

Opinion: The Future of FM Radio

England, Scotland, Wales and Northern Ireland

Summary

Government proposals for a complete switch-off of major FM radio services in the 2020s should be abandoned. These are no longer supported by any of the major broadcasters. Instead, the ‘digital switchover’ should be implemented gradually with coverage of FM services progressively reduced from the mid-2020s onwards as the FM audience declines. The main reasons are as follows.

- Providing simultaneous universal coverage on DAB and FM is too expensive. A gradual transition from FM to DAB is much cheaper as universal coverage can be provided using a mixture of FM and DAB during the transition period. This would enable the BBC and other broadcasters to maintain a steady transmission budget.
- It is much more difficult to switch from FM to digital radio in vehicles than it is indoors, while indoor reception requires a stronger signal. Therefore, reducing FM coverage from indoor to outdoor only is a logical intermediate step in the switchover process. This would reduce costs and release more FM frequencies for community radio.
- A transition from DAB to DAB+ is needed to ensure that FM sound quality can be matched. It is also unreasonable to expect listeners to replace FM radios with DAB radios and then upgrade to DAB+ radios a few years later. Decommissioning of FM for the majority of listeners should therefore be delayed until a full transition to DAB+ has taken place.
- FM coverage of local radio is needed for traffic bulletins to interrupt regular programmes on car radios with single, as opposed to dual, DAB tuners.

In the short term, there is still demand for new FM transmissions. FM reception of BBC local and regional services needs to improve in areas where local DAB is uneconomic to enable AM to be phased out. Although government policy is not to launch new commercial services on FM, it will support coverage extensions to existing commercial services. There is also continuing demand from the community sector, for which priority should be given to areas without small-scale DAB. As the FM band is full in some places, space should be created by reallocating 87.6-88.0 MHz from temporary to permanent services and reallocating some (but not all) of the frequencies used by BBC Radio 3. Temporary radio services will soon be able to use small-scale DAB.

1. Introduction

FM has been the most popular platform for radio listening in Britain since the mid 1980s and in early 2018 accounted for about 45% of radio listening (combined FM and AM listening was just under 50%). It offers extensive coverage and high quality audio (where reception is good), but programme choice is poor compared to digital platforms. Audiences are slowly moving from FM (and AM) towards digital platforms and digital listening (all platforms) overtook analogue listening (FM + AM) at the start of 2018. Until recently, government policy had been to announce a digital switchover (DSO) date once this 50% digital listening threshold was reached. On this date sometime during the 2020s, all national stations and larger local stations would become digital only, subject to sufficient DAB coverage.

The main motivations behind radio DSO are

- To reduce transmission costs by eliminating simulcasting of stations on DAB and FM (or AM);
- To free up spectrum in broadcast band II (87.5–108 MHz) for both small-scale radio and non-broadcast use;
- To remove the competitive advantage that DAB/FM stations have over DAB-only and FM-only stations.

However, both commercial broadcasters and the BBC are now resisting these proposals. Both wish to continue broadcasting on FM all the while a significant proportion of the audience uses that platform. Moreover, the commercial sector is seeking to improve coverage of some services on FM, while the BBC is expanding FM coverage of Radio Wales. Although digital listening for radio as a whole should overtake analogue in 2018, a substantial proportion of digital listening is to digital-only and digital/AM stations. For those stations that are available on FM, analogue listening is likely to dominate until the early 2020s, potentially the mid 2020s in some cases. In particular, mainstream popular music services have more competition on digital platforms than on FM. Thus, they have a higher share of FM listening than DAB listening. Consequently, a much higher proportion of listening to these services is on FM compared with radio listening as a whole.

Government policy has also subtly changed recently. Now, it will merely 'consider' a switchover date following the 50% digital listening threshold being reached. Most likely, the government will simply defer a decision for around five years, so a possible DSO would be delayed until sometime after 2025.

A further motivation for DSO was to promote digital radio. However, this is no longer necessary. The majority of British households now have at least one DAB radio and most cars now come equipped with DAB as standard.

This article explores some major flaws with the proposed plan for DSO during the 2020s, considering coverage, receiver availability and uptake, traffic information, sound quality, DAB to DAB+ switchover and FM platform viability. It then outlines an alternative plan for FM radio in the 2020s. This is *not* a proposal to maintain the status quo. FM (and AM) transmission costs need to be reduced once the majority of the audience has switched to digital platforms and there is a need to free-up more FM spectrum for stations that cannot practically be accommodated on DAB either at all or with the same level of coverage.

