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Mr Daniel Storey
Radio Spectrum Management Review Secretary
c/o Radiocommunications Agency
Wyndham House
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Dear Mr Storey

Response to Radio Spectrum Management Review

BT Cellnet welcomes the UK Radio Spectrum Management Review announced by the Government. As a leading mobile network operator in the development and delivery of mobile communication services in the UK, we provide our comments on the principles that should govern spectrum management to ensure that all spectrum users are focussed on using their spectrum as efficiently as possible.

BT Cellnet emphasises the following key points:

- **Given the importance of the radio spectrum to the economic and cultural health of the UK, BT Cellnet agrees with the need for a consistent UK national regime that gives all spectrum users an incentive to use spectrum more efficiently.**

- **The importance of ensuring that spectrum is used efficiently requires careful development, introduction and the application of efficiency enhancing mechanisms. This should be conducted through full, open and detailed consultations with industry and all other major spectrum users.**

- **The development of efficiency enhancing mechanisms will be assisted by supporting the introduction of a freer spectrum market, and in particular secondary trading, which will have a fundamental impact on the legislative basis for spectrum management.**

- **To support a freer spectrum market, the UK will need to strive for greater consistency of licensing procedures across the European Community and beyond, and for greater transparency of specific data on current and prospective spectrum use, both in the UK and internationally.**

We offer the following overall comments.

1) BT Cellnet agrees with the premises on which the Review is operating:

   Radio spectrum is an asset of large and growing importance, crucial to the success of many industries, including the communications industry, which have a major bearing on the future prosperity of the UK and in which the U.K. can excel. We note, however, that this asset has not featured in the Treasury's recently published National Asset Register.

The regime for allocating and assigning spectrum relies largely on administrative measures that are not always effective at ensuring that best use is made of the spectrum. The effectiveness of any measures will be enhanced by maintaining a UK national approach.

It is vital to ensure that adequate spectrum is available in the public sector to ensure the delivery of essential services such as defence and the emergency services. Balancing the public and private sector markets must be done whilst acknowledging that the spectrum market is imperfect, due to historical reasons and varied demand side factors, including technological and environmental aspects.

2) BT Cellnet agrees that a more efficient use of the radio spectrum can best be achieved by developing efficiency enhancing mechanisms that give all spectrum users an incentive to take into account the opportunity cost of the spectrum they are using. In the case of mobile network operators such as BT Cellnet, we believe that developing a freer spectrum market through secondary trading can enhance the sector's current high level of spectrum efficiency. Levels of efficiency will only be enhanced, however, if the processes associated with secondary trading were developed to give sufficient freedom to licensees, as opposed to being restricted by the licensor. The impact of secondary trading will be to loosen the restrictions placed on the uses to which particular blocks of spectrum can be put. This should help to ensure that spectrum is deployed in the most effective way by encouraging firms to develop or deploy new, more spectrally efficient technologies. This has a consequential impact on the legislative basis for spectrum management, suggesting that there should be a move away from conventional apparatus licensing to spectrum access licensing. The ability to take into account the opportunity costs of spectrum access directly, rather than via apparatus licensing, will also help to remove the distinction between licensed and licence exempt apparatus. The current regime leads to distortions in the market when licence exempt spectrum is used to provide services, and in particular public services, that are also provided in licensed spectrum.

3) BT Cellnet notes that the Review has identified the need for greater transparency of specific data on current and prospective spectrum use. We agree that the regular provision of up-to-date information to all spectrum users about current and prospective use will offset, to some extent, the factors that militate against a more delegated approach to spectrum management. However, BT Cellnet wishes to emphasise the need for a much clearer view and more regular reporting of current use, future UK spectrum supply, efficiency of use and pricing than we currently have in the Radiocommunications Agency's spectrum strategy report[1] and other studies[2]. This would help to ensure that business decisions are based on a more solid base of information than at present, thereby introducing a more stable basis for the development of new technologies. More industrial dialogue on the collection and reporting of economic gains can help to deliver this, and we suggest that this periodic reporting is best achieved through the use of an on-line database.

