RADIO SPECTRUM POLICY GROUP REPORT ON IMPROVING SPECTRUM EFFICIENCY AND UTILISATION IN FREQUENCY BANDS RELATIVE TO THE DIGITAL DIVIDEND

June 2010

Executive summary

The digital dividend spectrum becoming available in frequency bands below 1GHz as a result of the transition to all-digital terrestrial television services is an essential and valuable public resource[1]. The Council of the European Union[2], European Parliament[3], European Commission[4] and RSPG[5] together recognise that to maximise the potential benefits from the digital dividend it is very important that the digital dividend spectrum is used and coordinated efficiently while respecting Member States' competencies and specific national requirements[6].

Making digital dividend spectrum available to meet social, cultural and economic needs in delivering new electronic communications services (ECS) is a once in a generation opportunity. Timely availability of it paves the way to meeting the fast-growing demand for wireless broadband services.

This Report examines from a policy perspective a range of issues of relevance to improving spectrum efficiency and utilisation in the use in frequency bands relevant to the digital dividend. In particular, the Report:

- Explores the concept of efficient use of digital dividend spectrum. This concept sets the context for the considerations and issues that follow. In essence, it needs to account for service- and technology-neutral principles;
- Examines a range of issues perceived as affecting efficient spectrum usage. While this examination is at a high level, it nevertheless shows the tight balancing act that Member States face in ensuring efficient use of the digital dividend in the short and medium term. It also provides insights into future developments that are likely to alter and improve the prospect of efficient use of digital dividend spectrum including

[1] A study conducted for the EC by Analysis Mason, Dotecon and Hogan & Hartson indicated economic benefits of up to €44 billion to the EU's economy.
[2] Council Conclusions on "Transforming the digital dividend into social benefits and economic growth" 2987th TRANSPORT, TELECOMMUNICATIONS and ENERGY Council meeting Brussels, 17 December 2009
[3] European Parliament Resolution (2008/2099) on "reaping the full benefits of the digital dividend in Europe: a common approach to the use of spectrum by the digital switchover.
[4] COM (2009) 586/2 on "Transforming the digital dividend into social benefits and economic growth".
[5] RSPG09-291 Radio Spectrum Policy Group Opinion on the Digital Dividend.
[6] Ibid footnote 2.

use of cognitive technologies and improvements in technical standards for broadcasting transmitter and receiver equipments ;

- Focuses on the role that greater regulatory certainty would provide in improving spectrum efficiency and utilisation in those frequency bands relevant to the digital dividend;
- Points towards some of the potential benefits of efficient use; and
- Identifies strategic steps to improve efficiency in the use of the digital dividend.

It is the view of the RSPG therefore, that promoting and furthering spectrum efficiency gains, now and in the future, while recognising the dynamic nature of technological evolution and of market demand, will ensure the continued competitiveness of EU markets[7] and the availability of attractive services to users[8].

[7] COM(2010) 245 A Digital Agenda for Europe: A flagship initiative under the Europe 2020 strategy for smart, sustainable and inclusive growth.
[8] See Council Conclusion on Digital Dividend, 'Invites' c).

Table of Contents

Executive summary 2

1. Introduction 5

2. The concept of efficient use of digital dividend spectrum 5

2.1 Efficient spectrum use in a service-neutral context 7

2.2 Frequency coordination between ECNs in technology-neutral context 7

3. Issues affecting efficient spectrum usage 8

3.1. The role of spectrum harmonisation in spectrum efficiency 9

3.2. Frequency planning 9

3.2.1 Cross-border frequency coordination 9

3.2.2 Rearrangement of broadcasting services to release the digital dividend 10

3.2.3 Single Frequency Networks (SFNs) 12

3.3. The use of white spaces by Cognitive radio and PMSE 14

This section addresses the prospects for the use of the so-called 'white spaces' by cognitive radio and the current use of 470-862 MHz by PMSE respectively. 14

3.3.1 Prospects for cognitive radio 14

3.4. More efficient standards 17

3.4.1 More spectrally efficient standards for broadcasting transmission and receiver equipment 18

3.4.2 CEPT study on receiver parameters 19

4. Creating greater regulatory certainty 20

4.1 Digital dividend in the context of the EU's Spectrum Policy Programme 20

5. The benefits of efficient use of spectrum 21

6. Strategic steps to improve efficiency in frequency bands relevant to the digital dividend 23

ANNEX 1: Current PMSE use in the 470-862 MHZ band 25

ANNEX 2: Overview of CEPT and ETSI activities on PMSE 30

1. Introduction

This RSPG Report examines how to improve spectrum efficiency and utilisation in frequency bands relevant to the digital dividend.

The objective of this Report is to describe the range of issues affecting efficient spectrum usage and where appropriate to propose strategic advice on how it can be improved. The Report also necessarily refers to existing relevant ongoing and completed works in this area, and contains many factual considerations. This Report should therefore also function as a helpful reference source, given that it brings together in a single place references to related works (for example, the work set down in various CEPT Reports as well as other RSPG Reports and Opinions).

2. The concept of efficient use of digital dividend spectrum

Demand for certain types of services, (such as mobile internet and broadcasting), is accelerating. Innovation and service development requires access to spectrum to help fulfil the needs of consumers for ubiquitous access to the increasingly broader variety of innovative services. This points to the need for greater efficiency in the use of spectrum for wireless electronic communications services.

A clear understanding of efficient use of spectrum can stimulate an improvement in the use of spectrum, resulting in a greater abundance of spectrum for services to end-users and opportunities for innovation. The aim of this section is to explore in a broad sense the concept of efficient use of digital dividend spectrum.

As a starting point, it is instructive to consider the high-level differences between typical spectrum users' networks in the band 470 to 862 MHz as this presents a paradox concerning

efficient use of spectrum. Reflecting what might seem to be an efficient use of spectrum by one type of network but which could be considered to be an inefficient use of spectrum by another type of network will require a broad-based definition of the concept of efficient use of spectrum.

Consider on the one hand digital terrestrial television (DTT) networks, which typically use medium and high power transmitters to broadcast signals over very large areas. Some DTT networks may use powers of the magnitude of hundreds of kilowatts, and may provide coverage of the same set of TV/Radio programmes and other audiovisual media services to millions of homes. On the other hand, cellular networks (two-way networks) typically use base stations transmitting powers of the magnitude of just hundreds of watts, each station covering only a few square kilometres but with many more stations than in a DTT network in order to meet consumer demand and with a relatively high level of frequency re-use, compared to a broadcasting network. Yet both types of network may be using spectrum efficiently even though the rights of use of radio frequencies for them could be very different.

