Conversion of Analogue Television Networks to Digital Television Networks

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Introduction

- There are many possible planning approaches for the design of a digital terrestrial television network and in our preparations for the second session of the RRC.
- In order to facilitate the production of the draft plan – it is helpful to have a series of input requirements which you know are compatible with your neighbours'.
- But it is essential to ensure that your input requirements are going to meet your longer term digital service needs.
- Therefore, in order to resolve these issues, we need to have a clear understanding of what we require from our new digital network.

Initial planning issues

- What did our analogue network provide and how?
- Do we need the digital network coverage to match the analogue network coverage?
- Are we targeting portable or mobile receivers?
- What and where is our target audience?
- How much do we need to co-ordinate with our neighbours?
- Do we have a clear idea of our required network infrastructure?
- How many multiplexes are required to make the network viable?
- What are our programming requirements?

Issues for spectrum planners

- The requirements for DVB-T are likely to include fixed, portable, and mobile reception, interactivity and multimedia
- The number of multiplexes, level of coverage and requirements for national, regional and local services will be different for each country in Europe
- Whilst one option would be to specify a common set of coverage requirements (as implied by ST61) there could be multiple service requirements within a country
- Preferred option might be to devise a framework in which each country could develop its own requirements whilst protecting services in neighbouring countries

Frequency planning options: transition period

- Frequency plans during transition period will vary from country to country and digital transmissions will have to co-exist with and protect analogue transmissions from interference
- Various ways have been used to find the spectrum for implementation:
  - Unused analogue assignments
  - Channels above 60
  - Interleaved channels
  - Analogue channel changes
  - Island-by-island

Frequency Planning for the all-digital period

Several options were under consideration for the all digital frequency plan:

- Analogue conversions - as facilitated in CEPT countries using Chester 97 rules
- Current DVB-T assignments – where these have been possible within the existing plan
- Complete new plan – all frequencies available for reassignment but probably using existing broadcast sites

Not all options are suitable for all countries - a flexible approach is necessary.

Comparison of planning options for the all-digital period

	Analogue conversions	Existing DVB-T assignments	Completely new plan
Compatibility with analogue services	▲▲▲	▲▲	▲
Additional digital service prospects	▲▲	▲	▲▲▲
Effective use of spectrum	▲▲	▲	▲▲▲
Equitable access	▲	▲	▲▲▲
European migration	▲▲	▲	▲
Co-ordination	▲▲▲	▲	▲

Relatively easy ▲▲▲ Average ▲▲ Complex ▲

UK analogue legacy and its implications

- The four national analogue services are generally provided from a single transmitting station so each household needs only one receiving aerial.
- Our current analogue viewers use fixed roof-top directional antennas with a relatively narrow bandwidth, so we have planned for fixed reception for DTT.
- Public-service broadcasts carry different programmes regionally.
- Existing analogue viewers needed to be protected from interference from DTT as the new service was introduced, but may not need to be in the longer term.

The UK planning decisions

- The need for a regional network ruled out the use of a national SFN.
- At the time of launch (1998), only 2k receivers were being produced, which ruled out the use of smaller, regional SFNs.
- The new digital channels would be, as far as possible, in the same channel group as the analogue.
- The new digital frequencies would be interleaved with the existing analogue frequencies, and to reduce the effect of adjacent channel relationships on the analogue, were co-sited.

Therefore

A national MFN was the best solution for the UK

UK DTT network

- 2k, 64QAM, 2/3 code rate (at launch)
- MFN
- Fixed, rooftop reception
- 80 existing analogue sites
- Many transmit antennas shared with the analogue service
- Many new transmit antennas, designed to protect analogue from interference form DTT
- ‘plug and play’ installation marketed to the viewers
- 70% core coverage at launch

Transition to all digital

Guidelines for the UK

- Need to provide a digital service to all analogue viewers
- Need to maintain a service to existing digital terrestrial viewers
- Need to maintain the same regional structure as the analogue network

The best way to do this was to use an MFN conversion approach.

MFN Conversion Approach

- What is a MFN?
  - A mixed network of high and low power stations, using different frequencies – like the current analogue networks
  - All stations, including low power stations, are important to achieve near-universal coverage
- What is a conversion?
  - A digital transmission that replaces an analogue transmission on the same channel
  - Uses a set of rules to ensure no increase in interference

This approach should sound familiar…..

The Chester 97 Agreement

MFN Conversion Approach

- What is a MFN Conversion?
  - The conversion of all required analogue stations in the network to digital using the original analogue frequencies.
  - This is a particularly useful approach for countries which rely on existing fixed receive aerials for a large proportion of their television reception.