4) BT Cellnet notes that, in the forthcoming European Directive on a common regulatory framework for electronic communications networks and services[3], both secondary trading and the use of administrative pricing of spectrum will be introduced as a means of bringing greater consistency to licence procedures across the Community. We highlight the need for the UK to strive for consistency of licensing procedures within the UK, across the Community and beyond, to ensure that UK companies are not disadvantaged when competing in international markets. This has implications, internationally, on both the need for greater transparency of data and on the need to agree the metrics by which spectrum efficiency is measured. The proposed EU Spectrum Decision goes some way to securing that consistency and core set of metrics[4] and we urge the UK administration to encourage other administrations to publish on-line databases with specific data

[1] "Strategy for the future use of the Radio Spectrum in the UK", March 2000
[2] Including "The Economic Impact of Radio" study, February 2001
[3] COM(2000)393
[4] COM(2000)407

on current use and future spectrum supply and pricing. This will also help to address the potential issue of spectrum hoarding by keeping all assignments and use of spectrum in the public domain.

5) Finally, BT Cellnet wishes to highlight the importance of spectrum monitoring in ensuring that spectrum is used efficiently. When spectrum licences are awarded, the assignment process should not result in this finite resource lying fallow. Spectrum hoarding should be discouraged through the development of a higher level of pro-active monitoring than we currently see in the UK, and this can also be reported via the on-line database. Revenue generated through spectrum licensing should be used to develop this activity, and we suggest that the Review's Report should include recommendations on this specific topic. Additional monitoring will also help to ensure that spectrum remains free from interference and usable, although there are consequential implications on the legislative framework relating to jamming devices that will need to be addressed.

BT Cellnet provides further comments in the detailed responses to the issues identified by the Review team, attached as an Annex.

In addition, BT Cellnet highlights that the Review team (or Ofcom in their new role) should also consider the following issues:

- It is not clear whether the Review has the scope to take into account overall UK competitiveness when developing its recommendations. The Government must ensure that any new spectrum efficiency mechanisms and policies that are developed as a result of the recommendations of the Review's Report are linked in a clear and open manner to the trade and competition policies being implemented in the UK. This will ensure that the UK remains at the forefront of many industry sectors, including the communications industry.
- The Government, perhaps through Ofcom, has a spokesperson role in reassuring the public that technologies that might be deployed in wireless communications meet all UK and international exposure guidelines, and should ensure consistency of environmental and health policies both nationally in the UK, within the European Community and beyond.
- When considering the issues associated with Spectrum Pricing and Auctions it is important to take into account past experiences. The Review Team are encouraged to publish a review of the effectiveness of spectrum pricing since its introduction in 1998, and to take into account the work of the National Audit Office, which has been evaluating the process and outcomes of last year's 3G spectrum auction.
- In addition to the many issues relating to Spectrum Trading already identified by the Review team, and related to our call for the development of a higher level of pro-active monitoring, the implications of trading on ensuring interference free and usable spectrum should be considered more fully. Also, and in addition to the other spectrum efficiency measures highlighted by the Review team, the possibilities of enhanced efficiency of spectrum utilisation through spectrum sharing should be considered amongst the options for the implementation of Spectrum Trading.

BT Cellnet repeats the need for the Review team to address all of these key issues carefully and in an open manner. We look forward to seeing the consolidated views of all stakeholders brought together in a draft Report, published for further comment and public debate this Autumn. We would welcome the opportunity to meet with you to discuss our comments in further details. We will be in touch to arrange a convenient time.

Yours sincerely

Mike Short
Vice President – Industry Relations and Standards

Cc: Simon Wilson, Head of Spectrum Policy

DETAILED COMMENTS ON THE ISSUES IDENTIFIED BY THE REVIEW TEAM

BT Cellnet offers the following comments on the issues identified by the Review team in the consultation paper "Radio spectrum management review".