For example, building dense "cellular-like" DTT networks in order to improve coexistence with mobile networks is less likely to be economically viable, in particular for network business models based on advertising revenues only but also for publicly funded broadcasting networks due to the much higher costs of a cellular-type network. Additional costs on the receiving side could also be incurred by migrating from existing DTT networks into dense networks, for example due to subsequent requirements to re-orientate millions of roof-top antennas.

The concept of efficient use of spectrum therefore, should be a broad-based concept and take into account the service requirements of particular types of networks. While the difference between these typical networks provides a useful starting point, it may be more useful to broaden the understanding of the concept of efficient spectrum use to the case of service- and technology-neutrality.

2.1 Efficient spectrum use in a service-neutral context

There is a trend towards convergence of services[9] which has a particular implication for the concept of efficient use of spectrum.

Today's communication networks can support a range of communication and media services including, for example, transportation of TV and radio programmes via IP-based services. In the case of mobile networks, these TV and radio programmes are formatted for reception on portable and mobile devices. -

As explained in the WAPECS Opinion[10] different networks can provide mobile, portable, or fixed access for a range of ECS (e.g. IP access, multimedia, multicasting, interactive, broadcasting, datacasting and so forth) using a variety of technologies to seamlessly deliver services to users. From this perspective spectrum efficiency gains could be achieved by using the best-suited transmission path for a required service at a certain time in a certain location, taking into account the respective advantages of different categories of networks as explained above.

2.2 Frequency coordination between ECNs in technology-neutral context

For mobile services, the traditional concepts of frequency coordination are in most cases based on so-called "equal access to spectrum" methods in border areas. Frequency coordination methodologies for application between mobile services exist for various bands. Such methodologies are described in various CEPT Recommendations including the ERC/REC(01)01 on border coordination of UMTS; ECC/REC(05)08 on frequency planning and frequency coordination for the GSM 900, GSM 1800, E-GSM and GSM-R frequency bands; and ECC/REC(08)02 on frequency planning and frequency coordination for the GSM 900 (including E-GSM)/UMTS 900 and GSM 1800/UMTS 1800 bands.

Separate CEPT deliverable(s) are being developed for cross-border coordination between mobile services in the band 790-862 MHz similar to those in ECC/REC/(08)02 applicable to

[9] Convergence in this context is understood to mean that an Electronic Communications Network originally intended for a specific electronic communication service is now being used for a range of different services.
[10] RSPG05-102final: Radio Spectrum Policy Group Opinion on Wireless Access Policy for Electronic Communications Services (WAPECS) (A more flexible spectrum management approach).

the 900 MHz band. One such deliverable, CEPT Report 29[11], developed by ECC TG4 in response to an EC Mandate, provides guidelines on cross-border coordination between mobile services in one country and broadcasting services in another country.

The objective of coordination agreements between administrations is to provide equal possibilities for provision of services by all concerned operators of Mobile/Fixed communication networks (MFCN) on the basis of specified field strength limits for the respective MFCNs. These field strength limits have to be determined in such a way as to provide, on the one hand, the possibility for coverage in border areas and, on the other hand, the possibility for coexistence with neighbouring areas.

In summary, such field strength limits defined as coordination thresholds are part of least restrictive technical conditions for frequency bands addressed in the context of WAPECS. It may also be possible for the specified field strength limits to be exceeded on the basis of mutual agreements between the respective network operators provided that any such agreements are in compliance with the coordination agreements between the concerned administrations.

3. Issues affecting efficient spectrum usage

The RSPG has identified a number of issues which affect efficient use of spectrum and which can be explored further by Member States on a case-by-case basis. These include the role of spectrum harmonisation, frequency planning (cross-border frequency coordination, rearrangement of broadcasting services to release the digital dividend and the use of single frequency networks), and use of white spaces (including cognitive radio and programme making and special events (PMSE)), and more efficient technical standards. Each of these issues is now addressed in turn.

[11] CEPT Report 29 on "Guideline on cross border coordination issues between mobile services in one country and broadcasting services in another country"

3.1. The role of spectrum harmonisation in spectrum efficiency

The RSPG Opinion[12], on streamlining the regulatory environment for the use of spectrum, recognises that harmonisation is one of the main objectives of spectrum management at the European level and that global spectrum harmonisation is also important for European interests. The objective of spectrum harmonisation is a coordination and harmonisation of technical parameters for use and availability of spectrum to ensure compatibility with other services.

Spectrum efficiency can be defined as not assigning more spectrum than is necessary for a service or application[13]. Harmonisation of use of spectrum plays a key role in this respect through ensuring, for example, in neighbouring countries that the adoption of the same or compatible technologies, frequency band plans, etc., facilitates frequency sharing in border areas and thus minimises the amount of spectrum required by networks or systems operating in each jurisdiction. This is particularly relevant in the context of satellite, mobile or portable applications, where countries within a region all adopt the same spectrum management criteria and rules. Such spectrum harmonisation facilitates regional and global markets, and consumers can benefit from lower costs and mass-market availability of services and devices.

3.2. Frequency planning

3.2.1 Cross-border frequency coordination

The GE06 Agreement contains all of the necessary regulatory procedures for the coordination between broadcasting services on the one hand, and broadcasting or other primary services including mobile services on the other. However, once countries with which coordination should be sought are identified, detailed technical coordination is required to check and ensure compatibility between concerned assignments, allotments or stations.

[12] RSPG Opinion RSPG08-246 on Streamlining the regulatory environment for the use of spectrum.
[13] For example, see RSPG09-258: RSPG Opinion on Best Practices Regarding the Use of Spectrum by Some Public Sectors. 11 February 2009

Methodologies for this detailed coordination are developed by the concerned administrations during bilateral or multilateral discussions. The methodologies used may depend on the requirement of these administrations to coordinate both broadcasting networks and mobile networks. CEPT Report 29 provides guidelines on elements which can be selectively used by administrations in agreeing a methodology.