2. Coverage

Fundamentally, any digital switchover plan for radio must ensure that DAB coverage is available wherever FM transmitters are switched off, particularly for public service broadcasting. However, it is difficult to directly compare DAB coverage with that of FM because the reception characteristics are quite different. DAB+ either gives perfect sound or doesn't work at all, while classic DAB will exhibit 'bubbling mud' interference for signal to noise levels up to 3 dB (a factor of two) above the level at which both DAB+ and DAB fail. By contrast, FM reception fades gradually. A weak FM signal manifests as background hiss, particularly in stereo mode. Switching to mono reduces the hiss. Car radios automatically switch to mono as the signal strength degrades and also filter out the higher frequency parts of the audio to reduce hiss. Hissy mono reception possible at a signal to noise level 20 dB (a factor of 100) lower than that required for perfect stereo reception.

A number of different coverage figures are quoted for the BBC's national FM networks. According to the 2015 Digital Radio Report, strong coverage (i.e., indoor stereo reception) is ~95% of the population and 'variable' coverage is 99%. The BBC used to quote 97% population coverage in the 1980s, increasing to 98% in the 1990s, which corresponded to stereo reception with a directional roof aerial. In the 1970s, the BBC claimed FM coverage of 99% with less than half as many transmitters per network as now; this was based on mono reception with a roof aerial. By contrast, indoor coverage of BBC national DAB is now 97.4% of the population. Thus, good indoor stereo reception is already more widespread on DAB, while reception of a useable signal is much more widespread on FM.

Where a DAB and FM signal are transmitted from the same transmitter with equivalent coverage areas, DAB will give solid reception in places where FM is a little hissy in stereo. Further out, FM will still give a listenable mono signal in places where DAB does not work at all. Because DAB broadcasts at about twice the frequency of FM, it does not diffract as well around local obstacles, such as hills and tall obstacles. Thus, DAB is more susceptible to local holes in reception. Consequently, many areas that are served by a single transmitter on FM require two or more transmitters to provide DAB coverage.

In practice, DAB and FM transmitter coverage areas are not equivalent. FM national radio coverage is provided mainly by high power (>10 kW) and low power (≤100W) transmitters, whereas most DAB transmitters are medium power (100W-10kW). DAB does not use high power transmitters because transmitters more than about 70 km away cannot be time synchronized and thus interfere with each other (all DAB transmitters in a multiplex operate on the same frequency). Consequently, many areas that receive a good reception from a high-power FM transmitter will receive poor DAB reception.

For areas served by a low-power FM transmitter, the corresponding DAB transmitter is usually higher powered, compensating for the greater diffraction losses and sometimes providing better reception than FM. Thus, in these areas, FM transmitters can be safely switched off when DAB receiver uptake is sufficient. For the relatively few areas served by medium power (0.1–10 kW) FM transmitters, multiple DAB transmitters will typically be required to provide equivalent coverage. However, this will generally be manageable. The appendix shows which national FM transmitters will have their DAB coverage matched by the BBC national multiplex by the end of 2016.

The problem is the areas served by the high-power FM transmitters, including places where FM reception is weak but usable. These areas will incorporate many DAB reception holes, each affecting a relatively small number of households and roads. Consequently, it could be difficult to justify the costs of building DAB transmitters to fill many of these holes. However, the total number of households and roads across all of the DAB holes served by a high-power FM transmitter will be quite high in many cases, leading to a large loss of coverage if the FM

transmitter is switched off. See the Article ‘Matching DAB Coverage to FM’ for a list of new DAB transmitters required to match FM coverage. If FM is switched off when DAB coverage reaches 99% of the population, about 640,000 people will lose mobile radio reception (leaving TV platforms and the internet). Retaining a limited number of high-power FM transmitters may well be the most cost-effective way of providing a mobile radio service to those people.

Classic FM has lower coverage than BBC Radios 1–4 on both FM and DAB. Following proposed upgrades to the Digital One network, both FM and DAB will provide good indoor coverage to about 92% of the population. However, the two networks do not match. DAB typically offers better coverage in many large towns and small cities, while FM offers better coverage in many rural areas. There are thus significant areas of Norfolk, Suffolk, East Sussex, Devon, North Derbyshire, North Yorkshire, Northumberland, Cumbria, South Wales, Southern Scotland and North East Scotland where there is good reception of Classic on FM, but no plans to provide indoor coverage of the Digital One DAB network. Some of the affected areas could be served via local DAB multiplexes, while all could be served by retaining the relevant FM transmitters. However, Classic is not obliged to provide universal coverage, so any coverage above the minimum specified by Ofcom would be a commercial decision.

The local DAB multiplexes have recently been extended to match indoor coverage to the FM coverage of the first generation of local commercial stations (i.e., those that started between 1973 and 1992). This will enable those stations and most other large commercial stations to leave FM without loss of indoor coverage. However, most BBC local stations and all of the BBC’s regional stations have much wider FM (and/or AM) coverage than the local DAB multiplexes. The regional BBC stations also use a number of high-power FM transmitters, raising similar coverage issues to the national stations. Maintaining mobile coverage of BBC local and regional radio will thus require further expansion of DAB coverage, retention of a large proportion of the FM network, or a mixture of the two.

