Exploiting the digital dividend: Final public presentation

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Agenda

- 9:35 Study objectives and potential uses of digital dividend spectrum
- 10:00 Socio-economic analysis and high-level recommended actions
- 10:45 Q&A regarding the high-level recommended actions
- 11:15 Break
- 11:45 Sector-specific recommended actions
- 12:15 Q&A regarding the sector-specific recommended actions
- 12:45 Closing comments by the Commission
- 13:00 End

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Agenda

- Study objectives and potential uses of digital dividend spectrum
- Socio-economic analysis and high-level recommended actions
- Q&A regarding the high-level recommended actions
- Sector-specific recommended actions
- Q&A regarding the sector-specific recommended actions

Importance of the digital dividend

- The digital dividend presents a unique opportunity to realise economic and social benefits across the EU
  - a large amount of high-value spectrum is available
  - there are a wide range of potential uses, many of which produce significant social value
  - there will be ‘simultaneous’ availability across the EU
- We estimate the economic and social value of the digital dividend across the EU to be in the range of EUR150–700 billion*
- The nature of digital dividend spectrum means that this may be the band with the greatest scope for innovation
  - this is key to maintaining the EU’s competitiveness – especially given digital dividend advances in other regions
- This is not a ‘one-off’ issue – additional digital dividend spectrum could be released over time

** Net Present Value over 15 years*

The focus of the study is the 'European dimension'

- Economies of scale are key for many potential uses of the band (e.g. mobile handsets, DTT receivers)
- Ease of use of services is important whilst travelling in different Member States (e.g. roaming on mobile phones)
- High-power use of spectrum creates the need for extensive cross-border co-ordination
- Decisions made on use by one Member State could influence the use of the digital dividend in other Member States and ultimately impact the overall benefits at the EU level

The overall aim of the study is to ascertain what action needs to be undertaken at the EU level to ensure the benefits of the digital dividend are maximised

Potential uses of the digital dividend [1]

Examples of uses of digital dividend

	More digital terrestrial TV (DTT)	For more standard-definition channels and/or for high-definition TV (HDTV)
	Mobile TV broadcast networks	Main band proposed for DVB-H use in many Member States
	Cellular networks (3G/4G)	Spectrum is suited to covering rural areas at lower cost (fewer base stations)
	Broadband wireless access (WiMAX)	Spectrum is suited to covering rural areas at lower cost (fewer base stations)
	SAB/SAP (e.g. radio microphones)	A variety of users currently use the band for wide range of applications
	Public protection and disaster relief	Wireless broadband services for emergency services and other bodies

Potential uses of the digital dividend [2]

Examples of 'uses' of digital dividend

Cognitive technologies	A family of technologies, now under development, that will be able to assess whether frequencies are in use, and if not, transmit on a licence-exempt basis
Innovation reserve	Either reserving spectrum specifically for experimental purposes, or not making it available until a later date

Note: Neither of these uses are strictly services in themselves, and indeed could be used to provide the some of the services on the previous slide (e.g.cognitive technologies may be used in radio microphones)

Summary of main study activities

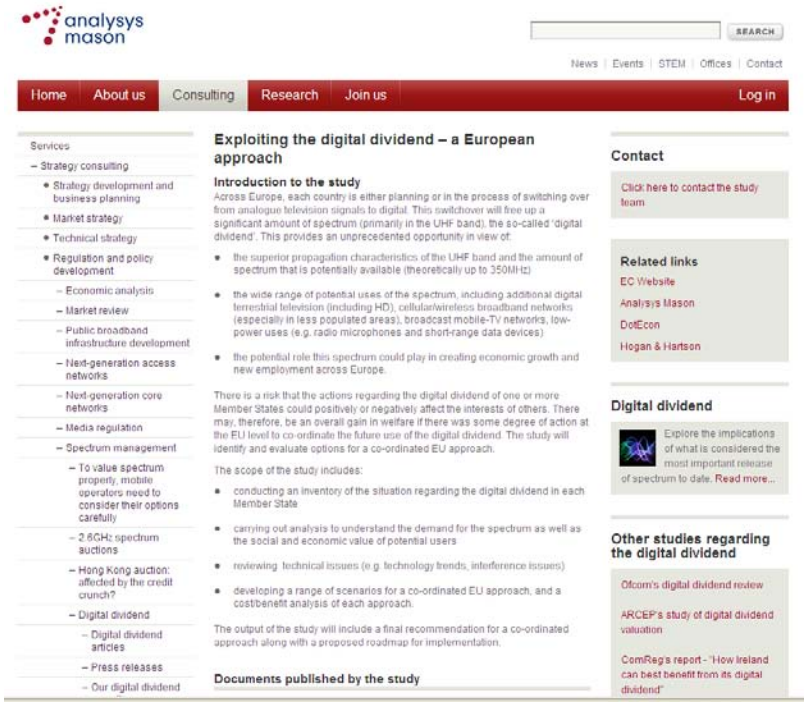
- Compile an inventory of the situation in each Member State
- Undertake a socio-economic assessment of the potential use of digital dividend
- Identify feasible options for action at the EU level in order to realise the full benefits of the digital dividend
- Carry out a detailed cost-benefit analysis of options
- Identify preferred option(s) and undertake a detailed impact analysis
- Develop an implementation roadmap (including a timetable)

Inputs to the study

- A key component of our study was input from Member States and industry stakeholders:
  - a questionnaire to Member States
  - stakeholders hearings
  - two Member States workshops
- We would like to thank those that have contributed to the study by participating in these events or by providing written submissions to the study

Additional information can be found on the study website

www.analysysmason.com/EC_digital_dividend_study



Published documents include:

- Slide pack introducing the study
- Presentations from and summary of stakeholders hearings held on 6 March 2009
- Presentations from and summaries of Member States workshops held on 15 April and 26 June 2009
- Final report, to be published in due course

Study objectives and potential uses of digital dividend spectrum

Socio-economic analysis and high-level recommended actions

Q&A regarding the high-level recommended actions

Sector-specific recommended actions

Q&A regarding the sector-specific recommended actions

Modelling objectives and approach

Objectives of the modelling

- Socio-economic modelling has been conducted to help develop recommended actions
- Aim was to understand the value generated under a range of spectrum supply and demand scenarios
- We then considered what appropriate EU-level actions could be taken to encourage beneficial outcomes