An example of a multilateral discussion forum is the Western European Digital Dividend Implementation Platform ("WEDDIP" group), created in May 2009 in order to coordinate the frequency coordination activities carried out by its member countries with a view to implementing the digital dividend. Its members are the Administrations of the following countries: Belgium, France, Germany, Ireland, Luxembourg, the Netherlands, Switzerland, and the United Kingdom. More specifically, the group aims at helping to achieve mutual compatibility of the spectrum resources to be used in the implementation of the digital dividend in each country, for both broadcasting and mobile services. Eventually, this should facilitate any consequential modifications to the GE06 Plan, while respecting the principle of equitable access to spectrum resources in border areas. The group is also a good place for sharing experiences and good practices concerning the implementation of the digital dividend among its members (e.g. the use of Channel 60, DVB-T2 etc.). The WEDDIP approach could be adopted by other sub-regional groups of regulatory Administrations to facilitate implementation of the digital dividend.

3.2.2 Rearrangement of broadcasting services to release the digital dividend

The GE06 Agreement and Plan are the result of a frequency planning process which was carried out under specific assumptions and conditions. The agreed GE06 Plan contains Plan entries for broadcasting services across the entire band from 470 – 862 MHz.

Further to this work, the European Commission has adopted an EC Decision[14] on the technical conditions for the use of the 790-862 MHz (800 MHz) sub-band by ECS. The Decision lays down parameters, including frequency arrangements and block edge masks, to be used by networks other than high-power broadcasting networks deployed in the band.

[14] Com(2010) 627/EC on "Harmonised technical conditions of use in the 790-862 MHz frequency band for terrestrial systems capable of providing electronic communications services in the European Union"

The need to utilize Plan entries in the sub-band 790 – 862 MHz for the future implementation of ECS other than broadcasting may require rearrangement of the Plan for the countries concerned in order to reconstitute the required number of layers and, possibly, to find additional resources below 790 MHz. As a result of GE06 discussions, equitable access was clearly taken as a regional concept providing for different quantities and/or qualities of resources under different regional planning conditions, e.g. number of administrations involved in a defined co-ordination range.

To provide for a harmonized use in the frequency sub-bands 470 to 790 MHz and 790 to 862 MHz respectively, a principle of equitable access has to be established for both frequency bands separately. Under the assumption of a mobile-type use in the latter sub-band band, a re-distribution of rights in this range seems to be achievable, based on the knowledge and experience already gained in other frequency bands, where the mobile-type usage was commonly introduced through coordination agreements between administrations.

There is no unique practice for finding additional frequencies. The reasons for this are multiple. Different countries pursue different objectives and the implementation of digital broadcasting is at a different stage in each country. However, making use of planning techniques and tools which can more accurately reflect the physical geography, e.g., topography and terrain in a given area, more relaxed technical parameters, provides additional important information which administrations can use to their advantage when trying to find additional frequency resources in the band 470 – 790 MHz, particularly when allied with appropriate methodologies. Some of the methods which may be used include:

- Modifications to the size of initial broadcasting coverage requirements;
- Planning additional coverage using low-power transmitters;
- Changes in transmitter characteristics (e.r.p., antenna diagram, tilt, etc) of broadcasting networks to avoid causing interference to new stations and services.

Such rearrangement activities require coordination with neighbouring countries in order to be able to record new assignments in the Plan in conformity with the GE06 procedures. In this respect, one of the first activities of the WEDDIP group is to study solutions to reconstitute a,

yet to be decided, certain number of layers (or rights) for each country as a basis for a more widespread solution, following the equitable access approach and noting that implementing the equitable access principle in detail depends on regional situations and circumstances.

According to the planning principles of the GE06 Agreement, any approach concerning the implementation of digital television transmission networks and ECS should be in conformity with the rights obtained by a country in the Plan. As a result of that, it is possible to adopt quite different approaches (i.e. network topology, number of networks, for example) as long as the thresholds described by the (transmission) rights are not exceeded. Hence, equitable access should be determined on the basis of the level of rights and not on the implementation approach adopted, thus maintaining the balance between administrations with respect to the level of rights, both now and in the future, irrespective of the implementation approach.

In this context, the above-mentioned term "layer" does reflect a set of such rights (potential frequency positions), covering a defined area. It does not matter whether such a layer would be appropriate to provide rights for a nationwide coverage or for just some "island" within the territory of an MS. For example, an administration could be provided with a number of nationwide layers and additional layers for specific regions, cities, towns, villages (or "hot spots"). This would include the right to implement any kind and any number of networks, as far as this implementation does not exceed the thresholds resulting from the description of rights (principle of conformity).

3.2.3 Single Frequency Networks (SFNs)

The configuration of DTT networks needs to be optimised with regard to a number of parameters, such as the size of the service area, terrain, population distribution, availability of transmission infrastructure and spectrum resource.

A Single Frequency Network (SFN) is a solution for extending coverage at a single frequency in a spectrally efficient manner. For this reason, SFNs are implemented in several countries as one solution out of many others to finalise the coverage of given geographical zones. However, in addition to their advantages, there are also challenges and disadvantages to using

SFNs. The pros and cons of SFNs may be assessed against technical, financial and content criteria.

i) Technical elements relating to SFNs

For SFN deployment, the selected guard interval directly constrains the maximum distance between transmitters. In a real environment the field strength variations are not only dependent on the distance between transmitters, and it would be a mistake to assume that a SFN may work if all sites are located less than the guard interval away from each other. Therefore, the use of a sufficiently large guard interval, synchronization between transmitters and rigorous planning are all necessary to prevent SFN self-interference. This is made even more difficult because SFN transmission sites are generally at predetermined locations (existing analogue transmission sites) and use existing transmit antenna patterns and polarisation. In addition, there is a balance to be found between bit rate and robustness of the signal (the larger the guard interval, the lower the bit rate and potentially the robustness). In order to mitigate self-interference in SFNs additional low-power transmitters are sometimes required. Therefore, designing SFN networks offering characteristics and same coverage as those of mixed SFN/MFN networks is more challenging. In terms of spectrum planning and efficiency, the benefits of SFN networks has to be considered taking also into account constraints on frequency availability arising from cross-border coordination.

ii) Financial issues

For portable reception, the SFN network gain may slightly improve the coverage e.g. for portable reception in mountainous areas. However, extensive coverage of countries would need a very large number of sites with medium power, thus increasing the cost of terrestrial broadcasting. Re-engineering the existing networks also presents a considerable cost. As explained in Section 2, building dense “cellular like” DTT networks is less likely to be economically viable, in particular for network business models based on advertising revenues only but also for publicly funded broadcasting networks due to the much higher costs of a cellular-type network. Additional costs on the receiving side could also be incurred by migrating from existing DTT networks into dense networks for example due to subsequent requirements to re-orientate millions of roof-top antennas.

iii) Content issues

With nationwide SFN there is no possibility to transmit regional or local programming content to individual areas (unless they are isolated from a radio propagation point of view from the rest of the country) within the SFN coverage. Therefore nationwide SFNs imply a cost to be paid in terms of reduced social, cultural and economic value of the programming. Such costs may be difficult to quantify and the wider implications may need to be explored on a case-by-case basis by Member States with respect to the efficiency of use of spectrum in bands relevant to the digital dividend.

