert and Warning System Modernization Act of 2015 (P.L. 114-143) directed the Federal Emergency Management Agency (FEMA)—a component of the U.S. Department of Homeland Security (DHS)—to, among other actions, (1) establish common alerting and warning protocols, standards, terminology, and operating procedures for a public alert and warning system and (2) include in such system the capability to adapt the distribution and content of communications on the basis of geographic location, risks, and multiple communication technologies. FEMA describes the multiple communication pathways on its website. DHS, FEMA, "Integrated Public Alert and Warning System," https://www.fema.gov/emergency-managers/practitioners/integrated-public-alert-warning-system.

[14] FCC, *2022 Communications Marketplace Report*, Report no. FCC 22-2103, December 30, 2022.

[15] Alvin J. Silk and Ernst R. Berndt, "Aggregate Advertising Expenditure in the U.S. Economy: Measurement Growth Issues in the Digital Era," *Foundations and Trends in Marketing*, vol. 15, no. 1 (September 2021), p. 7. (Finding evidence that during the period 2000-2008, "nominal aggregate advertising spending had become more responsive to changes in real GDP [gross domestic product] and GDP price inflation.")

[16] Rob Siegel, "History of Obsolete Car Audio, Part 1, Early Radio," *Automotive History* (blog), The Hagerty Group, Inc., December 11, 2017, https://www.hagerty.com/media/automotive-history/history-of-early-radio/.

receivers.[17] Another consumer survey reported that vehicles were the number one listening location for over-the-air radio station content as of 2023,[18] representing a 39% share of total listening modes.[19] Broadcast radio's share relative to other listening modes has declined since 2013, when the share was 58%.[20]

SiriusXM

The subscription satellite radio services XM and Sirius launched in September 2001 and February 2002, respectively.[21] These services are knowns as satellite digital audio radio services (SDARS).[22] During the 10 years following the companies' launch dates, an increasing number of new U.S. motor vehicles included SDARS.[23] By 2024, SDARS receivers were factory-installed in nearly 80% of all new vehicles sold in the United States.[24]

Some EV manufacturers have opted to forego factory installation of satellite receivers. At a March 2024 investor conference, SiriusXM CEO Jennifer C. Witz stated that the company's "penetration rates among EVs manufactured by … the more traditional OEMs are very strong," and that its exclusion from several models manufactured by Tesla—which makes only EVs—"is the big gap there."[25]

[17] Quu, *2024 In-Vehicle Visuals Report: Radio's Place in America's Top-Selling New Vehicles*, April 2024, p. 8, https://myquu.net/wp-content/uploads/2024/04/Quu_2024-In-Vehicle-Visuals-Report.pdf.

[18] The results from the 2023 report are based on a survey of 30,011 respondents within the United States and Canada. For more on the methodology, see Jacobs Media, *TechSurvey 2023 Results: Radio in the Post-Pandemic Era* (slide deck), 2023, p. 2, https://jacobsmedia.com/techsurvey-2023/.

[19] Fred Jacobs, "When It Comes to AM/FM Radio, 'Try a Little Tenderness,'" *JacoBlog* (blog), Jacobs Media, December 11, 2023, https://jacobsmedia.com/when-it-comes-to-am-fm-radio-try-a-little-trenderness/. Jacobs Media is a research and consulting firm for broadcasting and other media companies.

[20] Clyde Smith, "Jacob Media's Tech Survey Shows Annual Slip for AM/FM Radio and TV," *Hypebot*, June 17, 2013, https://www.hypebot.com/hypebot/2013/06/jacobs-medias-techsurvey9-reveals-annual-slip-for-both-amfm-radio-and-tv-infographic.html.

[21] "C-SPAN, Satellite Radio Launch," *C-SPAN*, September 25, 2001, https://www.c-span.org/video/?166288-1/satellite-radio-launch; and Brian Santo, "The Consumer Electronics Hall of Fame: SiriusXM Satellite Radio System," *IEEE Spectrum*, October 31, 2019, https://spectrum.ieee.org/the-consumer-electronics-hall-of-fame-siriusxm-satellite-radio-system.

[22] The FCC defines *SDARS* as "radiocommunication service[s] in which audio programming is digitally transmitted by one or more space stations directly to fixed, mobile, and/or portable stations, and which may involve complementary repeating terrestrial transmitters and telemetry, tracking and command facilities." 47 C.F.R. §25.103.