High-level approach

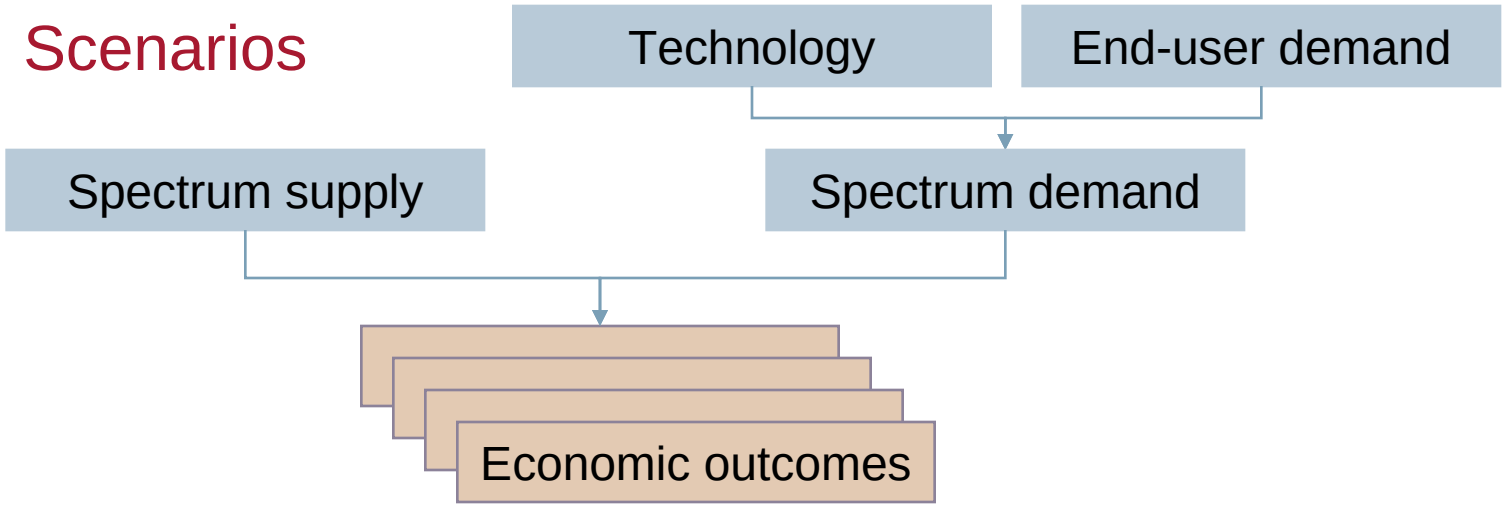
- "Top-down" private value assessment (direct benefit to individuals from their own consumption of a service)
- We focused on DTT and wireless broadband as they are the two drivers of economic demand
- We used the results of previous studies for the private value generated
- These were coupled with cost estimates for network alterations and consumer equipment upgrades

Socio-economic analysis and high-level recommended actions

- Approach
- Results
- High-level options for action and recommendations

Approach to modelling

- Rather than starting with possible actions and analysing their effects, we analysed how economic outcomes might vary under different combinations of scenarios for spectrum supply and demand



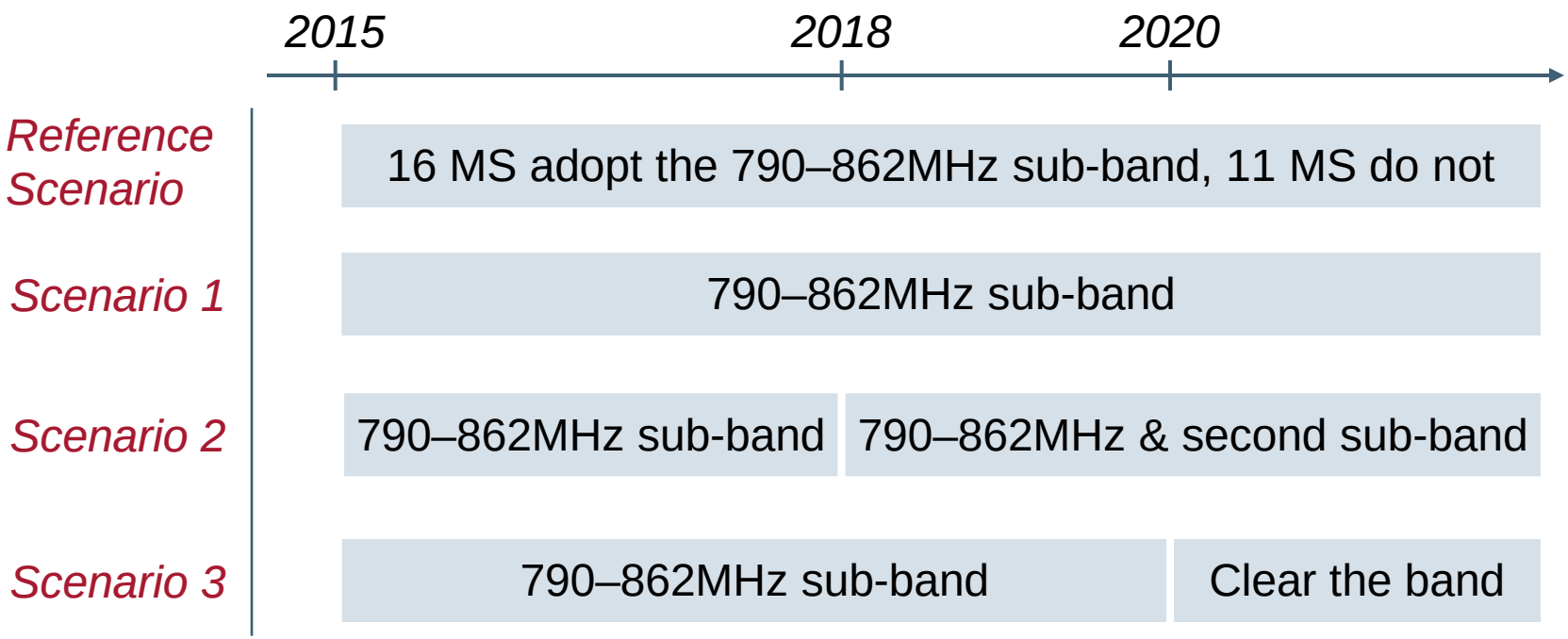
- We then considered what EU-level action could be taken to promote those scenarios that emerged as the most beneficial