3.3. The use of white spaces by Cognitive radio and PMSE

This section addresses the prospects for the use of the so-called 'white spaces' by cognitive radio and the current use of 470-862 MHz by PMSE respectively.

3.3.1 Prospects for cognitive radio

RSPG has recently published a report on Cognitive Technologies[15] (the Cognitive Report) which should be taken as the reference for RSPG work in this area.

The Cognitive Report considers that cognitive technologies are technologies that allow dynamic spectrum access, which in this context, means that cognitive devices may either:

i) rely on spectrum-sensing capabilities to detect unused spectrum in which they can transmit; or,

ii) alternatively, cognitive devices can measure their location and make use of a country dependent "geo-location" database to determine which channels they can use at their current location.

The Cognitive Report concludes that dynamic spectrum access is one way to increase spectrum efficiency because cognitive technologies facilitate access to interleaved spectrum that is otherwise unused allowing cognitive devices to transmit without causing harmful interference. Cognitive technologies, i.e. cognitive radios, have the potential to support a wide range of uses, including high-speed always-on broadband and are particularly suited to

[15] RSPG10-306 RSPG Report on Cognitive Technologies

using interleaved spectrum locally, precisely because significant capacity is often unused at any one location at least some of the time.

Whilst there is clear potential that allowing cognitive access will increase the spectrum efficiency, a number of issues need further consideration before the benefits of cognitive technologies and successful dynamic spectrum access may be realised. These include:

i) The nature of the authorisation of cognitive devices, as it will affect the future use of a band and also the potential benefit of cognitive devices. For example, if the user of the cognitive device will have to pay to access the spectrum, there may be less incentive to invest in spectrum sensing technology or in funding a geo-location database. On the other hand, if cognitive devices are authorised on a general authorisation basis, it may be difficult to re-farm a band at some future time for new use or for existing users to migrate to different technologies. Hence, there is potential for band sterilisation, but this applies also for devices not having cognitive capabilities and any licensing under a general authorisation regime;

ii) The ability of cognitive devices to adapt to sharing conditions in line with the evolving usage of the band (for example, in line with the evolution of broadcasting standards, new broadcasting uses, other new uses of the band, etc.). In this regard, industries would need to develop technological solutions to meet the regulatory requirements that will still allow for a feasible business case with acceptable implementation costs;

iii) The amount of interleaved spectrum available and the planning conditions and current usage of the band. For example, some Member States have already authorised PMSE use, either as a general or individual authorisation, to increase the spectrum efficiency in the UHF band. Hence, the potential benefits to be derived from deployment of cognitive radios may be reduced by the need to protect existing PMSE users. On the other hand, current initiatives to facilitate cognitive PMSE applications would increase the amount of spectrum available for such applications in bands which would otherwise not be available to PMSE users;

iv) The capabilities of dynamic spectrum access, in particular in relation to relying on spectrum-sensing. If cognitive devices fail to detect other users of spectrum, harmful interference might occur. However, some current studies have indicated that setting the sensing requirement at a level to adequately protect existing services will likely constrain the feasible operation of cognitive devices, as well as being technically challenging; and

v) Issues associated with the management and implementation of the "geo-location database", the approach currently preferred by the cognitive industry, need to be considered. For example, there is a need to ensure that cognitive devices have standardised and secured protocols/languages to access the database and format of data within the database (database profile). This would allow the cognitive devices to establish connection to the database and download the rules from the database to allow correct operation in the country in which it is operating, even though the rules may vary between countries.

Managed cognitive access, such as the use of geo-location databases to govern rules of access for cognitive radios, has the potential to realise the benefits of cognitive radios whilst minimising the risk associated with potential sterilisation of spectrum. This is because the rules of cognitive access can then be adapted as necessary by the national administrations to meet a changing radio environment and secure the most optimal use of radio spectrum.

In addition to the Cognitive Report, the 2010 RSPG work programme indicates ongoing work on 'Technology impact in spectrum management' which will continue the work on cognitive technologies and aims to develop an Opinion highlighting recommendations or guidelines for future spectrum regulatory regimes, with a scenario analysis including cognitive technologies as one way to promote flexible and efficient spectrum use.

3.3.2 Current PMSE usage in the 470-862MHz band

During the period between December 2009 and January 2010 the National IT and Telecom Agency of Denmark distributed a questionnaire to a number of European administrations. The questionnaire addressed the issue of how the allocation of the digital dividend would affect the use of frequencies for PMSE. Some further information was supplied by participants in the RSPG working group which developed this report.

In general the responses of the 15 administrations can be summarised as follows:

- All administrations have assigned frequencies for use by PMSE applications in the band 470-790 MHz and 790-862 MHz;
- The majority of frequencies are assigned under individual licences but with some usage covered under licence exemption if compliant with ECC Recommendation 70-03;
- Most administrations responded that future use of the bands by PMSE was under study or awaiting the outcome of CEPT compatibility studies, in particular potential use of the duplex gap if 790-862 MHz is used for FDD applications and the white spaces below 790 MHz; and
- Other frequency bands mentioned for use by PMSE, current or planned, included 174-230 MHz, 863-865 MHz (SRDs), 1.5GHz (assumed to be 1452-1492 MHz) and 1785-1800 MHz with possible extension to 1805 MHz.

The results of that questionnaire are at **Annex 1** and a summary of CEPT and ETSI activities relevant to PMSE are at **Annex 2** to this Report.

3.4. More efficient standards

Development and implementation of spectrally efficient transmission standards plays a key role in good spectrum management and can lead directly to efficiency gains in the use of spectrum and economic benefits to industry and users.

As noted in the RSPG Opinion on Streamlining the Regulatory Environment for the Use of Spectrum , the RSPG considers that the interplay of spectrum and equipment regulation is a key element in achieving the policy objective that the societal and economic value of

spectrum use should be maximised. Furthermore, smooth functioning of spectrum management and standardisation encourages innovation and technological development, and enhances the competitiveness of European industry.