Issue	BT Cellnet Comments
Economic gains from efficient use of spectrum i. How best can Government assess the economic gains from enabling more efficient use to be made of spectrum? ii. How could information from market transactions and economic impact studies best help inform the design of spectrum management policies?	1. As the Review notes, the current RA Study metrics are based on the benefits to producers and consumers of radio industry services. BT Cellnet recommends that these metrics are maintained, although the Review team are encouraged to study and verify whether the methodologies employed in calculating these surpluses should be maintained. 2. BT Cellnet suggests that industrial knowledge of economic gain within any individual sector is likely to be better informed than studies conducted through surveys with relatively small samples. The UK would best be served by assessing gains through regular Economic Impact Studies conducted with full industrial consultation and benchmarking against other countries. 3. The Review team is encouraged to compare the RA Study with other studies that are in the public domain, and to recommend that all radio industry sectors develop and publish their views on the benefits to producers and consumers of their services. Developing this open approach to economic impact studies would benefit both industry and Government by enabling the UK to be benchmarked against other countries. 4. To enable this information to be useful in assessing how a more efficient use of the spectrum would be of benefit to the UK, these values will need to be projected into the future. BT Cellnet recommends that this projection be done extremely carefully, and with full industrial consultation, over an appropriate time period. 5. The results of these studies, which will inform Government's approach to the design of spectrum management policies, need to take into account the following points: • How should the UK balance social and economic gains? • How should the UK encourage enterprise and innovation?
Economic principles of spectrum management iii. How far can the over-arching principle, that spectrum users should bear the opportunity cost of their usage, be applied in practice? iv. How can the trade-offs between competing economic and social uses of spectrum be more clearly articulated in the principles governing spectrum management?	6. BT Cellnet believes that the over-arching principle of opportunity cost, which should lead to the definition of rules for spectrum management, should apply to all sectors. It will be important to avoid overly complex methodology in assessing opportunity cost as potential users must be able to understand and compare different spectrum. This will be particularly true when spectrum trading and the possible of change of use is introduced. 7. Opening the spectrum assignment databases, with information relating to this opportunity cost included, is a critical next step in ensuring that all sectors are seen to be treated equally with regard to this principle.

	8. It is difficult to articulate clearly the trade-offs between competing economic and social uses of spectrum. To enable comparison it will probably be necessary to relate all uses to a monetary value. BT Cellnet suggests that the Review team should develop a number of scenarios to test how the alternative approaches to balancing economic and social uses would affect the competitiveness of the UK. 9. Spectrum is, today, a relatively specialised, market. We believe that the introduction of efficiency enhancing measures such as spectrum trading, will help to establish a "best" balance between the social and economic use of spectrum. 10. Spectrum pricing is a relatively blunt instrument, but as the uses of the radio spectrum increase in diversity we would expect to see more of a balance established between the various radio sectors with regard to licence fees per MHz and with respect to the benefits generated.
Legislative basis for spectrum management v. To what extent would a separate spectrum management duty for Ofcom be helpful, and how could this best be articulated in a new statutory framework for communications regulation? vi. What additional statutory alternatives to apparatus licensing could assist Ofcom in meeting its spectrum management objectives? vii. How far can new modes of licensing, based upon access to defined spectrum rather than defined wireless apparatus, assist in enabling more efficient use to be made of spectrum?	11. Ofcom is being established against a backdrop of converging media and technologies. BT Cellnet believes that the establishment of Ofcom is in the right general direction, but recommends that the changes affecting the legislative basis for spectrum management need to be managed very carefully and introduced one step at a time. 12. Key aspects of the Communications Bill should be: • The removal of outdated and unjustified regulation. • Regulation that stimulates innovation. • Clarity with flexibility. • Transparency and accountability. Achieving this will result in the best deal for consumers and an innovative UK economy that can compete globally. 13. Spectrum management is a major issue that cannot be taken in isolation. Separation of spectrum management from Ofcom is wrong, but we believe that a bias towards spectrum for communications only is also wrong. It is essential for Government to balance the UK spectrum policies with UK policies relating to trade and competition. Ofcom has the opportunity to facilitate a coherent treatment of spectrum against a background of competition law to ensure fair competition. 14. BT Cellnet suggests that the Review team benchmarks the current and potential UK legislative bases for spectrum management against other countries (including Australia) prior to making its recommendations detailing how Ofcom should define and implement the introduction of any new legislative bases for improving spectrum efficiency. 15. BT Cellnet agrees with the suggestion to license access to spectrum. We would wish the Review team to take note that the release, in the short term, of any additional large amounts of spectrum suitable for mobile use may have a further impact on the industry. 16. New modes of licensing, based upon access to defined spectrum, will help to bring about the balance between sectors desired.

