



3G Rollout Obligations : Measuring Compliance

O2 (UK) Limited's response to Ofcom's Consultation Document

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Executive Summary

1. O2 believes that before Ofcom expends its administrative resources in testing operator compliance with the coverage obligation in the 3G licences, it would be prudent for a reasonable regulator to ensure that the obligation is lawful.
2. The obligation was drafted before the current legal and regulatory framework was put in place by the Communications Act 2003. Since then:
 - a. it has become evident that Ofcom no longer believes in coverage obligations as an economic tool to ensure spectrum utilisation; and
 - b. 3G has not delivered the benefits expected by DTI and has technically underperformed against the expectations in 1997; and
 - c. Ofcom has determined to issue new 3G licences that will not contain the economic straightjacket of an obligation to maintain a network at 80% population coverage.
3. Ofcom has often advanced arguments along the lines of “operators purchased the licence including the obligation and must abide by that obligation”. Ofcom appears to view the 3G Information Memorandum as in some way sacrosanct. O2 does not believe that the terms of its licence and the content of the 3G Information Memorandum fetter Ofcom’s discretion or provide a justification for ignoring the need to ensure that regulatory burdens remain objectively justified, proportionate, non-discriminatory and transparent as required by Article 6(1) of the Authorisation Directive.
4. If, having completed the test required by Article 6(1) AuD, Ofcom can still justify a coverage obligation as currently written, then O2 has made a number of proposals to simplify any compliance measurement and ensure that Ofcom’s measure is consistent with operator experience.
5. In summary O2 proposes that any test would:
 - a. not in itself discriminate against differentiated operator business models. This can be achieved by reappraising the “population” measure against which the extent of coverage is compared;
 - b. benchmark Ofcom’s engineering model to those of the MNOs, which themselves have undertaken extensive field measurements. Thereby gaining a statistically accurate model at minimal administrative cost;
 - c. undertake an assessment of the factors identified at §6.8 of the consultation before issuing any compliance statement, in order that Ofcom can exercise its reasonable discretion;
 - d. result in a terse “compliant / non-compliant” statement rather than quoting a % coverage that might be at odds with an operator’s own measure of coverage and which might lead to “grandstanding” comparative advertisement campaigns;
 - e. be based on a received CPICH power of -108dBm at the edge of coverage rather than the -110dBm proposed by Ofcom.

Introduction

6. Ofcom has chosen to combine a Statement on its guidance on compliance with the 3G rollout obligation, on which it consulted in January 2005, with a consultation on the measurement of compliance with that obligation¹. Ofcom does not consider the relevant considerations to be linked. O2 cannot agree with this analysis for the reasons we identify in this section.
7. The consultation effectively sets the target which, O2 notes, Ofcom is very clear it expects operators to achieve by the end of 2007. The obligation states:

“Licensees shall install, maintain and use Radio Equipment (as specified in paragraph 10 of Schedule 1) in such a way as to enable the provision of, by not later than 31 December 2007, and to maintain thereafter, a telecommunications service by means of the Radio Equipment to an area where at least 80% of the population of the UK live.”
8. This obligation was drafted during a consultation process from 1997-1999, before the current legal and regulatory framework was put into place. Whilst O2 would accept that it might not be prudent for Ofcom to decide to alter the 3G licences for no objective reason, this does not mean that Ofcom is precluded from reviewing the regulatory environment for 3G from time to time in response to changing exogenous conditions.
9. Ofcom has already committed to review the rollout obligation in at least two circumstances:
 - a. The introduction of trading and liberalisation to 3G licences²
 - b. In response to a licence variation request, as described in the Statement.
10. Indeed Ofcom is under a statutory duty by virtue of §6(1) of the Communications Act 2003 to ensure regulatory obligations are not unduly burdensome or that their maintenance does not become unduly burdensome. Clearly Ofcom cannot be expected to do this on a day-by-day basis. A reasonable regulator might be expected to exercise its discretion as to when to undertake a review of regulatory obligations.
11. The decision by Ofcom to enter into an expensive and burdensome programme of compliance measurement would appear to O2 to be an appropriate trigger for a test of the rollout obligation against the four tests from Article 6(1) of the Authorisation Directive. Specifically that the obligation remains:
 - a. Objectively justified in relation to the networks and services to which [it] relates;
 - b. non-discriminatory;
 - c. proportionate; and
 - d. transparent in relation to what [it is] intended to achieve.

¹ Hereafter “the consultation” will be used to refer to the elements pertaining to the measurement of compliance and “the Statement” will be used to refer to Ofcom’s Decision in relation to the guidance on compliance.

² A Statement on Spectrum Trading §6.22 building on the views expressed by Ofcom in its Spectrum Trading Consultation at §6.3.2.