[23] SiriusXM Radio, "Sirius XM Radios Factory Installed in More Than 50 Million Vehicles," press release, August 22, 2012, https://investor.siriusxm.com/news-events/press-releases/detail/221/siriusxm-radios-factory-installed-in-more-than-50-million (hereinafter SiriusXM 2012 press release). Sirius and XM merged in July 2008. SiriusXM Radio, "Sirius and XM Complete Merger," press release, July 29, 2008, http://s1.q4cdn.com/750174072/files/doc_news/SIRIUS-AND-XM-Complete-Merger07292008.pdf.

[24] SiriusXM 2012 press release; and Sirius XM Holdings, Inc., *Transcript of Liberty Media Corporation and Sirius XM Holdings Inc. Joint Investor Call Held on December 12, 2023*, p. 1, https://investor.siriusxm.com/sec-filings/all-sec-filings/content/0000930413-23-002607/0000930413-23-002607.pdf.

[25] "Sirius XM Holdings, Inc. Presents at Morgan Stanley's Technology, Media & Telecom Conference 2024," San Francisco, CA, March 6, 2024, p. 9 (accessed via *S&P Global Market Intelligence* subscription database).

Apple CarPlay and Android Auto

In March 2014, Apple Inc. launched Apple CarPlay,[26] an infotainment system software interface that enables drivers and riders to access their mobile phone apps on their vehicle dashboards.[27] In May 2015, Google launched Android Auto, a competitor to Apple CarPlay.[28] The trade publication Wards Intelligence estimates that about 90% of U.S. motor vehicles manufactured in 2023 included Apple CarPlay and Android Auto software as standard equipment.[29]

Electric Vehicles and AM Radios

In 1997, Toyota launched the Prius—the first mass-produced hybrid EV on the global market.[30] Over the next several years, other OEMs also launched EVs. In August 2014, BMW disclosed that it would not include radios capable of tuning into AM radio stations in its i3 and i8 EV models.[31] In December 2022, in response to an inquiry from Senator Edward J. Markey to 20 OEMs about policies regarding the inclusion of AM radio,[32] BMW stated the following, citing electromagnetic interference (EMI) as one concern:

> BMW made the decision to not include analog AM radio broadcasting in its EV and [plug-in hybrid electric vehicle] models beginning with the BMW I3 [sic] in 2014 primarily for two reasons: 1) [EMI] creates poor analog AM radio reception quality and 2) technological innovation has afforded consumers many additional options to receive the same or similar information.[33]

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[26] The term *automotive infotainment* refers to an in-vehicle system that combines entertainment such as radio and music playing with driving information such as navigation, advanced driver assistant systems, and vehicle settings. Infotainment systems fundamentally rely on software rather than hardware. Rather than include multiple disparate pieces of hardware from different manufacturers, infotainment systems use one central hardware platform. The platform receives input from multiple sources within the vehicle, including sensors, global positioning systems, and cameras, combined with the software used to provide entertainment services. BlackBerry QNX, "Ultimate Guides: What Is Automotive Infotainment?," https://blackberry.qnx.com/en/ultimate-guides/software-defined-vehicle/infotainment#what-is-it.

[27] Apple Inc., "Apple Rolls Out CarPlay Giving Drivers a Smarter, Safer & More Fun Way to Use iPhone in the Car," press release, March 3, 2014, https://www.apple.com/newsroom/2014/03/03Apple-Rolls-Out-CarPlay-Giving-Drivers-a-Smarter-Safer-More-Fun-Way-to-Use-iPhone-in-the-Car/.

[28] Hyundai Auto America, "Hyundai Is the First Automaker to Launch Android Auto," press release, May 26, 2015, https://www.prnewswire.com/news-releases/hyundai-is-the-first-automaker-to-launch-android-auto-300088182.html.

[29] Bill Froberg, "Android Auto and Apple CarPlay Remain Standard Fixtures in MY '23," *Wards Intelligence*, November 28, 2023, https://wardsintelligence.informa.com/wi967531/android-auto-and-apple-carplay-remain-standard-fixtures-in-my-23.

[30] Rebecca Matulka, "The History of the Electric Car," *Articles* (blog), U.S. Department of Energy, September 15, 2014, https://www.energy.gov/articles/history-electric-car.

[31] Leslie Stimson, "Second BMW Model Lacks AM," *Radio World*, August 21, 2014, https://www.radioworld.com/news-and-business/second-bmw-model-lacks-am.