Regulatory framework for spectrum management **International dimension** viii. How can the UK's stance towards international spectrum management policy best reflect the opportunity costs of different spectrum uses? ix. What scope is there for greater autonomy in domestic spectrum policy within the constraints imposed by the UK's international commitments? x. How should the UK Government judge the trade-off between a more liberal approach to spectrum management and one in which technology standards and spectrum access are mandated as part of a strategic industrial and trade policy? xi. If there were greater latitude in international allocations and/or the UK's implementation of such decisions, to what extent would market mechanisms result in harmonisation of equipment and transmission standards? **National dimension** xii. Within the current and proposed statutory framework, what improvements (if any) could be made to the institutional arrangements for spectrum management in the UK? xiii. To what extent would greater transparency of specific data on current and prospective spectrum uses support efficient spectrum use? What are the key issues and trade-offs pertinent to the provision, by RA, of an on-line database containing spectrum-utilisation details? How far is transparency compatible with commercial confidentiality and public	17. BT Cellnet believes that it will be difficult to change significantly the balance of sectors within the ITU. More influence from the UK administration is possible within the CEPT, although the desired direction of influence on international policy will depend on how the UK balances social and economic gains. 18. There is limited scope for greater autonomy in domestic spectrum policy. It is also not desirable to seek additional autonomy that could reduce economies of scale and equipment compatibility. 19. BT Cellnet confirms the need for the UK to have a strategic trade and industry policy aligned with our European partners, and endorses the benefits of the forthcoming Spectrum Decision in this regard. However, we are unhappy that the latest Council advice has resulted in the abandonment of the Senior Official Radio Spectrum Policy Group, and reiterate the need for an enhanced framework for dialogue with industry. 20. One of the principles of spectrum policy should be to avoid spectrum misuse (for example through hoarding or undue interference), although within this there may still be scope for some liberalisation within existing EU Decisions. There are many examples of harmonisation with and without the mandatory aspects of Decisions: • GSM and UMTS through EU Decisions; • WLANs through regional standardisation; and • Bluetooth through industry collaboration. However, it should also be noted that the European Fixed Wireless Access (FWA) market has fragmented through inflexibility (despite standardisation). 21. BT Cellnet supports the establishment of a single spectrum authority (such as Ofcom), with a clear, prioritised role, and one that can work for consistency between the UK national approach and that of our European partners. 22. One of the key aspects for improvement, as noted previously, is the need for open databases, including information relating to pricing, current use and future plans. Transparency of specific data is necessary to achieve a more efficient overall use of the radio spectrum, although it does have an implication on the need for monitoring to verify the accuracy of the data. 23. Specific information that would be needed includes: • Sector/application (to link to the economic gains and opportunity costs discussed earlier) • Geographical usage and fees/MHz/region • Equipment/standards deployed • Conditions associated with current, future and prospective use • Contact details if further information is sought We agree with the need for public safety and security considerations, but do not believe that this would prevent the database from fulfilling its role. 24. BT Cellnet recommends that major licensees (such as

safety and security considerations? xiv. To what extent could intermediaries play a valuable role in buying rights to manage a particular frequency band and then selling access to parts of this spectrum to users on a commercial basis?	those who self manage their national assignments) should be able to trade in their own right. Licence obligations relating to service or rollout aspects would need to be monitored by Ofcom to ensure that national and international policy goals are maintained. 25. Flexibility in the implementation of spectrum trading will open up the possibilities of innovative approaches to improving overall spectrum efficiency, such as spectrum sharing. BT Cellnet does not see an inconsistency between a move towards allowing more flexibility in the use of the radio spectrum and the need to remain within ITU, CEPT and EU allocations and decisions in specific frequency bands. 26. BT Cellnet believes that spectrum brokers could emerge as a result of a flexible approach to spectrum trading, and that this might help to ensure that market prices are more speedily attained.
Spectrum use: marketed and non-marketed outputs xv. To what extent is the review's distinction between radio spectrum used for marketed and non-marketed goods a helpful one? xvi. How far can public policy objectives for the delivery of non-marketed goods be separated from the regulation of access to the spectrum necessary to deliver such services?	27. BT Cellnet believes that balancing the efficient use of spectrum by different sectors could be achieved in a number of ways. We recommend that the Review develops different scenarios to compare the effect on overall UK competitiveness of differentiating between: • Marketed and Non-marketed outputs • Public and Private applications Independent of the definitions used, the key question of how the UK should balance these different sectors remains. This is important since it relates to the effect the approach has on driving spectrum efficiency. 28. Since market definitions are changing, BT Cellnet recommends that all commercial usage of spectrum is treated equitably. Within the converging telecommunications and broadcast sectors there is also a need to assure that there is a consistent approach to obligations such as coverage and roll out. 29. We believe that it is important to identify appropriate metrics for measuring spectrum usage efficiency and suggest that this is achieved through an open consultation process with all sectors able to contribute to the debate. Once established, the metrics should be used consistently across all radio spectrum users.
Issues in non-marketed uses of spectrum **Defence** xvii. Is this a valid description of the factors affecting defence use of radio spectrum? xviii. What opportunities exist for commercial and other civil users to share spectrum with the defence establishment in the UK? xix. What further incentives could be introduced to encourage more intensive and efficient use of spectrum allocated to defence?	30. BT Cellnet has few comments to make on the defence, broadcasting, aeronautical and maritime sectors, since we have no direct experience of the sectors. We suggest that, in general, spectrum efficiency can be encouraged through the publication of digital transitions plans, the publication of assignment information, and the introduction or extension of spectrum pricing. The introduction of incentive pricing needs to take account of potential demand to avoid an excess supply of spectrum which in itself will lead to further inefficient use of spectrum 31. In the defence sector, identifying opportunities to share requires more knowledge of current usage. There could be many opportunities at the lower frequencies, but without the benefit of more open databases this is difficult for us to specify. We suggest that the MoD or DERA could be appointed as a "spectrum broker" to explore these possibilities more openly.