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12. In the consultation, Ofcom has chosen to focus purely on the mechanics of measuring compliance, rather than to first step back and look at what the obligation is seeking to achieve, in order to inform its decisions on the above questions and the consequent limits on Ofcom's discretion.
 13. Ofcom appears to believe it enjoys wide discretion on interpretation of the obligation given the less than descriptive terms in which the licence is written³. Critically Ofcom has to wrestle with three issues:
 - a. What level of service should be considered compliant?
 - b. How is the availability of this service to be measured?
 - c. What is the correct demographic with which to equate coverage?
 14. Had Ofcom undertaken what O2 believes to be the required level of analysis it would have had at least had to look at the documentation that preceded the 3G Information Memorandum, specifically:
 - a. The DTI's 1997 consultation "Multimedia Communications on the Move"; and
 - b. The minutes and documents of the UMTS Auction Consultative Group "UACG".

These documents chart the development of the rollout obligation and the rationale behind its inclusion in the 3G licences. Importantly they also shed light on a number of assumptions that were made in 1997-1999, which with the benefit of hindsight have been demonstrated to be somewhat optimistic.
 15. Our responses to Questions 1-4 of the consultation take as their starting point these historical information sources.
 16. O2 notes that Ofcom has yet to respond to many of the issues raised by O2 in the SFR:IP and paraphrased by Ofcom in its Statement, O2 expects that Ofcom will respond to these in sufficient detail in due course when it issues its final regulatory statement on the SFR:IP.

³ Section 7.3 of the consultation.

Evaluating Ofcom's proposed compliance test

17. Operators will have designed and built their networks on different bases and, critically, absent clarity in the obligation itself or any clarification from the regulator on the compatibility of different design methods with the regulator's view of what the obligation is actually asking for.
18. In designing their W-CDMA networks operators have had a number of variables they can use to determine the size of their cells and the data rates / users / traffic that is supportable by each cell. Therefore, it is possible that different operator designs will fare differently against certain tests.
19. Further, the test has to accommodate a range of different operator business models, which means the test must not discriminate between operators which:
 - a. Focus predominantly on business customers; or
 - b. Focus predominantly on consumers; or
 - c. Have a mixed strategy.
20. As Ofcom has rightly identified the test should not be predicated on the availability of a particular service or data speed, lest that would discriminate between operator network designs which might:
 - a. provided dense high data rate coverage (384kbit/s) to deliver particular applications or achieve contiguous coverage at a high level of service; or
 - b. have focussed on tailoring end user applications to cope with variable data rates – although some minimum data rate would be required for each application; or
 - c. limit the capacity available to each user in order to pack more subscribers into each cell; or
 - d. have seen little demand for 3G specific services and have chosen to focus their use of UMTS spectrum on providing voice capacity rather than lock themselves into GSM investments.
21. Finally, Ofcom's decision on the "population" against which this is to be tested must not in itself discriminate against the business models identified above.
22. Ofcom has four tools at its disposal to achieve the above:
 - a. Its overall methodology;
 - b. The test metric for the availability of a "3G service";
 - c. The geo-demographic data it intends to use to measure "coverage";
 - d. Discretion.
23. In relation to (d), Ofcom appears to have decided on a quantitative test and only after this test is "failed" would it seek to take into account other factors that might not be readily measurable. We discuss this further in response to Question 1.

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24. Ofcom has tried to insulate itself from the inherent complexity of radio network design by choosing one element of a W-CDMA network that *might* be sufficiently common in all networks where customers can gain access to data rates *up to* 384kbit/s downlink outdoors. That said, there is a very real risk that all Ofcom will learn through its test is how different networks fare in their ability to broadcast certain signalling information. This is a common phenomenon with measurement techniques that seek to precisely assess one amongst many variables⁴.

The need for further consultations in light of any amendments

25. The responses of MNOs to this consultation may suggest variations to the methodology that correct issues with, or enhance the performance of, certain network designs against Ofcom's chosen metric. Ofcom will need to be very transparent as to the reasons for adopting such amendments.
26. If Ofcom adopts amendments to its methodology it is likely that they will affect network designs in different ways.
27. Therefore, O2 reserves its right to provide additional submissions to Ofcom after the publication of other MNO responses in order to further inform Ofcom's thinking on how any possible amendments might interact with O2's chosen network architecture. It might also be prudent for Ofcom to engage in a further round of consultation on any revised methodology, in order not to discriminate and to be suitably transparent.

⁴ "The simultaneous measurement of two conjugate variables (such as the momentum and position or the energy and time for a moving particle) entails a limitation on the precision (standard deviation) of each measurement. Namely: the more precise the measurement of position, the more imprecise the measurement of momentum, and vice versa. In the most extreme case, absolute precision of one variable would entail absolute imprecision regarding the other." - Werner Heisenberg, 1926.

Comments on the basic methodology (Question 1)

28. O2 agrees with the use of a common engineering model against which operators will be tested subject to the following.