Community radio and smaller local commercial stations are currently limited to FM unless they wish to expand their coverage areas to match the county-level local DAB multiplexes. The introduction of small-scale DAB multiplexes over the next few years will enable many of these stations to move over to DAB at much lower cost and provide space for new stations that cannot be accommodated on FM. However, a DAB multiplex is only viable where several stations want to broadcast to the same area. Thus, small-scale DAB is likely to be limited to cities and large towns, while the multiplexes in the largest cities may become full. Thus, many small stations will need to continue with FM broadcasting indefinitely. Furthermore, for stations that only want to cover part of a city, FM is more efficient.

3. Receiver Availability and Uptake

Digital switchover for indoor listening is not a major problem. Currently, around 60% of households have at least one DAB radio. There is a wide choice of DAB radios available and prices start at £18. The only problem is that the majority of radios integrated with iPod docks, CD players and clocks are FM only (or FM/AM). Where DAB reception is available indoors, DSO simply requires listeners to buy a DAB radio, plug it into the electricity supply and switch it on. This is clearly not difficult. The main national radio stations are also available via terrestrial, satellite and cable TV, while BBC local radio is available via terrestrial TV. Moreover, almost every radio station is available via the internet.

For portable outdoor listening using DAB, poor battery life is a problem, particularly using rechargeables. Consequently, many people prefer FM (or even AM) for outdoor listening. DSO for outdoor listening needs to be delayed until receivers with better battery life are available. The next generation of DAB-compatible radio chipsets will most likely be more efficient. Thus, this is unlikely to be a major obstacle to DSO.

The major receiver availability problem is in-car listening. In the early 1990s when many stations became FM only while many car radios were AM only, car radios conformed to a standard fit and were easy to exchange. Now, the radio is integrated into the car dashboard, making it more difficult to replace the radio. One possibility is a stand-alone DAB ‘adaptor’ radio that either connects to the car using the jack connection provided for MP3 players or incorporates a low-power FM transmitter. However, a proper DAB antenna is needed. Commercial vehicles are a particular problem as drivers may find it difficult to persuade the owners to upgrade the radio.

Norway has kindly volunteered to act as a test-bed for in-car DAB installation through its decision to switch off its national FM transmitters in 2017. About 32% of cars had DAB+ radios before the switchover process began, slightly more than in the UK. However, after the national FM switch-off was complete, only 54% of cars had DAB+. Thus, only about a third of drivers without DAB bought an ‘adaptor’ radio (or a new car) during the switchover process. A large number of drivers simply did not install DAB, restricting themselves to the limited

number of local stations that continued on FM and to non-broadcast audio. Most UK broadcasters would not accept a near halving of their potential in-car audience. Britain should learn thus learn from Norway's experience and delay switching off the majority of FM transmitters until the vast majority of cars and commercial road vehicles are equipped with DAB.

Clearly DSO is much easier for indoor listening than for outdoor. Indoor listening also requires stronger signals than outdoor. In the case of DAB, indoor reception on the ground floor of a building requires signals about 10 dB stronger than outdoor reception. The figures for FM will be similar. Therefore, if an outdoor-only FM service was to be provided for several years wherever DAB reception is good, it would be possible to reduce the number and/or power of the FM transmitters. The appendix shows which BBC national FM transmitters are not required for an outdoor-only service.

4. Traffic Information

All BBC local and regional radio stations and some local commercial stations broadcast regular traffic and travel bulletins accompanied by a special flag via the FM radio data system (RDS). Car radios detect this flag and use it to interrupt listening to another station (or recorded music) with the travel bulletin. This is achieved by equipping car radios with dual FM radio tuners, one for regular programmes and the other for the traffic bulletins. The same system will eventually be introduced for DAB. However, this will require a new generation of car radios with dual DAB tuners. The current generation of DAB car radios use FM for travel bulletin interruptions.

As a result, a network of local and regional radio FM radio transmitters will need to be maintained for several years beyond any national radio DSO in order to maintain the traffic news interrupt service to cars with older DAB/FM radios (and the remaining FM/AM radios). Although indoor reception of these transmitters will not be required, the signals will need to be sufficiently strong for receivers to decode the RDS stream. Consequently, it is likely be necessary to maintain the full BBC local and regional FM transmitter network throughout the 2020s, potentially at full power.

5. Sound Quality, DAB and DAB+

In the UK, most DAB stations sound similar to FM on a mono radio. However, in stereo, FM tends to sound better, provided the reception is good (i.e. no background noise or multipath interference). DAB sounds flat by comparison. Furthermore, the majority of DAB stations, including many music stations, broadcast in mono. Stereo broadcasting on DAB is reserved for the most popular stations, including most of those that are also available on FM, although Radio 4 sometimes broadcasts in mono when 5 Live Sports Extra is on air. Radio 3 uses a much higher bit rate than other stations, giving much better sound quality. However, some listeners still prefer FM.