Broadcasting xx. Is this a valid description of the factors affecting use of radio spectrum by the broadcasting sector? xxi. How can the Government's commitment to value the spectrum used by broadcasters be implemented in a way which encourages spectrum efficiency? xxii. What further incentives might be introduced, consistent with wider broadcasting policy and with previous Government commitments about television and radio franchise fees, to encourage greater spectrum efficiency by commercial broadcasters? Are there differences in the approach to incentives before and after the proposed switchover from analogue to digital terrestrial TV broadcasting? xxiii. What incentives might be introduced, consistent with wider broadcasting policy and the Government's approach to the funding of the BBC and its public service remit, to encourage greater spectrum efficiency by the BBC?	32. We believe that wider implementation of administrative pricing is likely to encourage a more efficient use of the radio spectrum. 33. Within the broadcast sector, BT Cellnet recommends that a digital transition programme, that includes release dates, is published. We believe that commercial radio is already very efficient and is moving quickly to embrace the (more spectrally efficient) digital age, but that most television broadcasting is not. Content diversity in the digital world will encourage more spectrum use, so switchover details are needed soon. Incentives may be required to promote digital switchover. 34. We are unsure whether the current approach is too UK-centric, and suggest that the broadcasting sector is benchmarked against other leading European countries. 35. Finally, we agreed with the suggestion to introduce fees and cost recovery to BBC spectrum usage.
Aeronautical and maritime services xxiv. Is this a valid description of the factors affecting use of radio spectrum by aeronautical and maritime services? xxv. Given the international harmonisation constraints, where could new economic incentives most encourage more efficient use of spectrum in the UK? xxvi. How far could changes in spectrum use charges be reflected in air traffic control fees which are passed on to users of UK airspace and	36. BT Cellnet believes that the aeronautical and maritime services should be encouraged to move to digital technologies more quickly. 37. We believe that these services are generally efficient already, but perhaps under priced. We agree with the suggestion by the Review team that benchmarking of radar spectrum efficiency, followed by spectrum efficiency based pricing could encourage users to change their equipment over a shorter period of time than would otherwise be the case. However, we also believe that small changes to pricing are likely to have very little impact. 38. BT Cellnet is pleased to see that the Review team has noted the very important international dimensions that apply to this sector.