[32] Sen. Edward J. Markey, "Senator Markey Urges Automakers to Maintain Free Broadcast Radio in Future EV Models," press release, December 1, 2022, https://www.markey.senate.gov/news/press-releases/senator-markey-urges-automakers-to-maintain-free-broadcast-radio-in-future-ev-models.

[33] The term electromagnetic interference (EMI) refers to any "unwanted" electromagnetic field that can disrupt the operation of an electronic circuit. Avnet Staff, "Understand the Sources of Electromagnetic Interference in Electric Vehicles," Avnet Articles (blog), April 24, 2023, https://www.avnet.com/wps/portal/us/resources/article/understand-the-sources-of-electromagnetic-interference-in-electric-vehicles/?srsltid=AfmBOooI7PCWNJOrUTOnoV7pZH5-qt8XYjjjJKsXwlykJSiL0pYhXY4r. Quote in Letter from Adam McNeill, vice president of Engineering, BMW of North America, LLC, BMW Group Company, to Sen. Edward J. Markey, December 20, 2022, pp. 23-24, https://www.markey.senate.gov/imo/media/doc/letters_of_automaker_responses_-_030823pdf.pdf.

Several other OEMs—Jaguar Land Rover, Mazda, Rivian, Stellantis, Tesla, Toyota, Volkswagen, and Volvo—have expressed their agreement with BMW's view that the technology used in their EV models can interfere with AM broadcast station signals.[34] In contrast, the OEM Kia stated in its December 2022 response to Senator Edward J. Markey's letter, "we are not aware of any issues with [EMI] with AM signals from our EVs."[35]

Eight OEMs—BMW, Ford, Mazda, Polestar, Rivian, Tesla, Volkswagen, and Volvo—said they had removed broadcast AM receivers from one or more EV models.[36] Ford reversed its decision in May 2023.[37]

In October 2023, the Center for Automotive Research released a study commissioned by the Alliance for Automotive Innovation, a trade organization representing OEMs. The study found that the cost of EMI mitigation "depends upon the electrical architecture of the vehicle and entails several design and engineering tradeoffs."[38] The National Association of Broadcasters—a trade organization representing broadcast station owners—countered that OEMs could combat interference with AM broadcast reception with a "simple software upgrade" or other "nascent technologies."[39] Technical experts have discussed the feasibility of redesigning EVs, including the potential expense and complexity of shielding EVs' systems with cables.[40] Stellantis has reportedly placed radio receivers farther from EVs' motors to mitigate interference from the electric currents motors emit.[41] In addition, an executive with the technology firm XPeri, a manufacturer of digital radio technology, has suggested that by broadcasting in a digital format, AM stations could better withstand electronic "noise" that can cause interference.[42]

[34] See "Responses from automakers" link in Sen. Edward J. Markey, "Senator Markey Criticizes Eight Automakers for Removing Broadcast AM Radio from Vehicles," press release, March 3, 2023, https://www.markey.senate.gov/news/press-releases/senator-markey-criticizes-eight-automakers-for-removing-broadcast-am-radio-from-vehicles.

[35] Letter from Christopher Wenk, vice president of Government Affairs, Kia Corp., to Sen. Edward J. Markey, December 22, 2022, p. 32, https://www.markey.senate.gov/imo/media/doc/letters_of_automaker_responses_-_030823pdf.pdf.

[36] Sen. Edward J. Markey, "Senator Markey Criticizes Eight Automakers for Removing Broadcast AM Radio from Vehicles," press release, March 8, 2023, https://www.markey.senate.gov/news/press-releases/senator-markey-criticizes-eight-automakers-for-removing-broadcast-am-radio-from-vehicles.

[37] Jim Farley (@jimfarley98), "After speaking with policy leaders about the importance of AM broadcast radio," X post, May 23, 2023, https://x.com/jimfarley98/status/1661024295110463491.

[38] Snehasis Ganguly et al., *Analog AM Band Interference in Electric Vehicles: Technical Solutions & Cost of Mitigating Electromagnetic Interference*, Center for Automotive Research, October 2023, p. 1, https://www.cargroup.org/wp-content/uploads/2023/11/AM-Radio-RFI-Technical-Report.pdf.

[39] Curtis LeGeyt, "Preserving AM Radio in Cars Keeps Americans Safe," *Advocacy: Localism* (blog), National Association of Broadcasters, March 8, 2023, https://www.blog.nab.org/2023/03/08/preserving-am-radio-in-cars-keeps-americans-safe/.