Scenarios

- We considered:
  - three spectrum supply scenarios (Scenarios 1–3)
    - plus a Reference Scenario, representing the likely outcome in the absence of EU-level coordination
  - six spectrum demand scenarios (Scenarios A–F)

Note that we have included some radical spectrum supply scenarios in our analysis (e.g. clearance of DTT from the entire 470−862MHz band), in order to test them against potentially extreme demand scenarios (e.g. emergence of a new, currently unknown high-value use)

Spectrum supply scenarios



Note: MS = Member States

We calculated the incremental benefits and costs of realising each of the scenarios compared to the Reference Scenario

Spectrum demand scenarios

		Wireless broadband: Low	Wireless broadband: High	Wireless broadband: High with new use
DTT	Low	Scenario A	Scenario B	Scenario C
DTT	High	Scenario D	Scenario E	Scenario F

We then calculated the economic impact of each supply scenario (Scenarios 1–3) under each demand scenario (Scenarios A–F)

Scope and limitations of the model

Included within the modelling

- Benefits such as:
  - wireless broadband or other uses in sub-band(s) in all Member States
  - no sterilisation across borders
  - economies of scale, roaming
- Costs such as:
  - loss of DTT channels or cost of upgrading networks
  - frequency replanning
  - replacing aerials and set-top boxes
  - development of an alternative universal TV service

Limitations of the modelling

- We only captured private value aspects for which quantitative evidence exists
- The following private value impacts have been excluded:
  - effects on competition (e.g. TV platform competition)
  - costs to mitigate interference to cable receivers
  - incremental private value of the DTT platform
- public value impacts have been excluded
  - the incremental public value is either modest or is correlated with private value

Socio-economic analysis and high-level recommended actions

Approach

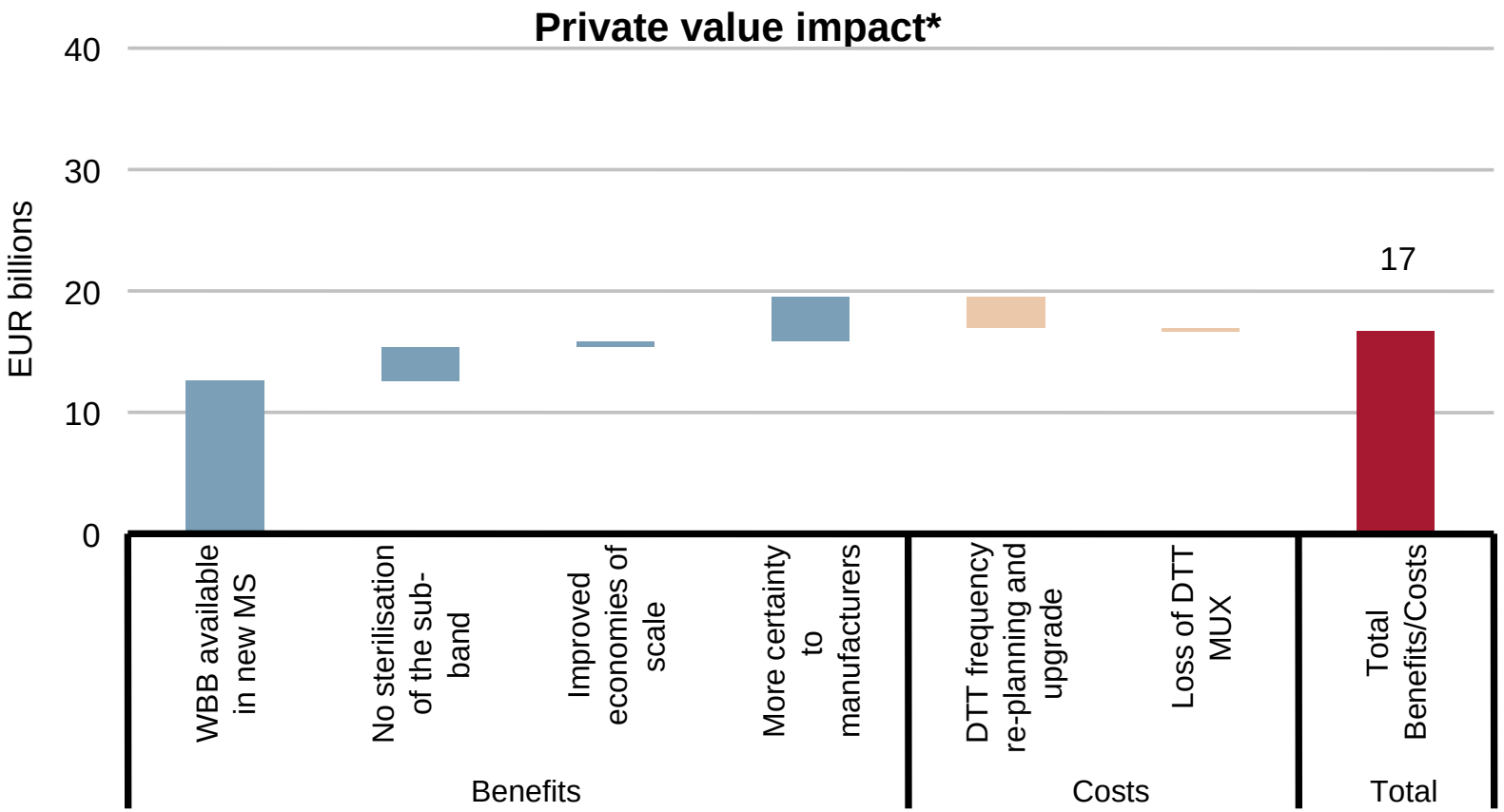
Results

High-level options for action and recommendations

Discussion of results

- With three spectrum supply scenarios and six demand scenarios, it is not possible to discuss all of the results in detail
- Instead we will:
  - discuss the detailed results for just one spectrum demand scenario, namely Scenario D: high demand for DTT but low demand for wireless broadband (WBB)
  - present a summary of all of the results

Scenario D: high demand for DTT, low for WBB
Scenario 1: adoption of the first sub-band only