landing services? **Emergency services** xxvii. Is this a valid description of the factors affecting use of radio spectrum by the emergency services? xxviii. How far can spectrum pricing influence emergency services to make efficient use of spectrum over time? xxix. What scope might there be for sharing of spectrum access with other users to enable more efficient spectrum use?	39. BT Cellnet believes that the emergency services use spectrum quite effectively already, but we suggest that the Home Office could encourage a speedier transition to the use of digital technologies. 40. We highlight to the Review team that NATO policy currently prevents sharing of the PSRC-S with non-emergency service users.
Spectrum pricing and auctions xxx. How far have economic incentives from spectrum prices helped to encourage efficient spectrum use? xxxi. Where should the balance lie between administratively set incentive prices and competitive auction of spectrum licences? To what extent could the two approaches be combined to encourage spectrum efficiency? xxxii. What factors should determine the choice of frequencies subject to auction of licences?	40. Spectrum pricing has not been widely implemented outside mobile communications, such that spectrum efficiency gains can be seen. We believe a real efficiency incentive would have seen spectrum released by now, as part of this spectrum pricing. To be effective, the rules must not be overly complex and the process must be transparent. In some sectors, it may be too early to judge the effectiveness of spectrum pricing, since full pricing will not be achieved in the UK until 2004 or beyond. 41. In theory an auction is a good way of selecting users who value the spectrum highly (and therefore use it efficiently). They can however be influenced by the state of the stock market and general sentiment about the future. It is likely that very high prices for licences will lead to market consolidation. 42. However, in practice auctions are designed to achieve specific objectives and these can conflict with efficient spectrum use (for example, in the UK 3G auction a specific objective was to add a new player to the market and the auction was designed accordingly; in Germany the 3G auction with different objectives had an indeterminate outcome since the final number of licensees was unknown - 4, 5 or 6 were possible). 43. Auctions can also have the effect of freezing the conditions surrounding the licensing of spectrum due to the possibility of litigation from successful and unsuccessful bidders. Spectrum trading may be a way of alleviating this situation. 44. If auctions are used to assign spectrum, there is an implication on the licensing authority to guarantee clean spectrum and audit interference. This, together with the considerable period of time that auctions can take to set up, can delay the release of spectrum. Potential market demand, the number of likely competitors and alternative spectrum options are constantly changing, and all therefore need to be considered when determining the suitability of an auction award process to any candidate frequency band.
Spectrum trading xxxiii. Which areas of spectrum use are most amenable to and which areas offer the greatest potential efficiency	45. Spectrum trading is potentially a valuable tool in increasing the efficient use of spectrum and of freeing up some of the current rigid allocations of frequency blocks. Pricing of spectrum will always be difficult, as it requires making a judgement about future value in an environment where there

	gains from the introduction of spectrum trading?	are a large number of constantly changing variables, such as technology, services and customer demand. Spectrum trading may be able to help licensees tailor their plans to future conditions better, whilst still allowing spectrum to be exploited efficiently. BT Cellnet suggests that spectrum trading should be introduced first to sectors that have implemented spectrally efficient digital technologies. Sectors that have experience of spectrum pricing, set to discourage hoarding and to represent market prices, would also benefit from the introduction of spectrum trading. 46. Spectrum trading is a way of levelling out inefficiencies in auction processes caused by the difficulty of bidders in assessing the future value of spectrum with a high degree of confidence. 47. A key issue for spectrum trading is where to start. Details of how the initial price is determined and what the lots that can be traded are will need to be resolved. For spectrum that has been auctioned it could be assumed that the market price has been paid and therefore subsequent trading will be related to a realistic market price. The concern, related to spectrum that has not got a realistic market price, is that it could offer a windfall gain to the present licensee. The question of market price also relates to the lots that are available for trade. Since, up to now, licensees have acquired spectrum on the understanding it was not divisible or tradable, trading part of it could also be thought of as a windfall. BT Cellnet therefore recommends that spectrum trading is introduced in phases, to allow these details to be developed based on experience gained. 48. BT Cellnet suggests that the most likely initial candidate for spectrum trading in the UK is the 3G spectrum that was auctioned in 2000. It clearly has a market price. 49. It should be open to organisations that trade licences to be able to assign some or all of the related spectrum obligations with the traded spectrum. This should be a commercial decision between the parties involved. Other aspects that will need to be considered include: • Allowing alternative technologies that fall within ITU, CEPT or EU allocations or decisions to be used. • Allowing traders to define the length of licence traded, within the current licence terms. • Allowing licensees to define spectrum sharing terms, providing that the use remains within the international allocations or decisions. Better facilitation may be achieved by allowing or appointing spectrum brokers and traders. 50. BT Cellnet supports the suggested move to spectrum access licensing, since we believe that this will support the introduction of spectrum trading, providing that appropriate constraints are retained. Some of the constraints that will need to be considered are: • The need to retain mandatory standards in some bands to retain a viable market size by avoiding market fragmentation. • The need to retain out-of-band parameters (specified or through standards) to avoid causing undue interference.
xxxiv.	To what extent would a move to licensing of spectrum access, as opposed to wireless apparatus licensing as now, facilitate spectrum trading?	
xxxv.	What changes to the terms and conditions of licences for the operation of wireless equipment and/or for access to spectrum would facilitate spectrum trading?	
xxxvi.	If new modes of licensing spectrum access (rather than equipment operation) were introduced, how could rights to spectrum usage, such as interference standards and length of licences, best be defined to facilitate spectrum trading?	
xxxvii.	What market infrastructure, such as spectrum registers and dispute resolution procedures, could facilitate spectrum trading?	
xxxviii.	What lessons can be learnt from the experiences of other countries (such as Australia, New Zealand and the United States) in introducing different modes of spectrum trading?	