[40] Michael Koziol, "EV Interference Doesn't Have to Kill AM Radio," *IEEE Spectrum*, June 28, 2023, https://spectrum.ieee.org/am-radio-ev-interference.

[41] Koziol, "EV Interference Doesn't Have to Kill AM Radio."

[42] Koziol, "EV Interference Doesn't Have to Kill AM Radio."

Federal Jurisdiction Over Electromagnetic Interference

National Highway Traffic Safety Administration

The U.S. Department of Transportation's (DOT's) National Highway Traffic Safety Administration (NHTSA) regulates the safety of motor vehicles and related equipment. Congress requires vehicle and equipment manufacturers to comply with NHTSA's vehicle safety standards in order to sell vehicles in the United States. OEMs must self-certify to motor vehicle distributors or dealers that they comply with the standards.[43] The National Traffic Motor Vehicle and Safety Act of 1966 (P.L. 89-563) authorizes NHTSA to require recalls of vehicles that do not meet federal standards for safety.[44] NHTSA has four primary tools to address the introduction of new technologies and approaches to existing technologies: (1) letters of interpretation, (2) exemptions from existing standards, (3) rulemakings to amend existing standards or create new standards, and (4) enforcement authority to address noncompliance with its standards.[45]

In its 2015 report to Congress, *Electronic Systems Performance in Passenger Motor Vehicles*, NHTSA stated that OEMs often test their platforms in accordance with the international standard-setting organizations SAE International and the International Organization for Standardization.[46] NHTSA added that "collaborating with industry, standards-development organizations, and academia to develop standards that ensure the safety and security of automotive electronic systems" is "importan[t]."[47] In May 2024, pursuant to NHTSA's authority to enforce safety standards, Ford recalled more than 109,000 Lincoln Aviator vehicles due to potential EMI with backup camera functions caused by consumer mobile phones.[48]

Federal Communications Commission

The FCC has general jurisdiction over broadcast radio stations and electronic-electrical products (devices) capable of emitting RF energy that could interfere with broadcast radio stations' signals. The FCC's Laboratory Division, part of the Office of Engineering and Technology, must preapprove RF devices that are subject to the agency's authorization rules before the manufacturers market or import those devices. Among the RF-emitting devices exempt from the

[43] 49 U.S.C. §30115. See U.S. Department of Transportation (DOT), National Highway Traffic Safety Administration (NHTSA), "Laws and Equipment," https://www.nhtsa.gov/laws-regulations.

[44] 49 U.S.C. §30120.

[45] 49 U.S.C. §30120.

[46] The organization known as the Society of Automotive Engineers until 2006 is an international association of more than 128,000 engineers and related technical experts in the aerospace, automotive, and commercial vehicle industries. SAE International, "About, Overview," https://www.sae.org/about. See also SAE International, "2023 Reflections: It's Actually Just 'SAE,'" *SAE Blog*, December 21, 2023, https://www.sae.org/blog/its-actually-just-sae-international. The International Organization for Standardization (ISO) is an international nongovernmental organization made up of national standards bodies from 172 countries that develop and publish a wide range of proprietary, industrial, and commercial standards. ISO, "About ISO: What We Do," https://www.iso.org/what-we-do.html.

[47] DOT, NHTSA, *Electronic Systems Performance in Passenger Motor Vehicles*, December 2015, p. 27, https://www.nhtsa.gov/sites/nhtsa.gov/files/2023-05/Electronic-Systems-Performance_1-20-16-tag.pdf. NHTSA published the report in response to a directive in §31402 of the Moving Ahead for Progress in the 21st Century Act (P.L. 112-141) that the Secretary of Transportation "complete an examination of the need for safety standards with regard to electronic systems in passenger motor vehicles."

[48] DOT, NHTSA, "Part 573 Safety Recall Report: Ford Motor Company," May 23, 2024, https://static.nhtsa.gov/odi/rcl/2024/RCLRPT-24V368-8061.PDF.