** NPV over 15 years*
MUX means multiplex

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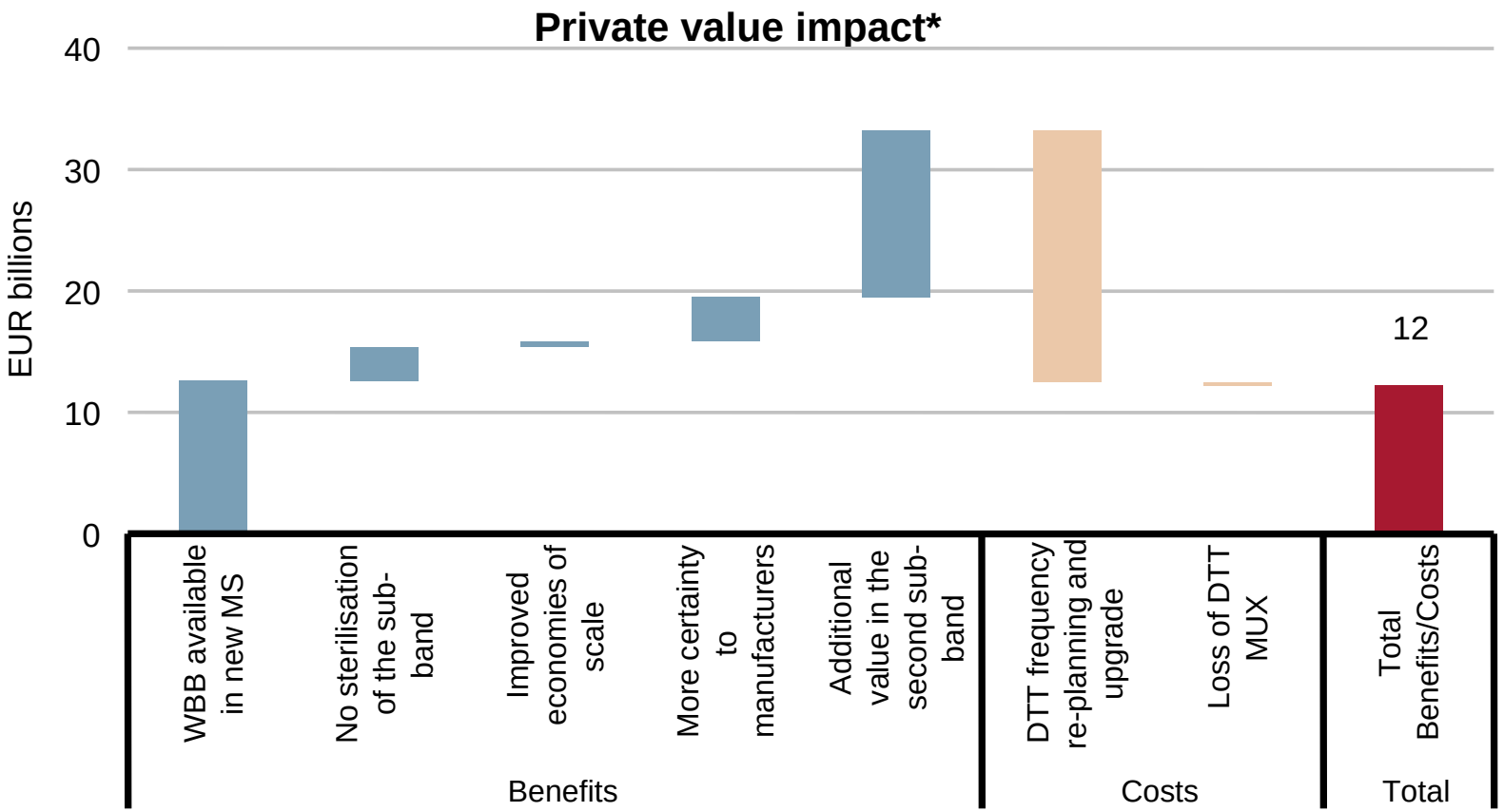
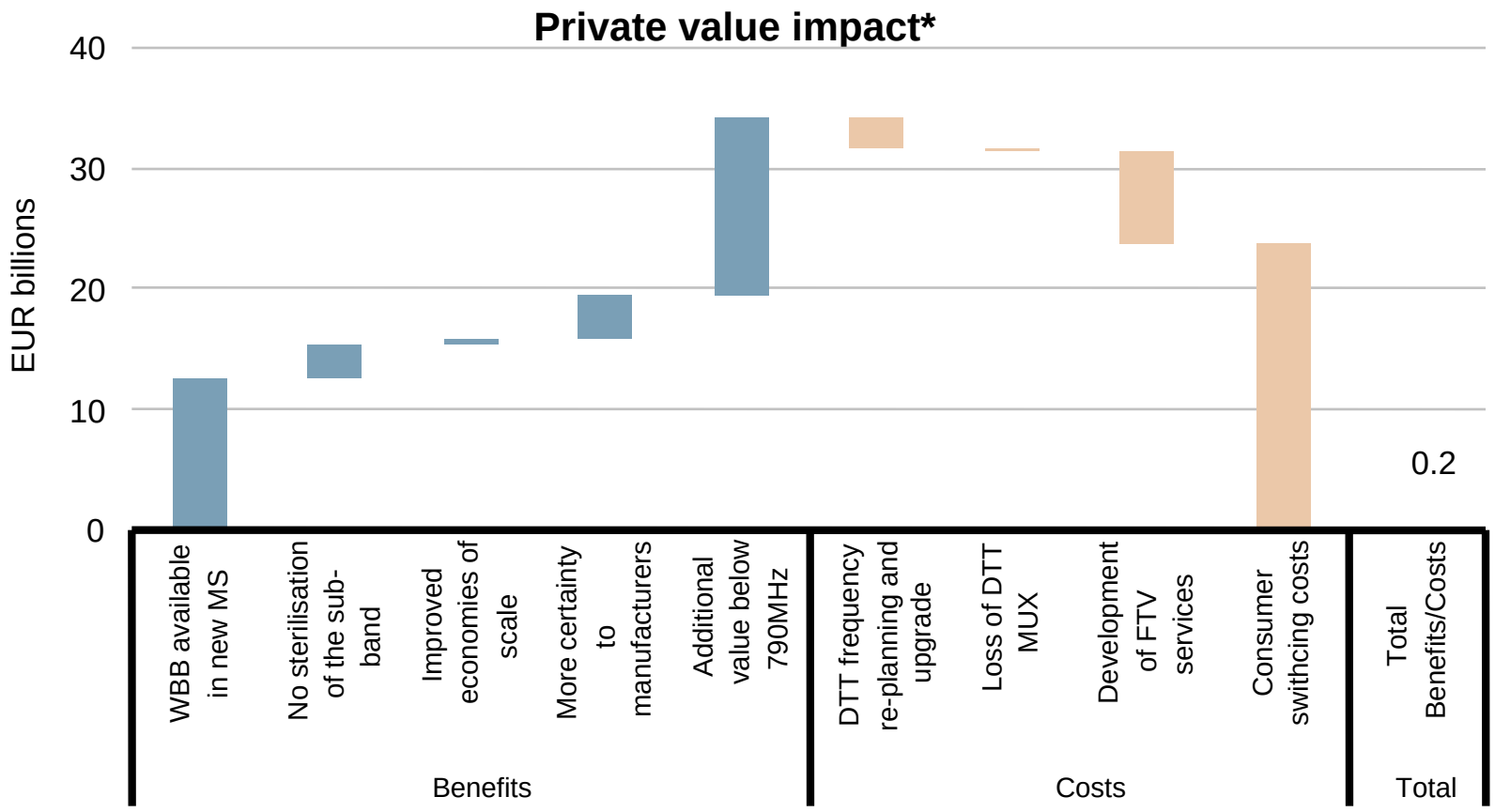
Scenario D: high demand for DTT, low for WBB
Scenario 2: adoption of the second sub-band