The same Opinion notes that receiver parameters are important for spectrum management and for facilitating the introduction of new applications in spectrum. It recommends that receiver parameters should be included in harmonised and/or product standards for all equipment and that administrations should encourage the development of good performance receiver specifications. It draws to the attention of CEPT that receiver parameters should be used consistently in sharing studies as part of the assumptions for the intended use of the band, taking into account equipment already in use before the adoption of standards, including receiver parameters.

3.4.1 More spectrally efficient standards for broadcasting transmission and receiver equipment

New standards such as DVB-T2 and MPEG-4 are two of the most important technological advances that would lead to efficiency gains in the use of spectrum in the band 470 to 862 MHz. [16]

The RSPG considers that, if implemented overnight in a "big-bang" approach, the transition to more spectrally efficient broadcasting technologies has the potential to disenfranchise consumers in the short term where large quantities of legacy consumer equipment exist in the market.

The specificity of free-to-view broadcasting networks is that the "upgrade" costs of end-user equipment is directly borne by the consumer. That means that strong incentives are needed

[16] DVB-T2 is a new standard for the modulation and coding of television broadcasting signals on digital terrestrial platforms, developed by Europe's Digital Video Broadcasting consortium. DVB-T2 builds on the existing DVB-T standard, currently used by almost all terrestrial television platforms in Member States, and provides an approximate 30% improvement in network capacity. MPEG-4 is an advanced video compression standard developed by the Moving Picture Experts Group.

for consumers to purchase new receivers, for example, through the provision of additional services, HD TV, 3D TV, etc.

In light of this concern, a practicable implementation methodology could be to follow a phased approach. For example, this type of approach is being adopted in several countries in relation to the introduction of MPEG4 for DTT networks, and in the United Kingdom also for DVB-T2. Some countries have also taken measures to ensure that receiver equipment sold is ready to operate with MPEG-4. Such an ambitious measure, already pioneered in France and also being adopted in Spain, can generate a critical mass of high-performance TV equipment and accelerate the deployment of the related network infrastructures and it may also be used for transition to DVB-T2.

Where no legacy issues exist however, there may be a strong case for Member States implementing the most spectrally efficient technologies from the outset. For example, many Member States chose to adopt and implement MPEG4 for the launch of their DTT networks.

3.4.2 CEPT study on receiver parameters

In 2008 the ECC published ECC Report 127 on the Impact of Receiver Standards on Spectrum Management[17]. The study identified several cases where it would have been possible to make a significant difference to an outcome in spectrum management if the treatment of receiver performance, and particularly the application of receiver parameters, had been different. In the study a number of cases were explored which suggested that the role of receiver parameters in standards and their related consideration in spectrum engineering should receive greater prominence in order to promote more efficient use of the spectrum, including maximising economic and social welfare. The study made recommendations on principles which could be introduced, or applied with increased vigour, to how receiver performance is specified and regulated, or information made available to consumers. It was recommended that further study would be needed to develop more precise proposals.

[17] See www.ero.dk

The ECC subsequently directed the European Communications Office (ECO) to conduct a pilot study as a follow-up to ECC Report 127. The progress of this pilot study has been regularly reported to the ECC.

4. Creating greater regulatory certainty

Regulatory certainty is generally perceived by stakeholders as having visibility of the rules and regulations which will be applied by a spectrum regulator to a specific frequency band, licence class or application. It may also be provided by publishing information or guidance on future plans for use of the radio spectrum such as in a spectrum strategy statement. For stakeholders regulatory certainty is an essential prerequisite to investment. Without that certainty, firms may be very reluctant to invest in infrastructure to support new wireless networks or services or even to participate in competitions for award of spectrum rights of use. In the context of digital dividend it is therefore essential for all stakeholders that regulators provide as much clarity and certainty in respect of their intentions to make the digital dividend spectrum available for ECS other than broadcasting in a coordinated manner.

4.1 Digital dividend in the context of the EU's Spectrum Policy Programme

The transition to digital broadcasting in the so-called Bands IV/V on a Europe-wide basis is likely to take some time, noting that some Member States have already achieved this but others are in various stages of the process towards analogue switch-off and reconfiguration of the band to accommodate new digital broadcasting services. Access to the digital dividend is of vital importance to the development of Europe's economy as the introduction of ECS other than broadcasting in the 800 MHz band has the potential to further extend access to broadband services to all citizens and to rural communities in particular.

In its Opinion on the Radio Spectrum Policy Programme (RSPP) the RSPG noted that the 800 MHz band which, on the basis of the earlier RSPG Opinion on the Digital Dividend[18] should be subject to an EU-wide coordinated approach based on the guiding principles of

[18] RSPG09-291 - RSPG Opinion on the Digital Dividend

service- and technology-neutrality and harmonisation of technical parameters, is ideal for extending coverage and improving in-building penetration.

Recognising the significant benefits to be gained by realising the digital dividend on a coordinated basis throughout the EU, it is noted that the RSPG Opinion on the RSPP proposes that an essential policy objective of the RSPP should be coordinated availability of the 800 MHz band for ECS other than broadcasting in all the EU Member States by 2015[19].

5. The benefits of efficient use of spectrum

Achieving greater efficiency in the use of spectrum increases the economic and societal value of it. This could serve to improve delivery of services and support the core goals of the European Union Lisbon Strategy and the European Digital Agenda[20], which the RSPG recognises as key strategic objectives in driving innovation and fostering growth in the European ICT sector.

Incentivising efficiency of use of radio frequencies through the use of a predictable regulatory framework will help the single European market to benefit from economies of scale and scope.

i. Incentives to greater spectrum efficiency and utilisation: Spectrum pricing

Spectrum pricing (a fee/charge system) can have an important role in incentivising efficiency in the use of spectrum. In 2009 the RSPG published a report on "Assignment and Pricing Methods" [21]. The report, which was based on a comprehensive questionnaire issued to Member States, identified practices in relation to the fee/charge systems used and the main drivers behind decisions on assignment and pricing issues in Member States.