FCC's authorization rules are digital devices used exclusively in transportation vehicles, including in motor vehicles.[49]

Oversight of Broadcast Radio Stations

The FCC's Media Bureau allocates spectrum for the use of broadcasting.[50] The bureau grants licenses to broadcast radio station owners for eight-year terms,[51] provided the FCC determines that the licensee will serve "the public interest, convenience, and necessity."[52] Section 307 of the Communications Act of 1934 authorizes the FCC to make determinations on radio licenses, frequencies, hours of operation, and power.[53]

Due to the physical properties of AM radio waves, AM station broadcasts are susceptible to EMI from broadcast stations.[54] To mitigate interference between AM broadcast stations, the FCC requires most AM stations to reduce power or cease operation at night to protect the signals of certain other AM stations that operate in frequencies known as "clear channels" 24 hours per day.[55]

Oversight of Electronic Devices

Broadcast radio stations are susceptible to interference from consumer electronic devices.[56] To mitigate such interference, Section 302a of the Communications Act of 1934, as amended, gives the FCC oversight over these devices and other electronic equipment.[57]

The agency's Office of Engineering and Technology authorizes and licenses devices, transmitters, and facilities that generate RF radiation.[58] In contrast to NHTSA—which establishes safety standards for, but does not preapprove, electronic equipment in vehicles—the FCC tests electronic equipment to ensure the equipment does not interfere with broadcast signals. Generally, manufacturers must obtain authorizations from the FCC before they sell electronic equipment.

Manufacturers of certain types of equipment, including "digital devices used exclusively in any transportation vehicle, including motor vehicles,"[59] need not obtain an FCC authorization prior to

[49] 47 C.F.R. §15.103.

[50] FCC, "Media, About the Bureau," https://www.fcc.gov/media.

[51] Communications Act of 1934, as amended, §307(c)(1) (47 U.S.C. §307(c)(1)).

[52] Communications Act of 1934, as amended, §307(a) (47 U.S.C. §307(a)).

[53] 47 U.S.C. §307.

[54] 2013 FCC AM Radio NPRM. In 2018, the FCC sought comments on proposed rule changes that would reduce nighttime protection for wide-area coverage Class A AM broadcast stations and enable more AM stations to increase their nighttime service. FCC, "Revitalization of the AM Radio Service, FCC 18-139, Second Further Notice of Proposed Rulemaking," 33 *FCC Record* 9946, October 5, 2018. As of 2024, this proceeding remains open. FCC, "EDOCS Search Results, RM 13-249, FCC only," https://www.fcc.gov/edocs/search-results?t=quick&dockets=13-249&fccda=fcc.

[55] FCC, Media Bureau, Audio Division, AM Radio, "Why AMs Reduce Power/Cease Operations at Night," December 11, 2015, https://www.fcc.gov/media/radio/am-stations-at-night.

[56] FCC, Office of Engineering and Technology, Laboratory Division, "Equipment Authorization – RF Device," https://www.fcc.gov/oet/ea/rfdevice.

[57] 47 U.S.C. §302a. This section became effective in 1968 with the enactment of P.L. 90-379, "An Act to amend the Communications Act of 1934, as amended, to give the Federal Communications authority to prescribe regulations for the manufacture, import, sale, shipment, or use of devices which cause harmful interreference to radio reception."

[58] 47 C.F.R. §15.

[59] The term *digital device* is defined at 47 C.F.R. §15.3(k).

selling that equipment.[60] These manufacturers must comply with the FCC's rules for general conditions of operations. Under these rules, if an FCC representative notifies an operator that an electronic piece of equipment is interfering with broadcast services, then the manufacturer must fix the interference issue.[61]

Transmission of Presidential and Emergency Alerts

In February 2023, seven former Federal Emergency Management Agency (FEMA) administrators wrote a letter to the then-Secretary of Transportation requesting that he "secure assurances from automakers" that they "[maintain] AM radios in their vehicles."[62] The administrators stated that the absence of AM broadcast radio reception in motor vehicles could interfere with FEMA's ability to comply with federal laws. According to FEMA, "In many cases, radio and TV stations continue to operate when other means of alerting the public are unavailable, providing a layer of resiliency to the suite of available emergency communication tools."[63] In February 2023, FCC Commissioner Nathan Simington echoed their sentiments, stating that the agency "can, and must, play a role."[64]

The following describes the role of AM radio stations in transmitting presidential alerts and nonpresidential federal, state, tribal, and local alerts.

National Emergency Message (Presidential Alert) System

Section 706 of the Communications Act of 1934, as amended (47 U.S.C. §606), grants specific, communications-related powers to the President during wartime. Section 606(a) grants the President the authority to direct electronic media regulated by the FCC so as to prioritize the communication of messages that are essential to the national defense and security. To that end, the FCC adopted rules and regulations providing for a national Emergency Alert System (EAS) that enables the President to provide immediate communications and information via broadcast radio receivers, satellite radio receivers, and television sets to the general public during periods of national emergency.[65] A national activation of the EAS for a presidential national emergency message must take priority over any other message and preempt any message in progress.[66]

The FCC requires certain entities (i.e., broadcast radio and television stations, wired and wireless cable television systems, SDARS, and others—known as EAS participants) to comply with EAS rules. EAS participants must be capable of monitoring, receiving, and transmitting a national

[60] 47 C.F.R. §15.103.