It is not reasonable to expect radio listeners to accept a drop in audio quality as part of radio DSO. Some stations offer higher audio quality via TV platforms and/or the internet. However, this is not acceptable compensation for a drop in mobile audio quality. Improving the audio quality of classic DAB requires an increase in bit rate. This increases the transmission cost per service and requires more radio spectrum to maintain the same number of services.

Switching to DAB+ provides a means to improve the audio quality without increasing bit rate. In fact, DAB+ can provide higher quality audio at lower bit rates. This enables the transmission cost per service to be reduced and more services to be accommodated within the current DAB/DAB+ spectrum. Thus, DAB+ is very attractive to the broadcasters. The problem is that older DAB radios are not compatible with DAB+. A wholesale switchover to DAB+ thus first requires ensuring that all new DAB radios are DAB+ compatible and then waiting five years on the basis that consumer electronics are expected to last at least this long. Factory-fitted car DAB radios are all compatible with DAB+ already. However, in 2018, some new DAB portables are still not compatible with the new standard.

Currently in Britain, DAB+ is used by many new services to minimise costs, particularly on the small-scale multiplexes. A switchover from DAB to DAB+ for established services will probably happen during the mid 2020s. Stereo stations will be able to broadcast a stereo DAB+ service and a mono DAB service in parallel during a transition period. However, mono stations will have to switch overnight unless the stereo stations on the same multiplex have already switched over. It is inevitable that some listeners will be caught by surprise by this switchover.

Thus, to maintain sound quality and to ease the logistics of a transition to DAB+ in the UK, there should be no major FM transmitter switch offs until the UK has moved over to DAB+. An exception might be made for Radio 3 because it already offers much better audio quality on DAB than any other UK radio station and has a much smaller

audience than the other main FM services (Radio 3, 6 Music and Radio 4 Extra each have about 2 million listeners).

6. FM Platform Viability

Since the 1980s, fewer and fewer radios have been equipped with long wave, even though Radio 4 Long Wave has always carried separate programmes at certain times and Atlantic 252 was available exclusively on long wave during the 1990s. Now, an increasing number of radios are being supplied without a medium-wave AM capability. Except in cars, DAB radios come with FM, but not AM. Furthermore, many radios integrated with clocks, CD players and iPod docks are FM only, despite many popular stations only being available on AM and DAB.

Therefore, if FM radio was to be limited to community stations and a few larger local and regional stations in areas unserved by local DAB, it is quite possible that receiver manufacturers would cease to support it, particularly if other countries in Europe adopt a similar approach. There is thus a risk of certain radio stations and certain parts of the country being stuck with a dying platform if a critical mass of FM stations is not maintained.

A counter-argument is that a DAB/FM radio can be produced for the same price as a digital-only radio as the receiver chip, the antenna and the user interface can all be shared. Furthermore, many manufacturers prefer to produce radios that will work anywhere in the world and some countries will continue with an FM-dominated radio ecology far longer than the UK. Broadcast band II (i.e., the FM band) is also being used for digital radio in some countries, including the USA.

A further issue is consumer behaviour. Many owners of FM/AM radios across the world never use them in AM mode and many owners of DAB/FM radios never use them in FM mode. Consequently, radio stations broadcasting on less fashionable platforms are disadvantaged. The radio industry has already proposed a solution to this problem, which is that radios should list DAB and FM stations on the same menu instead of requiring users to switch the radio between DAB and FM modes. However, radio manufacturers have yet to implement this.

To maintain viability of the FM platform, a mass DSO should be avoided until it is practical for all stations to broadcast digitally and all locations to be served by digital radio. Thus, a range of popular DAB-simulcast stations from both the BBC and commercial sector should continue to be provided on FM, albeit with a greater share of the FM spectrum allocated to services that cannot practically be accommodated on DAB at that location.

7. The Need for FM Radio in the 2020s

DAB/DAB+ is likely to overtake FM as the primary radio platform for the most popular stations in England, Scotland and Wales between 2020 and 2025 (depending on the service), leaving FM as a secondary platform. From that point, FM radio in the UK will have four main purposes:

1. To accommodate local stations that cannot broadcast on DAB/DAB+ either because there are no multiplexes with suitable coverage or because those multiplexes are full;
2. To fill gaps in DAB/DAB+ coverage;
3. To provide a traffic news interrupt service to vehicles without a dual-tuner DAB/DAB+ radio;
4. To provide a selection of popular services to vehicles that it is not practical to fit with DAB/DAB+ radios and potentially to portables used outdoors that require long battery life, noting that this requires a lower signal strength than indoor reception. Popular services are also needed to maintain FM as a viable platform until all radio services can be provided digitally at all locations.