	• The need to retain power limits or spectrum masks to continue or facilitate sharing. 51. An implication of allowing spectrum trading is the need to audit interference. For spectrum licences to be traded (or auctioned) they must be free from interference (as well as being subject to some time limits). Rules on spectrum "jammers" should also be tightened (as opposed to the current approach of buyer beware). 52. Further implications of allowing spectrum trading are the need for open databases, a definition of who can trade, the need for a "storage" policy to avoid spectrum hoarding, and the need for dispute resolution procedures as suggested in the Review. BT Cellnet recommends that the Review team benchmark the UK against other countries with regard to these and the other aspects of spectrum trading in its Report. 53. We also recommend that the detailed implementation plans for spectrum trading are developed through full and open industrial consultation and that the new regime has a phased introduction.
The boundaries of spectrum regulation xxxix. What factors should guide regulators in setting the boundaries of licence-exempt spectrum use? xl. What remit should regulators hold over licence-exempt spectrum use, other ensuring that it does not interfere unduly with licensed spectrum use? xli. How far can developments in radio technology provide an alternative to regulation in licence-exempt spectrum bands, particularly where the potential for interference with other users is very low given the propagation and power characteristics of the signals concerned?	54. BT Cellnet supports the need for a consistent spectrum licensing and pricing policy in areas that blur the distinction between public and private use, but we note that there may be a need for a transition or grace period to ensure that any individual sector does not suffer directly from the introduction of a new licensing regime. We note that, to achieve consistency with the Review team's objective of developing incentives for all users to take into account the opportunity cost of the spectrum they are using , it would be seem inconsistent to designate increasing amounts of licence exempt spectrum. 55. The issue of the use of licence exempt spectrum for the use of public telecommunications services is the subject of a separate consultation to which BT Cellnet will be responding. At this time we would just make the observation that very careful consideration should be given to any changes to the current approach as it would not achieve any benefit if services were subject to inconsistent quality of service due to high levels of interference. 56. It is important to consider the possibility of congestion in the unlicensed bands, especially if they were to be used for public services without any charge. It would be contrary to the approach being proposed of using financial incentives to ensure efficient use of the spectrum. if no charge were to be made. Congestion caused by a distorted pricing mechanism will not lead to efficient spectrum use. 57. We recommend that the Review team with RA identify and suggest a further review of the ISM (licence exempt) bands. We believe it is important to retain the original (i.e. Industrial, Scientific and Medical) applications' freedom in these bands, and to allow new and innovative technologies to be tried and tested. We also recommend that low power devices such as Bluetooth should be encouraged to use these bands, recognising that users of these Short Range Devices (SRDs) cannot be incentivised to use the radio spectrum more efficiently (through apparatus or spectrum access licensing). 58. Evidence to support usage reviews of the ISM bands

	needs to be collected, and we suggest that this could be done through (voluntary) system/device registration schemes. Reference should also be made to recent studies (for example, the SMAG/Aegis 2.4GHz study[5]). It should be noted that it is impossible to control usage (for example, by setting system or device density limits) since these limits could never realistically be policed. 59. In reviewing technological developments, such as the benefits and disadvantages of polite protocols, BT Cellnet notes that technology is improving all the time, but that digitalisation and other spectrum efficiency programmes are often held up by Government and other non-marketed usage (such as defence and public service broadcast applications). We recommend that these developments should be encouraged, within the constraints previously noted, and that non-marketed usage should be migrated to alternative frequency bands.

[5] "Demand for use of the 2.4GHz ISM Band Final Report", July 2000