[61] 47 C.F.R. §15.5.

[62] Letter from James Lee Witt, former FEMA administrator et al., to Secretary Pete Buttigieg, DOT, February 26, 2023, https://www.radioworld.com/wp-content/uploads/2023/02/radios-in-cars-letter-to-Sec-Buttigieg-sent.pdf.

[63] FEMA, "Tools for Practitioners, Broadcasters and Wireless Providers," https://www.fema.gov/emergency-managers/practitioners/integrated-public-alert-warning-system/broadcasters-wireless.

[64] FCC, "Commissioner Simington Underscores Need for AM Resiliency," press release, February 23, 2023, https://docs.fcc.gov/public/attachments/DOC-391276A1.pdf.

[65] 47 C.F.R. Part 11. The FCC established the Emergency Alert System (EAS) in 1994. FCC, "Amendment of Part 73, Subpart G, of the Commission's Rules Regarding the Emergency Broadcast System, Report and Order and Further Notice of Proposed Rulemaking, FCC 94-288," 10 *FCC Record* 1786, 1788, December 9, 1994.

[66] 47 C.F.R. §11.2.

emergency message, formerly known as a "presidential alert," and disseminating it according to EAS rules.[67]

Nonpresidential Federal, State, Tribal, and Local Alerts

State and local authorities may use the EAS to deliver emergency information such as AMBER alerts and severe weather warnings targeted to specific geographical regions or areas. EAS participants voluntarily transmit thousands of alerts and warnings issued annually by the U.S. Department of Commerce's National Weather Service (NWS) over NWS's nationwide radio network,[68] as well as those issued by state, tribal, and local governments.[69] These alerts typically address severe weather threats, child abductions, and other local emergencies.

FEMA established the Integrated Public Alert and Warning System (IPAWS) in 2006 pursuant to Executive Order 13407.[70] IPAWS allows federal, state, local, tribal, and territorial entities (also called "alerting authorities") to select a targeted area and send one alerting message to IPAWS, which disseminates the alert to many communication pathways at once—radio/television, wireless networks, internet-protocol based devices, and the NWS radio network.[71] IPAWS delivers the message to broadcasters that serve the targeted area, and those broadcasters (EAS participants) can then receive and broadcast the alert. According to FEMA, "IPAWS delivers timely, geographically-targeted messages during emergencies to save lives and protect property through multiple communication pathways."[72]

Role of AM Radio Stations

Under the traditional broadcast-based distribution structure, known as the "EAS protocol," EAS transmits an alert through a preestablished hierarchy of broadcast, cable, and satellite systems, beginning with initial delivery to 72 National Public Warning Systems stations, also known as Primary Entry Point (PEP) stations.[73] PEP stations are located throughout the country and have a direct connection to FEMA; they serve as the primary broadcast source for national alerts (i.e., alerts sent by the President to the entire nation). PEP stations network to other broadcast stations (relaying the message to smaller stations) in order to disseminate messages throughout the country. State and local public safety officials can leverage EAS and FEMA PEP stations when they are not in use for national EAS warning messages.

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[67] 47 C.F.R. §§11.2(a) and 11.31. EAS participants are electronic media that the FCC requires to comply with its EAS rules for the purpose of transmitting presidential alerts. Such media include broadcast radio and television stations, cable television systems, direct broadcast satellite systems, satellite digital audio radio services (SDARS), digital audio broadcasting systems, and wireline video systems. 47 C.F.R. §11.2(b).

[68] U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), National Weather Service (NWS), "Emergency Alert System (EAS)," https://www.weather.gov/nwr/eas_description.

[69] FCC, Public Safety and Homeland Security Bureau, *Report: October 4, 2023 Nationwide Emergency Alert Test*, June 2024, p. 28, https://docs.fcc.gov/public/attachments/DOC-403500A1.pdf (hereinafter FCC 2024 Nationwide EAS Test Report). NOAA—an operational unit within NWS—operates the NOAA Weather Radio All Hazards (NWR), a nationwide network of radio stations broadcasting continuous weather information directly from the nearest NWS office. U.S. Department of Commerce, NOAA, NWS, "NOAA Weather Radio," https://www.weather.gov/nwr.