Any current FM transmitter that fulfils at least one of these roles should be retained, though not necessarily at the current power, while transmitters that fulfil none of the above roles could be decommissioned. The FM spectrum released by this process should be made available for new services (and services moving from AM) that cannot be accommodated on DAB/DAB+ in the relevant location.

8. BBC National Radio in the 2020s

As a public service broadcaster, the BBC is obliged to balance maximisation of service coverage with value for money transmission. Due to budgetary constraints, the BBC have proposed not to invest further in DAB coverage beyond 2017. Instead, it has been agreed that the government will fund any DAB expansion needed to support DSO. The government requires DAB coverage to be completed in advance of any FM switch-off, but has not proposed a timetable for this. Most areas unserved by the BBC national DAB network can receive Radios 1 to 4 on FM. However, radio transmitters need replacing every 25 years or so. Thus, the BBC will eventually have to choose between completing DAB coverage, continuing to replace the FM transmitters or a mixed solution. The BBC's

current FM broadcasting contract with Arqiva runs until 2020, so a decision may need to be made soon on whether to continue renewing all transmitters.

Assuming DAB listening to Radios 1 to 4 overtakes FM listening during the early 2020s, it would be more logical to invest in improving DAB coverage and to eventually discontinue FM. However, maintaining universal coverage on both DAB/DAB+ and on FM in the run up to 'digital switchover' would be very expensive. Therefore, the BBC should gradually reduce FM transmissions over the course of the mid-to-late 2020s and use the money saved to gradually improve coverage of DAB. With careful planning, it should be possible to ensure that universal coverage using a mixture of FM and DAB/DAB+ is retained during the transition. Newer decommissioned FM transmitters could be redeployed to replace older transmitters in areas where FM coverage is still needed and/or boost coverage of local services that cannot be accommodated on DAB, enabling AM transmitters to be switched off.

Alternatively, a mixed DAB and FM approach could be retained indefinitely if maintaining and renewing a limited number of FM transmitters proves significantly cheaper than completing DAB coverage. In this case, FM radiation patterns should eventually be adjusted to focus on areas where DAB reception is poor.

Once the majority of listening to services available via FM is via DAB/DAB+ and other digital platforms, FM should be treated as a backup service, filling gaps in DAB+ coverage and, where needed, providing outdoor coverage for cars and portable receivers. As discussed in Section 3, indoor FM coverage will no longer be necessary in areas with good DAB+ reception.

The FM radio network in the UK was originally designed to provide mono coverage to roof-mounted aerials. In 1977, the BBC claimed to serve over 99% of the population with only about 80 transmitters per service and most transmitters radiating at half or a quarter of the current power. The network was then expanded to about 200 transmitters in the 1980s and 1990s with filler transmitters installed to boost the signal strength in many towns and cities. If only outdoor FM coverage is needed in the mid-to-late 2020s, it should be possible to decommission a lot of these filler transmitters, reducing costs and opening up spectrum for services that cannot broadcast using DAB+. It should also be possible to reduce the power of many of the high-power transmitters.

It is likely to be 2021 before even half of cars have a DAB+ radio, so it will be important to provide a good quality (generally stereo) FM radio service to the remaining vehicles. However, by 2030, the number of vehicles relying on FM radio will be small. Similarly, portable DAB+ receivers with a long battery life can be expected to become available in the 2020s or before. Thus, during the second half of the 2020s, an FM service with lower quality reception will become acceptable and there will be a case for reducing the number of FM services in less populated areas that have adequate DAB+ coverage.

FM radio in the 2020s will also need to provide indoor coverage in areas where DAB is not available. As explained in Section 2, most of these DAB coverage gaps will be in areas served by the high-power FM transmitters. If investment in improving BBC national DAB coverage is resumed during the 2020s (potentially funded by cost savings from reductions in FM and AM transmissions), the number of FM transmitters required to fill DAB coverage gaps will reduce as the decade progresses.

It is therefore proposed that the BBC reconfigure its FM radio networks as a backup service in the mid-to-late 2020s. Initially, the number of transmitters should be reduced from about 200 to 100-150 per network with the power reduced in some cases. This will reduce transmission costs for the BBC and release FM spectrum for other radio services. Further FM transmitters could be decommissioned as the decade progresses in response to increased DAB+ coverage and receiver uptake. Thus, by 2030, there might be about 25-50 FM transmitters per network. The appendix provides an indication of the order in which the FM transmitters should be commissioned. The process should start with categories 3 and 4, moving to category 2 once the vast majority of vehicles have DAB receivers, and potentially leaving the category 1 transmitters operational beyond 2030. In all cases, adequate DAB coverage should be ensured before each FM transmitter is decommissioned. Thus, further development of the BBC's DAB network might prioritise areas served by category 3 and 4 FM transmitters (and areas with poor FM reception). If the BBC decides to maintain universal coverage using a mixture of DAB and FM in the long term, then only the category 1 FM transmitters would need to be renewed during the 2020s.