Benefits of MFN conversion approach

- Economic:
  - Allows reuse of existing infrastructure
  - Allows use of off-air feeds to relay stations
  - Makes best reuse of existing receiving aerials
- Technical:
  - Retains compatibility with existing Plans
  - Eases the transition process
  - Retains the coverage of each individual station
  - Provides continued protection of all stations
  - Maintains the regionality of services
  - Does not preclude adding additional networks & coverages

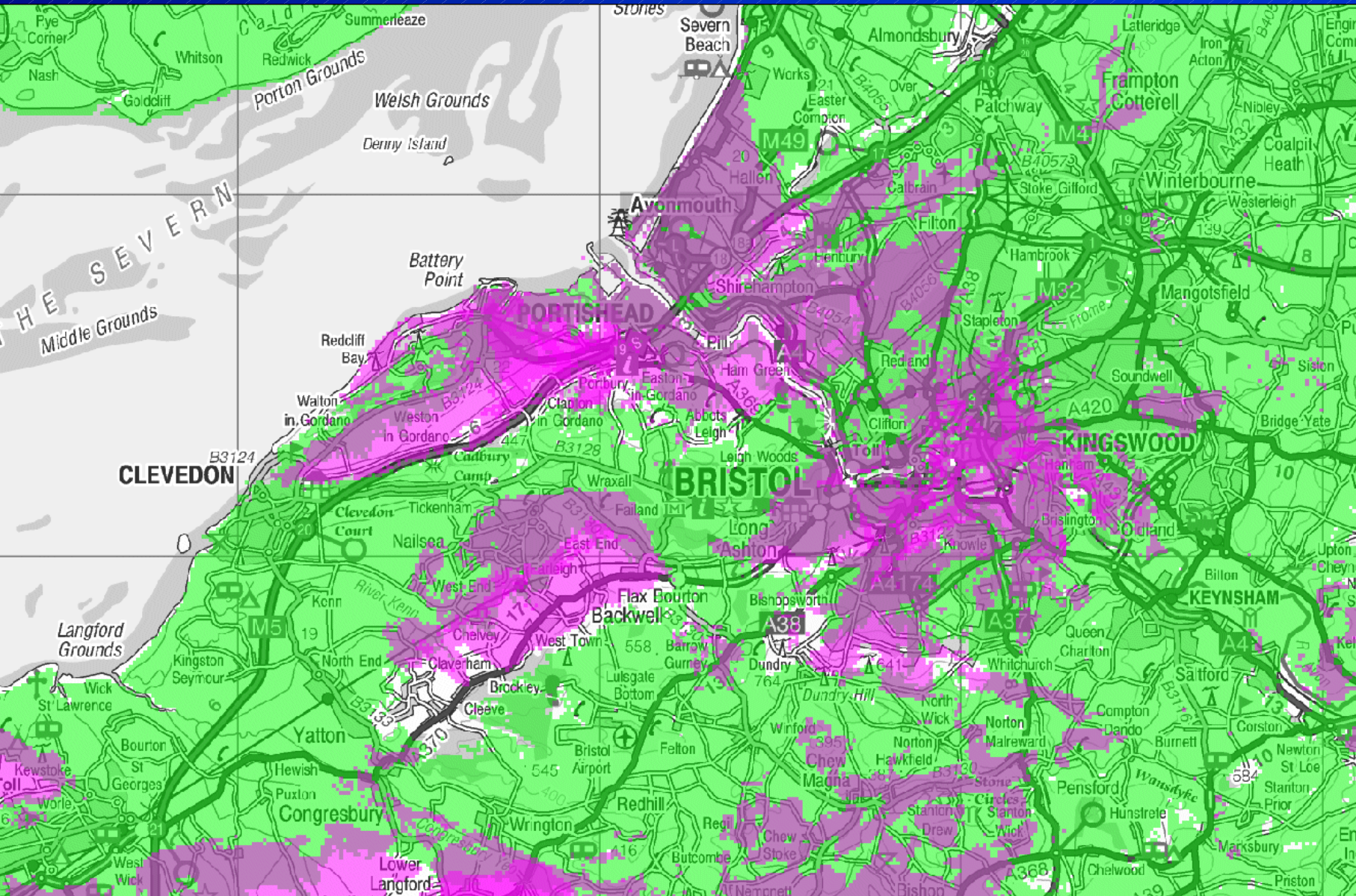
Transition Arrangements

- "Phased" switchover at each of the main stations allows gradual introduction of digital services to relays
  - Gives consumers opportunity to acquire equipment without losing all services
  - Gives broadcasters possibility of gradual implementation
- No transitional frequencies required
- Each main station and its relays can be treated separately from the others