[70] Executive Order 13407, "Public Alert and Warning System," 51 *Federal Register* 36975, June 26, 2006.

[71] For additional information about IPAWS, see CRS Report R48363, *The Integrated Public Alert and Warning System (IPAWS): Primer and Issues for Congress*, by Amanda H. Peskin.

[72] FEMA, "Tools for Practitioners, IPAWS, IPAWS Program Governance," https://www.fema.gov/emergency-managers/practitioners/integrated-public-alert-warning-system/governance.

[73] For more details about this process, see FCC 2024 Nationwide Emergency Test Report, p. 29.

Of those stations, 62, or 86%, are broadcast AM stations.[74] SiriusXM provides satellite-based backup to the broadcast-based PEP system in the event of a nationwide alert.[75] Because it is a nationwide service, SiriusXM does not participate in the distribution of state and local alerts.[76]

Pursuant to the Integrated Public Alert and Warning System Modernization Act of 2015 (P.L. 114-143), Congress directed FEMA to upgrade PEP stations around the United States to ensure continuity of broadcast radio services.[77] FEMA equips PEPs, which are operated by local station personnel, with backup communications equipment and power generators that enable them to continue broadcasting information to the public during and after an emergency.[78] These freestanding emergency studios, located at the radio transmitter sites, are designed to withstand various natural disasters and acts of terrorism.

AM radio stations serve two roles during emergency alerts: (1) the initial points of contact for presidential and nonpresidential emergency alerts in the EAS broadcast-based transmission system, and (2) one of several technology-based communications pathways for nonpresidential emergency alerts.[79] For example, in September 2024, after residents in Ashville, NC, lost mobile and internet services following Tropical Storm Helene, the AM radio station WWNC remained on the air and transmitted emergency and recovery information to listeners.[80]

Options for Congress

If Congress chooses to address the issue of the availability of AM radio in motor vehicles, it may consider one or more options, some of which are included in S. 315, as reported, and H.R. 979, as introduced. These options may include (1) increasing DOT's and/or the FCC's jurisdiction over motor vehicle equipment, (2) studying the role of and considering alternatives to AM radio in the transmission of national and emergency alerts, and (3) monitoring industry developments without enacting legislation. Congress also could choose to maintain the status quo, amend the jurisdiction of federal agencies in alternative ways, or conduct other types of oversight.

[74] CRS analysis of data from FEMA, "Emergency Management, Tools for Practitioners, Integrated Public Alert and Warning System (IPAWS), Broadcasters and Wireless Providers," last updated December 14, 2023, https://www.fema.gov/emergency-managers/practitioners/integrated-public-alert-warning-system/broadcasters-wireless.

[75] FEMA, "FEMA and SiriusXM Expand Relationship to Enhance Delivery of Emergency Alerts," press release, July 11, 2023, https://www.fema.gov/press-release/20230711/fema-and-siriusxm-expand-relationship-enhance-delivery-emergency-alerts. Pursuant to the agreement, SiriusXM provides a satellite-based delivery system to FEMA's National Public Warning System network.

[76] FCC, "Review of the Emergency Alert System, Order on Reconsideration FCC 19-57," 34 *Federal Register* 5382, 5384, June 27, 2019.

[77] Ibid. See also P.L. 114-143, §2(d) (6 U.S.C. §321o).

[78] FEMA, "FEMA and KIRO-AM Seattle to Unveil New Emergency Broadcast Studio," press release, November 18, 2021, https://www.fema.gov/press-release/20211118/fema-and-kiro-am-seattle-unveil-new-emergency-broadcast-studio.

[79] Alternative, non-broadcast communications pathways include mobile wireless transmission and internet transmissions. FCC 2024 Nationwide EAS Test Report, p. 31, Figure 3.

[80] Sarah Honosky, "Helene Trapped Asheville Broadcasters in Their Station. They've Stayed on Air Ever Since," *Asheville Citizen Times*, October 7, 2024, https://www.citizen-times.com/story/news/local/2024/10/07/wnc-listeners-call-into-local-radio-station-seeking-solace-connection/75543836007/.