The next question is which national services the BBC should broadcast on FM in the 2020s. Radios 1, 2 and 4 are the BBC's most popular radio services, while Radio 3 has a similar-sized audience to digital-only services 6 Music and Radio 4 Extra. There is thus an argument for taking Radio 3 off FM altogether. However, a counter argument is that the BBC's backup service should cater for all tastes. A compromise would be for Radio 3 to broadcast only in the evenings on FM, displacing one of the other services. Radio 3 is at its most popular in the evenings while Radios 1, 2 and 4 are more popular between 0600 and 1900. Radio Five Live might also borrow an FM network for

Saturday and Sunday afternoon sport once its AM service closes. Thus, the BBC might reduce the number of FM services it broadcasts from 4 to 3 at some point in the mid-to-late 2020s. Alternatively, Radio 3 could be retained as a separate FM service, but with lower coverage than Radios 1, 2 and 4.

In the short term, there is a strong case for Radio 3's FM network to move to the backup model before the other three networks. As Radio 3 is provided at a much higher bit rate (and hence audio quality) on DAB than any other UK station, there is no need to wait for a switchover to DAB+. A cutback in Radio 3 FM coverage would act as a pilot, enabling problems with DSO to be identified early. It would release spectrum for other radio services in many areas where FM is full. It would also make transmitters available for the BBC to improve FM coverage of local and regional radio without investing in new equipment (see Section 9). This could potentially be done straight away, though 2020 might be a more realistic date as this when the current transmission contract expires. The BBC has already decided to reallocate a small number of Radio 3 FM transmitters to Radio Wales during 2018.

9. BBC Local and Regional Radio in the 2020s

Following the 2015-17 expansion of local DAB multiplex coverage, there are still large areas of the country that can only receive BBC local or regional radio on FM (or even AM). Only a few of the local stations and none of the regional stations have FM-equivalent coverage on DAB. Although further expansion of local multiplex coverage is likely at some point, it will be difficult to persuade the commercial radio broadcasters that share these multiplexes to invest in universal coverage. Furthermore, with budgets constrained, the BBC may also resist further investment in local DAB coverage except possibly where this enables AM transmitters to be closed. Thus, long-term retention of some of the FM transmitters may well be needed to maintain coverage of BBC local and regional radio.

A further issue, discussed in Section 4, is that BBC local and regional radio's FM network will be required to deliver traffic news interruptions until cars are fitted with dual DAB tuners. Finally, many listeners to BBC local and regional radio are resistant to change and likely to be late adopters of digital radio technology. Currently, BBC local and regional radio has the lowest digital listening share of all the major radio services.

The only practical solution to these problems is to retain full FM coverage of BBC local and regional radio until at least 2030. Moreover, there should be improvements to the FM coverage in areas unserved by local DAB to enable all of the AM transmitters to be switched off. This is a particular issue for Radio Wales, for which some of the FM coverage gaps will be filled in 2018. However, there are also many parts of England, Scotland and Northern Ireland that can only receive local or regional services on AM. Decommissioned BBC national radio transmitters could potentially be used for this to minimize costs, noting that most would need to be relocated.

10. Large-scale Commercial Radio in the 2020s

Once radio listening becomes mainly digital, commercial broadcasters will wish to retain FM wherever the advertising revenue generated by the additional listening covers the transmission costs. With the exception of Classic FM, cost savings from reducing transmission powers will be minimal. Commercial radio will thus wish to retain an FM service in large cities, where the cost per listener is lower, for longer than in more sparsely populated areas. However, it is generally the cities where there is currently a shortage of FM spectrum.

If BBC national radio retains FM spectrum, albeit with reduced coverage, commercial radio will not be willing to switch-off profitable FM transmitters first. Commercial broadcasters may agree to a commensurate reduction in FM coverage with the number of FM transmitters (BBC and commercial) gradually reduced as FM listening declines through the 2020s. However, they would want to limit this to unprofitable transmitters. Re-allocation of spectrum from the BBC to the commercial sector is unlikely because the government has decided not to licence any new commercial services on FM. Coverage extensions are permitted, but the demand for that is now, not the mid-to-late 2020s, when FM listening will be much lower than now.