[19] The set implementation date may have to be postponed in Member States facing frequency coordination issues with non EU countries until such issues are resolved in line with the policy recommended in this opinion. A similar need for postponement of implementation could arise in Member States where exceptional local circumstances would prevent the availability of the band.
[20] ibid footnote 7
[21] RSPG09-298 Radio Spectrum Policy Report on Assignment and Pricing Methods

In relation to pricing issues, the report applies the definitions of ECC Report 53 such that charges are a levy used to recover the costs of spectrum management, while fees are a pricing tool to reach spectrum management objectives[22]. It is noted in the report that there is not a single approach to the application of spectrum fees/charges within Europe[23]. In some cases**,** prices for accessing spectrum are decided by the Member State with pre-determined licence fee**s**. In other cases, the fees are determined by using auctions. It is also noted that in some cases fees and charges may not be separated clearly.

The report identifies that a clear separation between charges (aimed at recovering the cost of spectrum management) and fees (pricing to support spectrum management objectives) not only increases transparency of the financing of spectrum management but also supports the spectrum management organisation to concentrate on its objectives when designing and imposing fees. The potential elements of an incentive fee formula aiming at efficient and effective use of spectrum are identified in the report. However, it is noted that no formula, no matter how complex, can take into account all the variations of the market place and that all of the elements mentioned in the report are approximations of the market mechanism.

In conclusion, irrespective of the approach to assignment of radio frequencies, in order to achieve predictability and to help ensure efficient use of digital dividend spectrum, elements of an incentive formula should be applied. Such an approach could greatly incentivise opportunities for cost effective provision of services (e.g. broadband/internet) to rural areas.

ii. Facilitating convergence of platforms

The RSPG notes that efficient use of spectrum could be hampered if the rights of use of radio frequencies are heavily prescribed in terms of specific technical conditions for specific technologies. It previously made a recommendation in this regard calling for least restrictive

[22] Definition of fees - "price charged by the administration to a licence holder for the grant of rights of use of spectrum, with the aim of achieving certain spectrum management objectives such as to ensure efficient use of that spectrum…" Definition of Charges - "price charged by the administration to cover administrative costs incurred in the management, control and enforcement of the authorisation scheme…"

[23] In accordance with the Authorisation and Framework Directives, Member States are obliged to ensure fees imposed for rights of use of radio frequencies reflect the need to ensure the optimal use of the spectrum resource.

technical conditions based on the outcome of CEPT work to be borne in mind in any EU harmonisation of technical elements.[24] In light of the trend towards a convergence of platforms, as discussed above, the RSPG finds further reason to support least restrictive technical conditions, as this could lead to greater efficiency and utilisation of digital dividend spectrum and facilitate the convergence of platforms and foster innovation.

6. Strategic steps to improve efficiency in frequency bands relevant to the digital dividend

Measures to improve efficiency in the use of that part of the radio spectrum identified as the digital dividend should take a broad-based approach, including taking account of the spectrum requirements of the different types of networks which will be using the digital dividend spectrum. A non-exhaustive list of such measures is as follows:

1. In line with the RSPG Opinion on the RSPP, ensure that 2015 is adopted as a target date[25] for making the 800 MHz available for ECS other than high power broadcasting.
2. Member States should review the efficiency of use of digital dividend spectrum periodically in order to maximise future opportunities for additional services.
3. Measures taken by Member States to facilitate the early adoption and implementation of more spectrally efficient technologies should be encouraged, including in relation to the TV receiver market.
4. In order to facilitate the efficient use of spectrum, greater prominence should be given to standards in receiver parameters and their related consideration in spectrum management.
5. Use of digital dividend provides an excellent opportunity for the cost effective provision of services (e.g. broadband/internet) to rural areas particularly if the spectrum is awarded for ECS other than high-power broadcasting using an appropriate incentive formula.
6. The technical conditions for use of the digital dividend should be the least restrictive in order to accommodate a potential convergence of platforms and foster innovation;

[24] Recommendation 4 of RSPG09-291
[25] Noting the conditions on this point mentioned in the RSPP Opinion.

7. The authorisation conditions for cognitive technologies could impact on how efficiently the digital dividend spectrum is used in the future and the potential benefits from use of this type of technology. However, managed cognitive access, for example the use of geo-location databases, has the potential to realise the benefits of cognitive radios whilst minimising the risk associated with potential sterilisation of spectrum.

The RSPG considers that these measures could form the broad outline of a strategy to improve spectrum efficiency and utilisation in the frequency bands relevant to the digital dividend.

ANNEX 1: Current PMSE use in the 470-862 MHZ band[26]

Question/Country	1. Have you allocated frequencies to PMSE usage in the frequency band 470-790 MHz?
Austria	Yes. It is possible to apply for a license in the frequency band 470-790 MHz.
Belgium	Yes.
Bosnia and Herzegovina	Yes.
Croatia	Yes.
Cyprus	Yes. Wireless microphones.
Denmark	Yes, it is possible to apply for a licence in the frequency band 470-790 MHz. But licences can currently only be assigned on a temporary basis.
Estonia	Yes. Wireless microphones in the frequency band 470-862 MHz.
Germany	Yes.
France	Yes.
Ireland	Yes, on a secondary basis.
Luxembourg	Yes.
Portugal	Yes, on a secondary basis.
Sweden	Yes.
The Netherlands	Yes, licence exempt for low power (50 mW), with licence for high power (10 W).
UK	470-550 MHz is available for PMSE use on a short term basis and on a secondary basis to DTT until further notice. 550-590 and 598-606 MHz are available for PMSE use on a short term basis and on a secondary basis to DTT until the end of national switchover. 590-598 MHz is available for PMSE use on a short term basis and on a secondary basis to DTT on 12 months' notice. 606-614 MHz will be available for PMSE use on a primary basis from 2012 and until further notice. 614-790 MHz are re available for PMSE use on a short term basis and on a secondary basis to DTT until further notice.

Question/Country	2. If you have: How do you assign the frequencies: a. Individual licences b. Licence exemption (under certain conditions)?
Austria	Radio microphones in the band 470 – 790 MHz are individually licensed on a shared basis. Licenses will only be granted for frequencies compatible with spectrum use by digital TV.
Belgium	a) Frequencies are assigned on individual licence. b) Some Frequency bands can be used licence exempt (under certain conditions).
Bosnia and Herzegovina	In practice, the frequencies are used for mobile and temporary applications and no licensing has ever been requested nor done. Users are determining the best frequency themselves. We never received any complaints of interferences from licensed operators in the band.
Croatia	Individual licences.

[26] Based on a questionnaire to a number of European administrations by the National IT and Telecom Agency, Denmark.