Increase Federal Jurisdiction Over Motor Vehicle Equipment

Congress could expand authorities of DOT, the FCC, or both. In the 119th Congress, the AM Radio for Every Vehicle Act of 2025 (S. 315, as reported, and H.R. 979, as introduced) focuses on expanding DOT's authority. Both bills would direct the Secretary of DOT, in consultation with the FCC and the Administrator of FEMA, to issue a rule requiring all new passenger motor vehicles to install AM broadcast receivers as standard equipment no later than one year after the bill's enactment. In so doing, the bills would give DOT—which currently does not preapprove or mandate the inclusion of specific electronic equipment in vehicles—new authority. Pursuant to the bills, both the rule and DOT's authority to enforce it would expire 10 years after the bill's enactment. In addition, the bills would direct DOT to study the role of and consider alternatives to AM radio in the transmission of national and emergency alerts, at least once every five years, in coordination with the FEMA Administrator and the FCC.

Alternatively, Congress could amend the definition of *motor vehicle safety* in Section 102(1) of the National Traffic and Motor Vehicle Safety Act of 1966, as amended,[81] to include protecting "the public against an unreasonable risk of accidents" and/or disasters occurring due to a driver's inability to receive national and local emergency alerts. This would expand NHTSA's current authority over vehicle safety.

To reduce the likelihood that OEM equipment does not interfere with broadcast services, Congress could amend Section 302a of the Communications Act of 1934 and/or direct the FCC to repeal its current exemption for motor vehicle equipment with respect to the agency's authorization requirements. To reduce the likelihood that the FCC's rules interfere with vehicle safety, Congress could direct the FCC to consult with NHTSA.

Direct Government Agencies to Issue Studies, Reports

Congress could direct the Comptroller General or other entities to conduct studies. Both S. 315, as reported, and H.R. 979, as introduced, would direct the Comptroller General to conduct a study on emergency alert and warning systems. The bills also stipulate that the study include an assessment of the role of passenger motor vehicles in IPAWS communications, including by providing access to AM broadcast stations.

The FCC adopted the motor vehicle equipment exemption in its equipment authorization rules in 1980.[82] At the time, the FCC stated that it saw "advantages in postponing the ... rules for [motor vehicle equipment and found] that additional information may be useful to further assess the impact of the ... rules on electronics in automobiles."[83] Congress could direct the FCC, in consultation with DOT, to study and report on the potential impact if the agency were to extend its rules to include motor vehicle equipment.

[81] 49 U.S.C. §30102(a)(8).

[82] FCC, "Amendment of Part 15 to Redefine and Clarify the Rules Governing Restricted Radiation Devices and Low Power Communication Devices, Order Granted in Part Reconsideration of First Report and Order Technical Standards for Computing Equipment, FCC 80-148," *FCC Report, 2nd Series*, vol. 79, p. 67.

[83] FCC, "Amendment of Part 15," *FCC Report, 2nd Series*, vol. 79, p. 83.

Monitor the Private Sector

Congress could consider waiting for industry participants to determine whether market conditions or other business factors support or oppose inclusion of AM radio receivers in motor vehicle models. Some OEMs, based on feedback from consumers or others, may choose to alter their plans about including AM radio receivers. In its December 2022 letter to Senator Edward J. Markey, the trade organization Auto Innovators stated that it has discussed with National Association of Broadcasters and FEMA consumers' access emergency broadcast information in vehicles.[84] Members of Congress could follow up with these organizations to receive updated information about these meetings. Members could also continue to monitor and weigh in on developments via oversight letters.[85]

Congress could also weigh the effectiveness of emergency alert systems in the presence or absence of AM radio receivers in motor vehicles. If OEMs were to exclude broadcast receivers from additional vehicles, the affected consumers may be less able to receive state and local emergency alerts. Additionally, if alternative communications pathways (i.e., wireless, satellite, and internet transmissions) become inoperable during a natural disaster or weather event, national-level emergency alerts might be affected. Members could weigh the potential cost of risking this scenario against the potential benefit of permitting OEMs to make what some might consider to be a business decision.

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[84] Letter from Garrick Francis, vice president, Federal Affairs, Alliance for Automotive Innovation, to Sen. Edward J. Markey, December 20, 2022, pp. 20-22, https://www.markey.senate.gov/imo/media/doc/letters_of_automaker_responses_-_030823pdf.pdf.

[85] U.S. Senate Committee on Commerce, Science, and Transportation, "Sens. Cruz and Markey Send Bipartisan Letter Urging Automakers to Keep AM Radio in Vehicles," press release, June 23, 2023, https://www.commerce.senate.gov/2023/6/sens-cruz-and-markey-send-bipartisan-letter-urging-automakers-to-keep-am-radio-in-vehicles.