Large-scale commercial radio stations broadcasting on FM may be divided into three categories, each of which is discussed in turn.

a. Classic FM. Classic is the only commercial station with national FM coverage. It is likely to seek lower-cost FM transmission for the 2020s and is likely to agree to a similar arrangement to BBC national radio (Section 8), whereby low-power filler transmissions are decommissioned and power reduced at some of the high-power sites. In addition, Classic is likely to want to decommission medium- and high-power transmitters serving less populous areas, such as West Wales, Cornwall, Cumbria, Southern Scotland, Northern Scotland and NW Northern Ireland. Thus, it is proposed that the number of Classic FM transmitters be reduced from the current 42 to between 10 and 25 by 2030. Classic's initial 22 FM transmitters are about 25 years old and due for replacement now. These all serve relatively large populations. Classic's current FM broadcasting licence expires at the end of February 2022, at

which point the remaining FM transmitters, generally serving smaller populations, will need replacement. This would thus be a logical time to reduce FM coverage

b. Stations with Good DAB Coverage. For stations with good DAB coverage, FM is only needed for outdoor reception in the longer term. Transmission powers could therefore be reduced to make space for community radio and potentially other new services. Stations wishing to reduce costs should also be permitted to close some of their transmitters without losing their licences to transmit from the remaining sites. These changes should be made when the relevant FM broadcast licence is renewed. Many of these licences expire in 2019 or 2020, which is probably too early. Automatic 5-year FM licence renewals are being offered to stations that also broadcast on DAB. The expiry of these renewed licences in 2024-25 is a suitable time to begin changing FM transmission arrangements, depending on what happens with Classic FM.

c. Stations with Poor DAB Coverage. There are relatively few large-scale commercial radio stations broadcasting on FM only or with poorer DAB coverage. Most of these are likely to add or extend DAB transmission by the 2020s. Clearly, full-power FM transmission must be retained wherever DAB is not available.

11. Small-scale Commercial Radio in the 2020s

Most small-scale commercial radio stations launched between 1997 and 2008 and struggled to make a profit until they were permitted to form clusters, sharing programming and premises. As choice increases with the growth of digital radio, their audience is likely to decline. Therefore to retain a sufficient audience to sell local advertising, they will need to offer multiple programme streams (as the larger broadcasters already do). Then, to support the additional programming costs, they will need to extend their clusters to towns and cities without small-scale commercial radio. Small-scale DAB/DAB+ is a suitable platform for these developments to take place on. Towns and cities that are too small to support a small-scale DAB multiplex are also likely to be too small to support their own commercial radio stations. Alternatively, in areas where spectrum is available, small-scale stations could simply increase their FM coverage, becoming larger scale.

As small-scale commercial stations are likely to move towards DAB/DAB+, they should be treated in the same way as larger-scale commercial radio stations. Any requirements to reduce transmission power should not apply to stations broadcasting at 200W or less or to stations that have wider coverage on FM than on DAB.

12. Community Radio in the 2020s

The development of community radio in Britain is currently limited by the lack of FM spectrum. Most community stations that have been licensed to broadcast on AM frequencies have failed to launch; currently, only 12 are operating. The introduction of small-scale DAB multiplexes over the next few years will make more spectrum available for community radio. However, these multiplexes are only viable where several stations wish to serve the same area. Thus, community radio will still need FM frequencies for areas not covered by small-scale multiplexes. FM frequencies are also more appropriate for stations wishing to cover a much smaller area than the local small-scale DAB multiplex. This includes stations serving hospitals and military bases (student stations will have an audience across the relevant town or city).

The lowest part of the FM band, 87.6-88.0 MHz, has been reserved for temporary services since the early 1990s. However, with the advent of internet broadcasting and small-scale DAB, there is much less need for temporary FM services. Therefore, these frequencies should be reallocated to permanent broadcasters. Community radio stations that cannot practically broadcast on small-scale DAB should have priority for FM spectrum.

13. Developing FM Radio between 2018 and 2023

There should be three priorities for expanding FM radio in the short term:

1. Improving BBC local and regional FM reception in areas not served by local DAB multiplexes, enabling these services' AM transmitters to be closed;
2. Improving FM coverage of small-scale local commercial radio services, particularly in areas with relatively few FM services;
3. Continuing the licencing of community radio in areas that are not served by small-scale DAB.

FM spectrum is currently available in some areas but not others. Further spectrum should be released by:

1. Reallocating 87.6-88.0 MHz from temporary to permanent services;
2. Closing low-powered Radio 3 FM transmitters in areas where there is good DAB coverage and a high-power transmitter provides adequate outdoor coverage (Category 4 in the appendix); Indoor coverage

would be provided by DAB. This could be justified on the basis that Radio 3 has a much lower audience than any other national FM station *and* much better audio quality on DAB than any other station in Britain. The BBC could also redeploy some of the transmitters for its local and regional services.)

3. Synchronising a number of low-power BBC national radio transmitters on common frequencies (particularly in London and parts of Northern England), a technique currently used by a few commercial stations;
4. Using spectrum more flexibly by placing new commercial radio transmitters in the BBC sub-bands and vice-versa, where appropriate, and by allowing low-power transmitters to use frequencies that are suitable for higher power use where they are not needed for higher power services (particularly in the West Midlands).