** NPV over 15 years*
MUX means multiplex

Scenario D: high demand for DTT, low for WBB
Scenario 3: clearance of the band



** NPV over 15 years*
FTV means free-to-view, MUX means multiplex

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Summary of all results

	Scenario 1 *(adoption of the first sub-band only)*	**Scenario 2** *(adoption of the second sub-band)*	**Scenario 3** *(clearance of the band)*
Scenario A *(DTT low, WBB low)*	**EUR17 billion**	EUR13 billion	EUR1 billion
Scenario B *(DTT low, WBB high)*	EUR44 billion	**EUR61 billion**	EUR51 billion
Scenario C *(DTT low, WBB high & new use)*	EUR44 billion	EUR75 billion	**EUR95 billion**
Scenario D *(DTT high, WBB low)*	**EUR17 billion**	EUR12 billion	EUR0.2 billion
Scenario E *(DTT high, WBB high)*	EUR44 billion	**EUR60 billion**	EUR50 billion
Scenario F *(DTT high, WBB high & new use)*	EUR44 billion	EUR74 billion	**EUR95 billion**

Red indicates the private value associated with the optimal supply scenario

High-level observations

- The Reference Scenario is inferior to the supply scenarios, irrespective of the demand scenario
- The key drivers of private value are the future demand for wireless broadband and other new services, rather than DTT
- Lower demand for wireless broadband favours fewer changes to existing spectrum allocations; higher demand favours more changes
  - however, our assessment is limited to private value effects *only*
- The spectrum supply scenario which maximises private value varies by wireless broadband demand scenario:
  - any recommended action needs to be sufficiently flexible and robust to cope with the potential evolution of demand for wireless broadband and other new uses

Interference to cable receivers

- If the 790–862MHz sub-band is adopted, mobile uplinks (832–862MHz) may interfere with some nearby cable receivers. This would negatively impact up to three cable TV programming channels
  - this issue would be larger if more of the band were to be cleared
- This issue that was raised late during our study, and therefore it was not included in the socio-economic modelling
- We are unaware of any quantitative work to assess how widespread the issue is and the cost to mitigate it
- We recommend that further work is undertaken to assess the scale of this issue in individual Member States, and the costs of resolving any harmful interference problems
- We note that the scale of the expected private value benefits for wireless broadband means that the cost of mitigating this interference would need to be very large in order to change our conclusions

Socio-economic analysis and high-level recommended actions

Approach

Results

High-level options for action and recommendations

Potential areas for high-level action

- Creation of 790–862MHz sub-band suitable for medium or low-power services e.g. wireless broadband
- Further clearance of high-power DTT from 470–862MHz:
  - creating a second sub-band, *or*
  - promoting the long-term clearance of the entire band
- Encouraging the use of interleaved spectrum
- This section gives our assessment of these areas for possible action and our recommendations for action to be taken *now*

Creating the sub-band [1]

- There is a clear economic case for action:
  - our modelling suggests a benefit of EUR19 billion to EUR47 billion compared to the Reference Scenario
- 2015 is earliest realistic date for the sub-band to be created
  - high-power interference on the EU's eastern border needs to be resolved
  - allows a realistic timeline for migration of DTT out of the sub-band (e.g. Spain: not before 2015)

Creating the sub-band [2]

- There is no need to abandon technology neutrality (the WAPECS concept):
  - technology-neutral award processes can determine the best mix in each Member State
  - high-power DTT is not specifically precluded, provided interference it causes to neighbouring countries is no more than from a medium-power use
  - however, conformity with the CEPT FDD band plan is necessary to achieve scale economies and roaming benefits

Creating the sub-band [3]

Recommended action 1

- Member States should be *required* to:
  - clear the 790–862MHz sub-band so that it may be used for WBB
  - impose technical restrictions to prevent cross-border emissions exceeding medium-power uses (e.g. WBB)
  - do so by 2015
- Member States should be *encouraged* to:
  - award spectrum on a service- and technology-neutral basis
  - ensure that spectrum winners can deploy WBB using the FDD band plan suggest by CEPT
  - share plans early with other Member States

Further clearance of 470–862MHz [1]

- There is potentially an economic case for *future* action
  - *additional* value is estimated to be up to EUR30 billion from a second sub-band at 694–790MHz, and up to EUR51 billion from total clearance, if demand for WBB or other future uses is sufficiently high
- But the case depends on uncertain demand:
  - if demand for WBB proves weak, we estimate a loss of up to EUR17 billion value relative to clearing the first sub-band only
- However, the above results are limited to a private value assessment, and exclude external value impacts
- Further, any decision to clear DTT from the band would need to be a political decision

Further clearance of 470–862MHz [2]

- In summary, there is no *current* case for further clearance until this market uncertainty is resolved
- However, a review regarding potential action to prepare for further clearance is recommended in the short to medium term
  - research and preparation may be required in advance, in order to inform this review

