Understanding the environmental impact of DAB+

Introduction

Sustainable development and carbon neutrality are key objectives of the European Union.

In 2020, the European Commission proposed the European Green Deal, a legally binding commitment for Europe to be climate neutral by 2050. The aim is to make Europe the world's first climate-neutral continent – by developing and leveraging cleaner sources of energy and green technologies.

To realise this vision, every sector of the economy has a role to play – and broadcasting is no exception. This is reflected in initiatives such as the EBU group on Sustainable Technology in Broadcasting.

In radio, the growth of digital is changing the way that audio is transmitted and consumed. The migration from analogue to digital is a gradual process and this presents broadcasters with both challenges and opportunities as they seek to achieve their sustainability goals.

Against this background, WorldDAB and its members need to:

- understand the environmental impacts of DAB+
- compare these impacts with those of other platforms (e.g. AM / FM, IP and digital TV)

The aim of this factsheet is to provide our members with an insight into these issues.

About this factsheet

This factsheet offers a summary of findings from numerous studies into the environmental and economic impacts of broadcasting on DAB radio and other platforms.

To provide a balanced picture, research studies from several countries / organisations have been included.

The DAB+ research studies have focused on three topics:

1. energy consumption
2. transmission costs
3. recycling initiatives for DAB+ digital radio.

Summary

The key findings of this factsheet are as follows:

- **Germany:** Research by Bavarian public broadcaster, Bayerischer Rundfunk, found that broadcasting one service on DAB+ required, on average, one fifth of the energy required to broadcast a service on FM (2021)
- **UK:** The BBC estimates that energy consumption per device hour (distribution and consumption) is lower for DAB than for any other platform, i.e. AM, FM, IP or DTV (2020)
- **Switzerland:** public broadcaster SRG SSR estimates that, after FM switch-off, total energy consumption for broadcast radio distribution via DAB+ will be less than 10% of what it was for FM (2019)

Energy

- **Germany:** In 2021, the public broadcaster for Germany's federal state of Bavaria, Bayerischer Rundfunk (BR), conducted a study comparing the energy consumption required to broadcast their five radio stations on FM and DAB+. The research found that, on average, transmitting a service on DAB+ required only 19% of the energy required for a service on FM.

  The study, which considered the energy consumption of BR's transmitters without taking into account encoding, multiplex, contribution and receivers, found that:

  - On FM, the average consumption per radio service is 1022 MWh per year (based on total of 5110 MWh for five FM services).
  - On DAB+, the average consumption per radio service is 192.5 MWh per year (total of 2310 MWh for 12 DAB+ services).

- **UK:** In October 2020, BBC R&D published and presented a research study looking at the energy footprint of BBC radio. The research included the impact of both distribution (through the transmission network) and consumption (via radio receivers or other devices). The research found that DAB radio services have the lowest energy consumption per device hour of any platform, and determined that in the long-run, retaining DAB and IP only would lead to the largest energy savings.

  Using the BBC's listening figures from 2018, the research compared the energy consumption of the BBC's radio stations across AM, FM, DAB, IP and DTV radio services.

  When looking at energy consumption levels per device per hour of listening, the research indicated that DAB radio services have the lowest energy consumption compared to other platforms, at 9 Wh/device-hour, followed by FM at 13 Wh/device-hour, IP at 23 Wh/device-hour, AM at 29 Wh/device-hour and DTV at 81 Wh/device-hour.

  The study also found that FM radio services use approximately 40% more energy per hour of listening than DAB – "mainly because of the higher power consumption of the FM transmitter network", as well as the fact that "DAB radios tend to have a lower standby power".

Consumption was shown to use the largest proportion of energy across the radio chain at 239 GWh (73%), with Distribution at 86 GWh (27%) and Preparation at 0.3 GWh (<0.1%).

- **Switzerland:** According to Swiss public broadcaster **SRG SSR**, the energy consumed per station on FM in 2019 was 40 GWh, compared to 3.4 GWh on DAB+. After the FM switchoff, the total energy consumption for broadcast radio distribution via DAB+ will be less than 10% of what it was for FM.
- **Germany:** The public broadcaster for Germany's federal states of Thuringia, Saxony and Saxony-Anhalt, **MDR**, published a research study in 2019 that considered the sustainability of DAB+.

  The study found that the broadcast of radio services via DAB+ would only require 10% of the currently used effective radiated power (ERP).

  The study also found that on average, a two-person household uses approximately 2 MWh of energy per annum for receiving terrestrial broadcast services. Using DAB+ instead of FM could result in energy savings comparable to approximately 5600 households.

- **International:** In 2020, TV and radio equipment manufacturer **GatesAir** published a research study comparing energy consumption and pricing between digital and analogue services. The study found that, for a single service on a DAB+ multiplex (with 18 services), the energy requirement for that service was approximately 50 times less than it would be on FM.

Transmission cost

- **International:** The **European Broadcasting Union** carried out an analysis in 2017 comparing the distribution cost of FM and DAB broadcasts. The analysis, which covered the five biggest markets in the EU28, found that FM was the most expensive distribution platform, and that a transition to DAB would indisputably lower the budget required for distribution, permitting greater investment in content production and employment.

  According to the analysis, the operational expenditure of a national radio station on FM, which is absorbed entirely by a single radio station, is equivalent to 5.8M$ (€4.8M) – whereas the cost of the equivalent DAB network (11M$ /€9.1M) is shared across the different radio stations populating the multiplex, typically up to about 18 different stations (600k$ / €500k per station).

  The analysis also states that although broadband has a variable cost that depends on the listening time and the population reach it sustains, it proves to be an expensive technology for distribution and not really capable of competing with DAB.

  The analysis, which covered the five biggest markets in the EU28, concluded that FM is a more expensive distribution platform than DAB+, and a "digital transition to DAB would

indisputably lower the budget required for distribution, permitting greater investment in content production and employment."

- **International:** A WorldDAB research study published in 2017 found that if radio was delivered purely over mobile streaming, it would use 2.2GB of data per month per user for the typical daily listening time. Access to broadcast radio, on the other hand, is always free to the listener.

- **UK:** Network operator **Arqiva** published a research study in 2019 comparing the cost of radio distribution using three different transmission platforms – FM, DAB+ and IP. Three different scenarios were laid out to compare the three distribution channels, taking into account differences in Gigabyte shifted pricing – ranging from £0.02 (€0.023) to £0.04 (€0.046) – as well as different levels of reach, which ranged from 5% to 7%.

  The study concluded that FM is the most expensive distribution channel, at £0.00105 per hour, followed by IP, costing £0.00047 per hour of distribution. DAB+ was deemed to be the most affordable means of distribution, at £0.00033 per hour.

  The study also found that the reduction in transmitter cost from ceasing dual broadcasting, as well as the reduction in energy costs from digital transmitters over analogue, has a net benefit, with an NPV in excess of £200 million.

Recycling

- **Norway:** the 2018 report on Norway's digital switchover showed that the country has a well-developed system for recycling electronic waste. When the radios were handed in, 90 per cent of the components would be recycled into new materials, while 9 per cent would be used for energy recovery. This means that 99 per cent of the products would be recycled.

  In the run-up to switching off FM in Norway a campaign was launched to inform consumers on how to recycle their FM receivers, or upgrade them to digital radio using an adaptor.

- **Switzerland**: the country has launched Swico Recycling in order to recycle used electronic goods. It is a national, not-for-profit system for taking back discarded electronic and electrical equipment used in the areas of informatics, consumer electronics, communications, graphics industry and measurement and medicine technology.