Finally, low-power AM (LPAM) restricted service licences (RSLs), including many hospital radio stations, should be moved to FM wherever possible. As these stations broadcast over a much smaller area than community radio stations, it should be possible to allocate them FM frequencies that are unsuitable for other radio services. This might include frequencies 200 kHz away from transmitters serving adjacent areas.

Paul Groves. August 2015

Last Updated May 2018

Appendix: Categorisation of National Radio FM Transmitters

Category 4: Adequate outdoor coverage available from other FM transmitters

Good Indoor DAB Reception from the BBC National Multiplex	Conwy	Ivybridge	Salisbury	Croeserw
Basingstoke	Crieff	Kenley	Stranraer	Cornholme
Beecroft Hill	Darwen	Kingswear	Ton Pentre	Douglas
Bexhill	Ebbw Vale	Larne	Ventnor	Ferndale
Blunsdon	Fenham	Limavady	Weymouth	Llangeinor
Buxton	Folkestone	Llandyfriog	Wharfedale	Llwyn-Onn
Cambridge	Girvan	Luddenden		Manningtree
Camlough	Gogwell	Newton	Inadequate Indoor DAB Reception	Minehead
Carmarthen	Grantham	Northampton	Barnoldswick	Pennar
Carnmoney Hill	Hastings	Ogmore Vale	Beacon Hill	Porth
Caterham	Hebden Bridge	Penaligon Downs	Berwick	Walsden South
Chard	Hemdean	Penmaen Rhos	Blaenavon	Westwood
Chippenham	Holcombe Down	Plympton	Chalford	Woolmoor
	Hutton	Saddleworth	Cirencester Town	
	Idle	Salcombe		

Category 3: Outdoor coverage with weak patches available from other FM transmitters

Good Indoor DAB Reception from the BBC National Multiplex	Clettraval	Milburn Muir	Weardale	Guildford
Aberdare	Crystal Palace	Mynydd Pencarreg	Whitehaven	Llanrhaeadr
Aberlillery	Cwmafan	Newhaven	Winter Hill	Llyswen
Axe Valley	Exeter St Thomas	Okehampton		Marlborough
Bath	Haslingden	Peebles	Inadequate Indoor DAB Reception	Nailsworth
Ben Gullipen	High Wycombe	Pendle Forest	Ardgour	Ness of Lewis
Bridport	Ilchester Crescent	Penicuik	Barnstaple	Newbury
Brighton Whitehawk Hill	Keighley	Pontypool	Bow Brickhill	Penifiler
Cambret Hill	Keswick Forest	Port Ellen	Calne	Rosemount
Chesterfield	Kirkconnel	Rosneath	Combe Martin	West Kilbride
Churchdown Hill	Lyme Regis	Rhymney	Durris	
	Membury	Stanton Moor	Egford Hill	
	Mickleham	Todmorden		

Category 2: Areas with no coverage available from other FM transmitters – Small population exclusively served

Good Indoor DAB Reception from the BBC National Multiplex	Innerleithen	Rheola	Bressay	Llangollen
Abergavenny	Kendal	Rothesay	Chatton	Mallaig
Ballycastle	Kingussie	South Knapdale	Daliburgh	Melvaig
Betws-y-coed	Kirkton Mailer	Tullich	Eitshal	Rostrevor Forest
Brecon	Knock More	Varteg Hill	Ffestiniog	Rumster Forest
Campbeltown	Llandecwyn	Whalley	Fort Augustus	Skriaig
Clyro	Llandinam	Whitby	Glengorm	Strachur
Deiniolen	Llanidloes	Windermere	Isles of Scilly	Ullapool
Dolgellau	Long Mountain	Inadequate Indoor DAB Reception	Keelylang Hill	Wensleydale
Eyemouth	Ludlow	Ballachulish	Kilkeel	
Fort William	Machynlleth	Bilsdale	Kinlochleven	
Grantown	Oban	Bowmore	Lethanhill	
	Olivers Mount		Llandrindod Wells	
	Pitlochry		Llanfyllin	

Category 1: No coverage available from other FM transmitters – Large population served

Good Indoor DAB Reception from the BBC National Multiplex	Inadequate Indoor DAB Reception	Darvel	Morecambe Bay	Rowridge
Kilvey Hill	Ashkirk	Divis	North Hessary Tor	Sandale
Londonderry	Belmont	Forfar	Oxford	Sheffield
	Black Hill	Haverfordwest	Peterborough	Sutton Coldfield
	Blaenplwyf	Holme Moss	Pontop Pike	Swingate
	Brougher Mountain	Les Platons	Redruth	Tacolneston
	Carmel	Llanddona	Ridge Hill	Wenvoe
		Meldrum	Rosemarkie	Wrotham