Further clearance of 470–862MHz [3]

Recommended action 2

- No action is needed currently to require or encourage further spectrum clearance
- However, we recommend a review in the short to medium term to:
  - assess the evidence to date and the likely evolution of WBB and other uses, and estimate the costs associated with partial or total clearance
  - decide whether it is appropriate to commence preparations for further clearance, and if so, its extent and timescale
- This review should only take place once decisions regarding the first sub-band are largely resolved
- Limited research may be initiated ahead of this review, including investigating costs and logistics, and necessary platform upgrades

Use of interleaved spectrum [1]

- There is no immediate shortage of interleaved spectrum for SAB/SAP
  - our modelling suggests widespread national SFN deployment is unlikely if only the first sub-band is adopted
  - reserving interleaved spectrum may impede flexibility for future spectrum reorganisation

Use of interleaved spectrum [2]

- The need for action to safeguard SAB/SAP use may arise, depending on plans for further clearance. For example:
  - promoting more spectrally efficient (digital) technologies
  - coordinating accommodation outside the 470–862MHz band (e.g. 1452–1559MHz, 1785–1800MHz)
- Cognitive technologies are not a use, but a family of technologies
  - they adapt to spectrum availability, rather than requiring spectrum allocations on a primary basis
  - interleaved spectrum is available to support further development

Interleaved spectrum use [3]

Recommended action 3

- No action is needed to require or encourage Member States to reserve interleaved spectrum
- No action is needed to encourage interleaved spectrum users to migrate to more spectrally efficient equipment or use spectrum outside the 470–862MHz band
- A review should be carried out alongside a consideration of possible further partial or total clearance of the 470–862MHz band

Study objectives and potential uses of digital dividend spectrum

Socio-economic analysis and high-level recommended actions

Q&A regarding the high-level recommended actions

Sector-specific recommended actions

Q&A regarding the sector-specific recommended actions

Summary of recommended high-level actions

- All Member States should be required by 2015 to clear the 790–862MHz sub-band and impose technical restrictions to prevent high-power cross-border interference
- Member States should be encouraged to award spectrum on a service- and technology-neutral basis
- In the short to medium term carry out a review to decide whether action is warranted to prepare for further clearance, and consider actions to safeguard users of interleaved spectrum
- Limited research should be initiated ahead of this review, including investigating costs and logistics, and reviewing necessary platform upgrades

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Sector-specific recommended actions

Q&A regarding the sector-specific recommended actions

Sector-specific actions

- In the previous session we summarised our recommendations for high-level actions to coordinate allocation of the digital dividend across the EU
- In this session we will present our recommendations for actions that target *specific sectors* such as DTT
- These are actions that:
  - are either required to support the recommended high-level actions, or are warranted in their own right
  - have a 'European dimension' (as opposed to issues that can be resolved by individual Member States)

Sector-specific recommended actions

- DTT
- Broadcast mobile TV
- Wireless broadband
- SAB/SAP
- PPDR
- Cognitive technologies

DTT: European dimension (interference management)

- DTT signals travel over long distances
- A decision by one Member State to reserve spectrum for DTT will restrict the ability of neighbouring Member States to deploy new uses
- Adopting more spectrally efficient broadcasting network techniques could free up spectrum for other uses
- Future DTT spectrum replanning will potentially require substantial multilateral negotiations (especially if national SFNs are widely adopted)

DTT: European dimension (standards)

- There is variation and uncertainty over standards, technologies and topologies between Member States (MPEG-4, DVB-T2, SFNs and receiver equipment)
- Coordination could facilitate:
  - technical efficiency of spectrum use
  - improved economies of scale and certainty of take-up for equipment manufacturers
- A lack of standards for interference rejection by DTT receivers may inhibit deployment of new uses in the band

DTT: potential areas for action

- Our modelling shows that adopting more spectrally efficient technologies and topologies for DTT broadcasting could facilitate more rapid implementation of our high-level recommendations
- There are four areas in which EU-level action may be beneficial:
  - adopting receiver specifications
  - adopting advanced DTT transmission technologies
  - coordinating DTT deployment topologies
  - brokering multilateral negotiations on replanning

DTT: receiver specifications – options for action

- Manufacturers currently have little incentive to maximise the interference tolerance of DTT receivers
- At our workshops, there has been strong support from stakeholders for action to promote common standards that could be adopted by all manufacturers
- We identified three options for EU-level action:
  - produce guidelines or require that all sold receivers are MPEG-4 and/or DVB-T2 compatible
  - produce guidelines or require that all sold receivers meet minimum technology-neutral performance specifications
  - specify minimum interference rejection standards for DTT receivers
- Early introduction of standards would be advisable, to allow current receivers time to reach the end of their lifetime before 2015

DTT: receiver specifications – evaluation of actions

- There are both benefits and costs to making all receivers MPEG-4 compatible (H.264/MPEG-4 AVC)

Benefits

- Helps prevent delays to the adoption of the 790–862MHz sub-band
- Reduces the cost of MPEG-4 migration

Costs

- May increase the cost of DTT receivers
- MPEG-4 may not be the optimal choice of technology in the long term

DTT: receiver specifications – evaluation of benefits

Preventing delays to the sub-band

- Historic studies have estimated a one-year delay would reduce the value of the sub-band by around 10%
- We estimate this is equal to:
  - EUR3.6 billion if demand for wireless broadband is low
  - EUR8.8 billion if demand for wireless broadband is high

Reducing the cost of migration

- Assuming the 15 Member States that use MPEG-2 only were to upgrade to MPEG-4 in 2015 …
- … we estimate the cost of replacing MPEG-2 receivers would be EUR700 million less if all sold receivers were MPEG-4 compatible by 2012

DTT: receiver specifications – evaluation of costs

Increased cost of receivers

- Currently the average cost of receivers is around:
  - EUR30 for MPEG-2
  - EUR80 for MPEG-4
- If all receivers had to be MPEG-4 compatible, they would benefit from economies of scale
- Consumers that would have bought an MPEG-2 receiver would incur an incremental cost
- Consumers that would have bought an MPEG-4 receiver would do so at a lower cost
- We estimate the net cost to be EUR170 million

Non-optimal choice of technology

- This risk appears small:
  - 12 Member States use or plan to use MPEG-4
  - most equipment manufacturers are already producing MPEG-4 receivers
- However, it is against the Commission's policy of technology neutrality