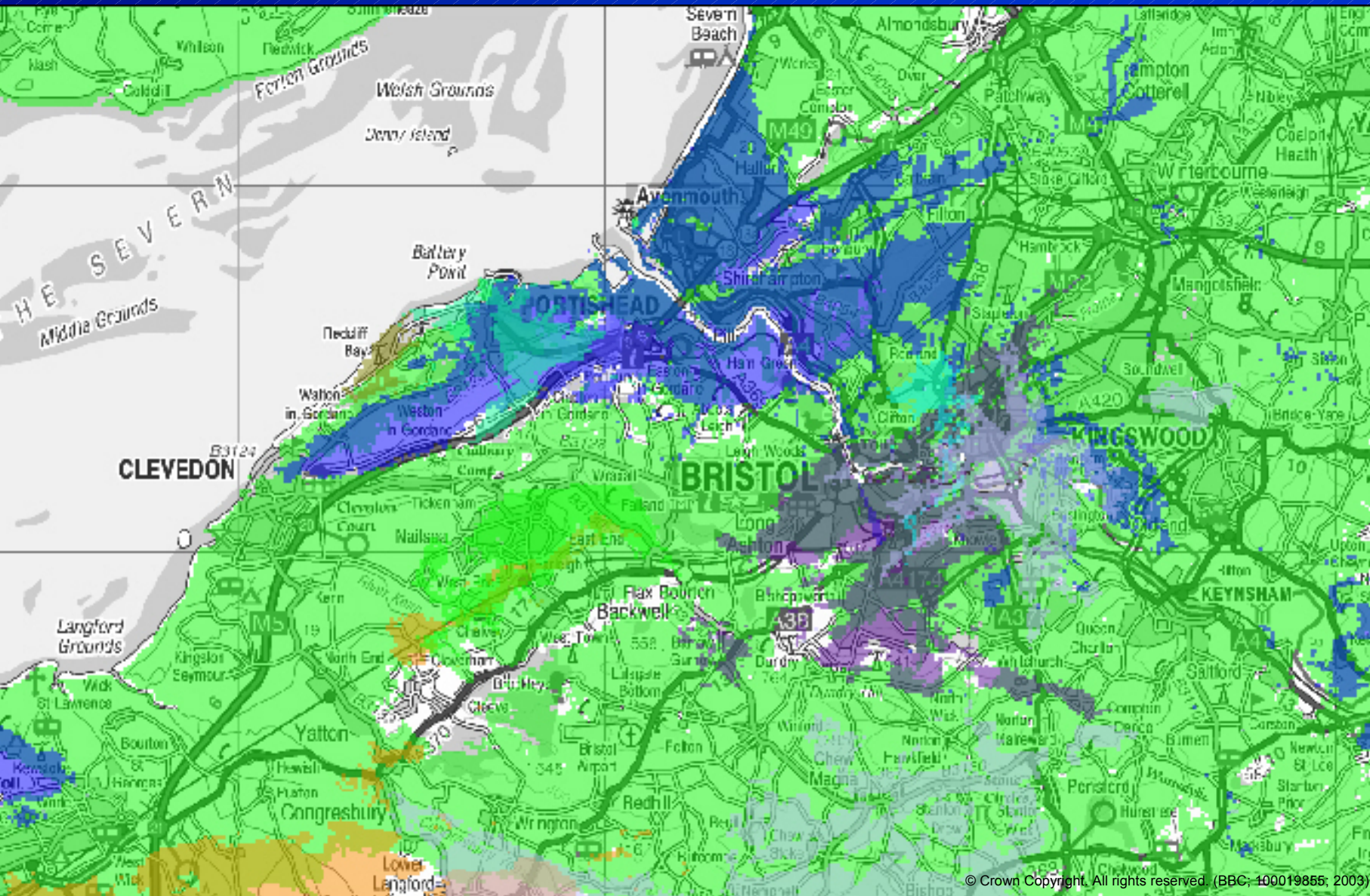
Example

- Conversion of an analogue network in the Bristol area.
- 1 high power station & several low power stations
- Reuse of original analogue channel at all stations
- Digital ERP is 7 dB below analogue ERP
- Same antenna heights and patterns

Example of MFN Conversion Approach



Example of MFN approach (2)



Compatibility with other approaches

- The MFN conversion approach is compatible with existing network plans.
- If your neighbours wish to use a different approach, then this may no longer be compatible, therefore…
- Bilateral negotiations – talk to your neighbours to agree your plans before the production of the draft Plan.

Conclusion

- One approach to a digital plan is to:
  - Retain the analogue MFN configuration
  - Convert the analogue assignments into digital assignments, including low power stations
- This approach is particularly suitable for countries which rely on fixed receive aerials for a large proportion of their television reception.
- Economically advantageous for reuse of infrastructure and programme distribution using off-air feeds

The End