Question/Country	2. If you have: How do you assign the frequencies: a. Individual licences b. Licence exemption (under certain conditions)?
Cyprus	Not considered.
Denmark	Individual licences. See above.
Estonia	Licence exemption. Under general licence conditions (e.r.p. 50 mW).
France	Licence exemption (restricted to professional users)
Germany	a) Frequencies are assigned on individual licence. licenses will only be granted for frequencies compatible with spectrum use by DTT.
Ireland	Individual licences.
Luxembourg	License exempt for applications in conformance with ERC/REC 70-03 If not individual license is issued.
Portugal	Licence exempt for applications in compliance with ERC/REC 70-03. If not individual licence is issued.
Sweden	Individual licences.
The Netherlands	Licence exempt for low power application, generic licences for high power applications (10 W).
UK	JFMG is a contracted body that assigns frequencies to PMSE on our behalf. In the 600 MHz, individual licences are issued.

Question/Country	3. Have you planned any change of usage of the frequency band in the future including assignment procedure?
Austria	No changes planned.
Belgium	Will be done in the future
Bosnia and Herzegovina	Have no problems in adapting a general change in direction towards license exemption
Croatia	No plans at this stage, still has to be decided.
Cyprus	Not considered
Denmark	No changes planned, however NITA is considering allowing licence exemption usage of PMSE in “white spaces” in the frequency band 470-790 MHz.
Estonia	No
France	No
Germany	470–710 MHz PMSE in connection with broadcasting 710-790 MHz professional use outside broadcasting 470-790 MHz Fixed installations
Ireland	No decision has been taken in this regards yet
Luxembourg	Yes. Individual license for all applications, in order to be prepared for possible future restrictions concerning the available frequency bands
Portugal	No changes planned
Sweden	PTS consider allowing licence exemption usage of PMSE in “white spaces” in or in parts of the frequency band 470-790 MHz

The Netherlands	Studies to allow more licence exempt usage are currently carried out (e.g. licence exempt shared use of channel 38, with astronomy)
UK	Ofcom consulted twice in 2008 and 2009 on the award design for a band manager with special obligations toward PMSE (http://www.ofcom.org.uk/consult/condocs/bandmanager09/bandmanager09.pdf and http://www.ofcom.org.uk/consult/condocs/bandmngr/condoc.pdf): the consultation proposes that all the spectrum currently allocated for PMSE in the UK be awarded to a commercial band manager with special obligations toward PMSE. Ofcom will publish its decision on the two consultations on future spectrum access for PMSE in the near future

Question/Country	**4. Have you allocated frequencies to PMSE usage in the frequency band 790-862 MHz?**
Austria	Yes. It is possible to apply for a licence in the frequency band 790 – 862 MHz.
Belgium	Yes.
Bosnia and Herzegovina	As above.
Croatia	Yes.
Cyprus	Yes. Wireless microphones.
Denmark	Yes, 800-820 MHz and 854-862 MHz both until 31.12.2012. 823-831 MHz (under implementation)
Estonia	Yes. See above.
France	Yes, but this will be reviewed before end November 2011
Germany	Yes.
Ireland	Yes, also on a secondary basis (especially Ch. 69).
Luxembourg	Yes.
Portugal	Yes, also on a secondary basis.
Sweden	Individual licences until June 2010.
The Netherlands	Yes.
UK	PMSE users have temporary access to 790-854 MHz on a secondary basis to DTT and on twelve months notice, no later than 31 December 2012; 854-862 MHz is available for PMSE use on a primary basis on twelve months notice no later than 31 December 2012.

Question/Country	**5. If you have: How do you assign the frequencies** **a. Individual licences** **b. Licence exemption (under certain conditions)?**
Austria	The frequency band 790 – 862 MHz is still available for radio microphones on the basis of individual licences. Licenses will only be granted for frequencies compatible with spectrum use by digital TV. The maximum duration of licenses for radio microphones is limited to 1 year in order to be able to timely react to future developments.
Belgium	Both a) Individual licence; and b) licence exempt under certain conditions.
Bosnia and Herzegovina	As above.
Croatia	Individual licences.
Cyprus	Not considered.
Denmark	800-820 MHz and soon also 823-831 MHz is licence exempt. 854-862 MHz licence is needed.
Estonia	Licence exemption. See above.

Question/Country	5. If you have: How do you assign the frequencies a. Individual licences b. Licence exemption (under certain conditions)?
France	b) as for the band 470-790 MHz
Germany	b) General Licence until 31.12.2015 on a secondary basis, no prolongation.
Ireland	No plans for this band yet. Most likely the duplex gap will be liecence exempt, but cannot confirm this for the moment.
Luxembourg	b) license exempt for ERC/REC 70-03 applications. No other licenses have been issued in this band.
Portugal	Only licence exempt in compliance with ERC/REC/70-03
Sweden	Yes.
The Netherlands	Licence exempt.
UK	Individual licences are requested in accordance with the WT Act 2006 for all the other UHF spectrum available for PMSE. PMSE users have to apply to JFMG, Ofcom's contracted PMSE licensing body, to obtain a WT Act licence. Frequencies are not coordinated, apart from the interleaved spectrum. 863-865 MHz are the only licence exempt UHF frequencies.
Question/Country	**6. Have you planned any change of usage of the frequency band - specially the centergap (821-832 MHz) and white spaces in 470-790 MHz - in the future, including assignment procedure? If you have any plans for the band, when do expect it to be effective?**
Austria	No Decisions are made. In the case of FDD in 790 – 862 MHz the centre gap is under consideration for PMSE.
Belgium	A decision to phase out broadcasting from the band 790-862 MHz has not yet been taken.
Bosnia and Herzegovina	-
Croatia	No plans at this stage, still has to be decided.
Cyprus	Not considered.
Denmark	NITA will soon allowe licence exemption usage of PMSE in the center gap in the 800 MHz band (821-832 MHz).
Estonia	Under consideration.
France	821-832 MHz: Under consideration for continued access to radio microphone in the review to take place before end November 2011
Germany	Whitespaces(that means without DTT-operation) are available for PMSE use on a licensed basis (see answer to question 3) cognitive devices should only be allowed if they can operate without harmfully interfering into licensed users (e.g. DTT and PMSE) The centre gap is under consideration for PMSE.
Ireland	PMSE users are required to apply for a licence as normal (470-862 MHz) until the decision taken by both ComReg and Dept. of Communications.
Luxembourg	It is planned to open this band (Centergap) for PMSE applications, if studies show that it is possible.
Portugal	No decisions were taken. In the case of FDD in 790 – 862 MHz the centregap is under consideration for PMSE.
Sweden	PTS consider allowing licence exemption usage in the duplex gap in accordance with the conditions in the ECC dec. effective this year.
The Netherlands	Policy concerning the usage of 790-862 MHz by mobile services is currently developed. The FDD duplex gap is considered as serious candidate for licence exempt usage.
UK	We have made no decisions on the future use of 821-832 MHz. The whitespaces in 470-790 MHz will be made available for PMSE use on a licensed basis after switchover with the exception of a number of localised frequencies which are being made available for separate award. We have proposed that 470-790 MHz should also be made available for cognitive devices on an unlicensed basis, but only after they have demonstrated that they can operate without harmfully interfering into licensed users (e.g. DTT and PMSE).