Although there is a strong case for making all DTT receivers MPEG-4 compatible, we suggest that setting technology-neutral performance standards (equivalent to MPEG-4) is more appropriate

DTT: receiver specifications – other technical options

DVB-T2

- Our modelling shows that DVB-T2 will probably only be required if spectrum is cleared for a second sub-band – which is uncertain
- To be consistent with our approach to the second sub-band, we suggest revisiting action for the use of DVB-T2 in receivers alongside a review of possible further partial or total clearance of the 470–862MHz band

Interference rejection

- Minimum standards for receivers would ease the introduction of uses other than DTT into the band
- However, it could increase the cost of receivers
- We expect that this increase in cost would largely be offset by gains in economies of scale

DTT: receiver specifications – recommended action

Recommended action 4

- Research should be conducted to define parameters for minimum interference rejection standards and minimum performance of compression technologies for DTT receivers
- We suggest that the minimum compression performance is set to reflect the efficiency gains provided by the H.264/MPEG-4 AVC standard
- As soon as possible, all DTT receivers sold in the EU should be required to conform to these technology-neutral minimum standards for interference rejection and compression performance (note this would not preclude receivers also being compatible with older standards)

DTT: transmission technologies – possible actions

- Action to promote common transmission technologies could:
  - establish economies of scale and create certainty for manufacturers
  - promote spectral efficiency, thus facilitating DTT replanning and timely introduction of sub-bands for new uses
- We considered two options for EU-level action:
  - producing guidelines or requiring that Member States adopt MPEG-4 and/or DVB-T2
  - producing guidelines or requiring that all DTT transmission meet technology-neutral performance specifications

DTT: transmission technologies – evaluation of actions

Benefits

- Adopting MPEG-4 would reduce the risk of delay in adopting the sub-band
  - we estimate a one-year delay would cost EUR3.6 billion to EUR8.8 billion
- Adopting DVB-T2 would accelerate the possibility of adopting a second sub-band
  - we estimate a one-year delay would cost EUR1.7 billion to EUR3.1 billion

Costs

- Broadcasters and consumers may need to replace equipment earlier than otherwise required, or even unnecessarily
- Adopting DVB-T2 may not be required if the second sub-band is not adopted
- We estimate the cost of upgrades across the EU to be:
  - EUR4 billion for MPEG-4
  - EUR10 billion for DVB-T2

DTT: transmission technologies – recommended action

Recommended action 5

- Non-obligatory guidelines should be produced regarding the timeline for the adoption of minimum compression performance specifications for DTT transmission by Member States
- These should be equivalent to H.264/MPEG-4 AVC (consistent with our recommended action 4)
- Member States should be requested to share their plans for migration to more advanced transmission technologies, so as to assist other Member States in developing their own plans

DTT: topologies – possible actions

- The wider use of national SFNs could greatly increase spectral efficiency in DTT deployment
- This might be achieved by developing guidelines or mandating adoption of SFNs over a specified timetable
- However, SFN deployment would be costly and would require extensive multilateral coordination
  - our modelling suggests that upgrading some or all DTT networks to SFNs is only likely to be required if a second sub-band is adopted
  - the cost of upgrading networks to national SFNs is estimated at EUR14 billion
- Given the uncertainty over the case for a second sub-band, it is unclear whether further investment in SFNs is necessary or cost-effective

DTT: deployment topologies – no action is proposed

- No definitive action should be taken in the near term regarding DTT deployment topologies
- The issue should be reviewed alongside any decisions on further action to clear digital dividend spectrum

DTT: brokering negotiations

- Our report identified potential concerns about the ability of Member States to achieve timely consensus on DTT replanning on a bilateral or multilateral basis
- In particular, negotiations may be complicated by:
  - asymmetries between the positions of Member States resulting from uneven GE-06 assignments
  - requirements to coordinate with non-EU neighbours
- For the 790–862MHz sub-band, there is evidence that bilateral and multilateral negotiations are having success – but there is still particular uncertainty over non-EU coordination (e.g. with Russia)
- Any decision to plan for or introduce a second sub-band would require much more complex coordination

DTT: brokering negotiations – recommended action

Recommended action 6

- The Commission should make itself available as a neutral broker in negotiations regarding the re-allocation of spectrum in the 470–862MHz band
  - between Member States
  - between Member States and non-EU countries

Sector-specific recommended actions

- DTT
- **Broadcast mobile TV**
- Wireless broadband
- SAB/SAP
- PPDR
- Cognitive technologies

Broadcast mobile TV

- If Member States coordinate the frequencies for mobile TV, this could reduce the tuning range, thus reducing remanufacturing costs
- Some Member States have already deployed, or made plans to deploy, DVB-H networks using existing GE-06 assignments
  - these allocations are likely to be spread across the band
  - narrowing the tuning range may create migration and replanning costs for some Member States
- There are already devices in the market that tune over a wide range (e.g. 470–750MHz for the DVB-H-enabled Nokia N96)
- Therefore, it is not obvious that guidelines for a smaller tuning range are necessary, or that they would be beneficial

We do not recommend any action regarding mobile TV

Sector-specific recommended actions

- DTT
- Broadcast mobile TV
- **Wireless broadband**
- SAB/SAP
- PPDR
- Cognitive technologies

Wireless broadband: FDD inflexibility

- We have already made high-level recommendations for coordinated EU-level spectrum allocation that have implications for WBB
- Here we consider the flexibility of WBB systems and the challenges this creates for European coordination
- FDD is the leading technology for European WBB, and a definite proposition for the 790–862MHz sub-band
- FDD systems require the same fixed duplex spacing in all Member States, in order to realise common economies of scale and roaming
- In the future, if it were possible to redesign FDD systems so that they were more flexible in their use of spectrum, this might allow:
  - Member States to vary the amount of spectrum allocated to WBB without compromising European-scale economies
  - expansion or contraction of WBB spectrum in response to changing demand, without the need to adopt further sub-bands

WBB: potential EU-level actions

- We have considered two possible actions:
  - encouraging research into frequency-agile WBB systems such as TDD and variable-duplex FDD
  - prioritising access to spectrum for flexible systems in future allocations (this is not practical for the 790–862MHz sub-band)
- If flexibility can be introduced without unduly increasing technology costs:
  - economic benefits of more efficient spectrum use may be substantial …
  - … especially for Member States whose optimal requirements differ significantly from the EU average
- Further research into frequency-agile technologies needs to be carried out by manufacturers, but European bodies could influence its direction
- Prioritising access to future releases of spectrum for flexible systems appears a step too far without progress on research