Question/Country	7. Other information on use of frequencies for PMSE
Austria	Actually PMSE services/applications are possible in the frequency band of: 1.) 174 – 216 MHz (individually licensed on a shared basis and compatible with spectrum use by future digital TV transmission. 2.) 1785 – 1800 MHz (Generally Licensed) 3.) 863 – 865 MHz (Consumer equipment according to ERC/REC 70-03 Generally licensed) The L-Band (about 1,5GHz) is under consideration.
Belgium	A decision to phase out broadcasting from the band 790-862 MHz has not yet been taken.
Bosnia and Herzegovina	-
Croatia	-
Cyprus	N.A.
Denmark	-
Estonia	-
Germany	32 - 38 MHz Individually licensed and general licence. 174 - 230 MHz Individually licensed, compatible with spectrum use by future broadcast transmission 863 -865 MHz general licence. L-Band (about 1,5 GHz) is foreseen for PMSE. 1785-1800 MHz General Licence Extension on 1805 MHz is foreseen.
Ireland	-
Luxembourg	-
Portugal	-
Sweden	There is licence exemption for wireless microphones, 10 mW ERP, in 863-865 MHz
The Netherlands	-
UK	-

ANNEX 2: Overview of CEPT and ETSI activities on PMSE

The following summaries of CEPT and ETSI activities relevant to PMSE reflect the situation in June 2010.

CEPT PT SE43 is defining technical and operational requirements for the operation of cognitive radio systems in the "white spaces" of the UHF broadcasting band (470-790 MHz) to ensure the protection of incumbent radio users/systems and investigate the consequential amount of spectrum potentially available as "white space". Preliminary studies indicated that operation of ubiquitous cognitive devices relying on sensing only will be significantly constrained by the need to protect broadcasting services. Hence, there is a need to study other scenarios, such as a combination of sensing and geolocation, that may enable cognitive devices to provide adequate protection to existing services. Preliminary technical and operational requirements for cognitive devices which make use of geo-location databases have been defined.

CEPT CPG PT-A is responsible for WRC-12 Agenda Item 1.19 dealing with identifying regulatory measures, if needed, in the Radio Regulations (RR) for the introduction of Software Defined Radio (SDR) and Cognitive Radio (CR). As SDR and CR are technologies that can be implemented by any radio services as long as it operates in accordance with the provisions of the RR applicable for that specific service in the frequency band allocated to it, CEPT's preliminary position is that no action is necessary at the RRs level to facilitate the introduction of SDR and CR. It is recognised that further technical analysis and sharing studies are encouraged within the ITU-R for the implementation of CR technology

CEPT CPG PT-D is the CEPT project team responsible for preparing the CEPT work on agenda item 1.5 for WRC-12. AI 1.5 considers worldwide/regional harmonisation of spectrum for electronic news gathering (ENG – this is the international term for PMSE), taking into account results of ITU-R studies, in accordance with Resolution 954 (WRC-07). WRC-07 adopted Resolution 954 that

invites studies for WRC-11 to establish whether, and to what extent, worldwide harmonisation of spectrum usage and user requirements for ENG links may be achievable in terms of the frequency bands used for such applications in specific band(s).

To satisfy the agenda item, the project team is compiling a table of potential frequency bands for tuning ranges suitable for ENG equipment across CEPT Member States. CPG-PTD has defined the term 'tuning range' as a range of frequencies over which radio equipment is envisaged to be capable of operating, but limited to specific frequency band(s) according to national conditions and requirements. A tuning range does not preclude the use of other applications in the same frequency band.

CEPT FM45 is tasked with reviewing the spectrum requirements for PMSE including, but not limited to, wireless microphones in the frequency bands Band III, 470-790 MHz, 790-862 MHz, 1452-1479.5 MHz, and 1785-1800 MHz, and to monitor the related activities in other CEPT groups and advise WGFM on any action required. With respect to the Digital Dividend and the band 790 – 862 MHz, FM PT45 has identified the need for further compatibility studies between IMT systems and PMSE to establish to what extent the duplex gap or the guard band between DTT and mobile services in the 800 MHz band could be used for PMSE and is liaising (via WG FM) with WG SE.

CEPT Report 32[27] was developed in response to a European Commission mandate requesting a recommendation on 'the best approach to ensure the continuation of existing Program Making and Special Events (PMSE) services operating in the UHF (470-862 MHz), including an assessment of the advantage of an EU-level approach'. It concluded that PMSE demand for spectrum is expected to continue to rise in the medium term and that interleaved channels in 470-79MHz band should be maintained for PMSE use on a temporary basis where broadcasting is not yet used. The Report went on to define PMSE applications as 'critical use' meaning those that require some

[27] http://www.erodocdb.dk/Docs/doc98/official/pdf/CEPTREP032.PDF

form of protections and 'less critical' for those with a higher tolerance to interference and offered recommendations for suitable regulatory measures. In addition, the report identified possible additional bands that could be considered to accommodate both 'critical' and 'less critical' PMSE use in the future.

Furthermore, the report noted that the efficiency of the PMSE systems should be improved and offered two possible ways to do this; improving the frequency management of PMSE (i.e. a more effective approach to planning assignments); and improving the spectrum efficiency of the equipment (i.e. using new equipment that uses less spectrum overall in a sharing environment).

ETSI TC ERM has established new work items to develop System Reference Documents for PMSE applications which will describe the technical characteristics of PMSE equipment and systems. ETSI has decided to create specific documents for PMSE application categories. The existing ETSI TR 102 546 V.1.1.1 and the applications under the SAB/SAP definition will be considered by ETSI ERM TG17 WG3. The deliverables, which will cover the whole range of PMSE, both in terms of frequency usage and applications, are scheduled to be delivered by November 2010.