Wireless broadband: recommended action

Recommended action 7

- The European Commission or other appropriate European bodies should work together with Member States to encourage research into the development of more frequency-agile technologies for wireless broadband (e.g. FDD systems with variable duplex)

Sector-specific recommended actions

- DTT
- Broadcast mobile TV
- Wireless broadband
- SAB/SAP
- PPDR
- Cognitive technologies

SAB/SAP: European dimension

- Sufficient interleaved spectrum will remain available for SAB/SAP even after the creation of the first sub-band
- A major EU-level issue is migrating SAB/SAP out of proposed FDD channels without disrupting future reorganisations:
  - several Member States have dedicated SAB/SAP spectrum in the 790–862MHz sub-band
  - if a common destination could be found, this would maximise economies of scale
  - an FDD centre gap in 790–862MHz has been suggested, but the SAB/SAP community is concerned about interference and the tuning range of current equipment
- In the longer term, further clearance of the band may put pressure on availability of interleaved spectrum for SAB/SAP

SAB/SAP: potential EU-level actions

- We have identified four options for EU-level action:
  - sharing information or producing guidelines on frequency channels to be dedicated for SAB/SAP use
  - encouraging or requiring Member States to make a dedicated channel available for SAB/SAP
  - encouraging the migration of SAB/SAP to alternative frequency bands (e.g. 1452–1559MHz or 1785–1800MHz) with a lower opportunity cost
  - supporting the development of digital technology for SAB/SAP, in order to promote more efficient spectrum use

SAB/SAP: evaluation of possible actions

- Our modelling suggests that the benefits from having common frequencies are modest
- It is unclear if dedicated channels are required in all Member States
- The opportunity cost is high (except in sub-band duplex split)

Benefits from economies of scale

	Number of Member States adopting common frequencies		
	6	*15*	*27*
Low estimate	**EUR14m**	**EUR40m**	**EUR53m**
High estimate	**EUR27m**	**EUR81m**	**EUR106m**

- The benefits from migration and/or introducing digital technology are ambiguous unless and until availability of interleaved spectrum becomes more constrained
- There is insufficient justification for any action beyond requesting that Member States consider relocating dedicated channels to share their plans

SAB/SAP: recommended action

Recommended action 8

- We propose that Member States that are considering relocating dedicated nationally available frequency channels for SAB/SAP (as part of their plans to clear the 790–862MHz sub-band) should be requested to share their plans

Sector-specific recommended actions

- DTT
- Broadcast mobile TV
- Wireless broadband
- SAB/SAP
- PPDR
- Cognitive technologies

PPDR: European dimension

- There is a significant European dimension:
  - economies of scale (important for the creation of bespoke networks required by PPDR)
  - cross-border interoperability (for cross-border emergency services)
  - cross-border interference management (which has the same issues as commercial WBB)
- However, the benefits from creating a Europe-wide wireless broadband network for PPDR using digital dividend spectrum are unclear:
  - some Member States have recently invested in PPDR systems in other bands
  - there may be other options with lower opportunity cost (e.g. 300–400MHz, or satellite in the 2GHz range)

PPDR: potential EU-level actions

- We considered two options for EU-level action:
  - 790–862MHz sub-band – producing guidelines or requiring Member States to deploy a PPDR system in this spectrum
  - 470–790MHz – producing guidelines or requiring Member States to deploy a PPDR system this spectrum
- Both options look unattractive:
  - the sub-band has very high opportunity cost (2 ×16MHz = EUR13–32 billion) and is available too soon
  - other digital dividend spectrum has a lower opportunity cost (2 ×16MHz = EUR1–3 billion) but this is still high relative to other frequency bands, and may require extensive DTT replanning

We do not recommend any action for PPDR at this stage

Sector-specific recommended actions

- DTT
- Broadcast mobile TV
- Wireless broadband
- SAB/SAP
- PPDR
- Cognitive technologies

Cognitive technologies: European dimension

- Cognitive technologies are not a use or a source of spectrum 'demand' – they are means to adapt to available spectrum
- European dimension:
  - economies of scale, particularly for mass-market applications such as wireless local area networks
  - some applications may also benefit from international roaming
- Key issues are technical parameters, approaches (detection, geolocation databases, or beacon reception) and regulatory conditions – to be discussed at WRC-11
- It may be beneficial for Europe to adopt the same technical parameters as other markets, e.g. USA (c.f. Nov 2008 FCC decision)

Cognitive technologies: potential EU-level actions

- European guidelines for technical and regulatory standards could:
  - encourage Member States to adopt common standards, while allowing them to decide whether or not to permit cognitive technologies based on national considerations
  - promote economies of scale
  - provide confidence to manufacturers, accelerating time to market
- Potential benefits from cognitive radio are not certain enough to justify any stronger action
- We understand that European SMAs are contributing to WRC-11 agenda item 1.19 regarding regulatory measures via CEPT (CPG project team A)
- These contributions could form the basis for developing a Common European Position

Cognitive technologies: recommended action

Recommended action 9

- Common guidelines should be developed regarding the technical parameters (including frequency ranges) and regulatory conditions for the introduction of cognitive technologies in the 470–862MHz band
- These may feed into the EU's contribution to WRC-II agenda item 1.19
- Member States will not be required to adopt this position, nor permit cognitive technologies: these decisions will remain at the national level

Study objectives and potential uses of digital dividend spectrum

Socio-economic analysis and high-level recommended actions

Q&A regarding the high-level recommended actions

Sector-specific recommended actions

Q&A regarding the sector-specific recommended actions

Summary of recommendations

DTT	• All sold DTT receivers required to meet technology-neutral minimum interference rejection and compression performance standards (equivalent to MPEG-4) • Guidelines for the adoption of minimum compression performance specifications for DTT transmission • The Commission to be a broker in negotiations between Member States, and with non-EU countries
Wireless broadband	• Research into the development of frequency-agile technologies should be encouraged
SAB/SAP	• Member States requested to share their plans to relocate dedicated frequency channels for SAB/SAP
Cognitive technologies	• Guidelines for the technical and regulatory conditions for the introduction of cognitive technologies to the band

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