Benchmarking to Operator Models rather than Field Measurements

29. At §7.10 of the consultation Ofcom suggests that it backs up the use of its engineering model with field measurements. O2 believes this would be a costly and inefficient exercise. A more efficient solution would be to align Ofcom's model with those in use by the MNOs.
30. The radio propagation model proposed by Ofcom is ITU Rec P.1546-2, an internationally recognised technique for predicting radio coverage that is referred to by regulatory bodies when defining cross-border coordination agreements. As such its range of applicability is very wide covering frequency bands from 30 to 3000MHz and distance ranges of 1 to 1000km. Its intended use is for field strength prediction for broadcast, land mobile, maritime mobile and some fixed radio services and as a result allows for transmitter (base station) antenna heights from 10 to 1200m.
31. The ITU is required to produce recommendations that can be implemented by members who do not necessarily have access to computer systems. As a result the ITU propagation models are generalisations based on graphs and tables that can be interpolated to provide results for the wide variety of cases considered. Consequently, Ofcom's model will be sensitive to the assumptions used within it.
32. In contrast, MNOs are likely to have spent considerable effort in aligning their own models with what they see in the field. Otherwise, network planning would be subject to a consistent error between model data and reality. Thus, alignment of Ofcom's model with operators' models will provide a more statistically significant benchmark than the proportionately smaller number of field measurements that Ofcom might itself be able to resource.
33. The O2 radio planning tool, [X], was calibrated against drive test measurements during a substantial measurement campaign. As a result there is no need for additional assumptions to be made and the propagation model can be expressed as a simple equation.
34. At Annex 1 we discuss how this benchmarking process might take place and the likely assumptions in Ofcom's model that this would derive.

Compliance Statement by Ofcom

35. The level of coverage determined by Ofcom will not reflect the engineering models used by each and every operator. An operator's own models are likely to be the basis for its decisions on which services to advertise as available, where. Therefore, Ofcom should not distort competition by publicly stating the level of coverage achieved by each MNO based on Ofcom's model. This would cause confusion for consumers as the differences in design assumptions between Ofcom's test and MNO's own design rules will not be all that transparent to consumers.
36. O2 would be concerned if the marketing department of the "winning" MNO used Ofcom's figures as the basis for an advertising campaign. Ofcom will be familiar with the competitive issues surrounding the use of comparable service statistics⁵.
37. Ofcom's statement on compliance against its metric should be a binary, "compliant / non-compliant" statement.

⁵ O2 also notes that H3G and all 3G networks are not currently part of the revised Ofcom quality of service testing programme, so consumers will lack the ability to compare coverage with quality on an objective basis.

38. Finally, O2 notes that at §6.8 of the consultation Ofcom identifies a number of factors that might need to be taken into account in an investigation of non-compliance. O2 believes that “investigation” is perhaps too strong a word. If Ofcom’s test is not sufficiently flexible to deal with all operator network designs then it is important that Ofcom exercises reasonable discretion, before making any public statement as to the compliance or otherwise of operators with Ofcom’s test.

Ofcom must clearly state how it intends to ensure that the required level of coverage is “maintained” in accordance with the obligation

39. O2 understands that the 2G rollout obligation was removed from the Telecommunications Act licences of the 2G MNOs when the Licensing Directive was implemented. The obligation was not transferred to the WT Act licences of the 2G MNOs.
40. At the time the 2G MNOs’ coverage had exceeded the licence obligation and competition in the market was vibrant and to a significant extent based on the scope and quality of coverage.
41. These conditions do not appear to apply to 3G. The demand for “3G services”⁶ has not materialised and [X]. The market does not seem to be predicated on coverage, it is of note that O2 and Orange have recently reported a similar number of 3G subscribers⁷ despite claiming markedly different levels of 3G coverage.
42. [X] This alone would suggest that a disproportionate obligation creates uneconomic investment behaviour, driving up consumer prices and distorting competition. Citizens (as opposed to consumers) do not benefit from a rollout obligation that drives operators to invest in access network (masts) in residential areas that might not actually warrant that investment on commercial grounds. O2 does not believe that ODPM and local authorities will welcome such an outcome either, [X]
43. If MNOs have invested in coverage purely to achieve the 3G rollout obligation that is a matter for them. As Ofcom has highlighted, the facility to apply for a licence variation has existed at least since 2003 and all MNOs have been free to exercise their rights to scrutinise the compatibility of the obligation with the relevant tests set out in the Authorisation Directive.
44. O2 does not believe that a reasonable regulator would be able to whip an MNO over the finish line, only to then withdraw the obligation so that the MNO need not maintain the level of coverage it had been forced to invest in under duress.
45. In particular, it would appear to be an irrational decision if Ofcom were to require the existing MNOs to comply with a rollout obligation that Ofcom felt should not be required of newer 3G licensees that were in the process of being awarded their licences.

⁶ We will use the term “3G services” to indicate services other than voice telephony and text, which can also be served by the existing 2G networks.

⁷ 498,000 and 526,000 respectively

Appropriate basis for measurement (Question 2)

46. Ofcom has quite correctly sought to avoid the need to define a minimum data rate or quality of service required to be compliant with the obligation. This is a commercial matter for operators as was recognised in the DTI's original consultation and subsequent discussion at UACG.
47. A 3G radio network design includes assumptions about the expected level of capacity in terms of the number of concurrent users on a base station, the maximum data rate that could be supported at the edge of the cell and the base station range. To define if a particular service level has been achieved should require knowledge of all these assumptions.
48. To make decisions on when the mobile should move between base stations, each base station transmits a reference signal. This is referred to as the common pilot channel (CPICH). Mobiles measure the level of the CPICH received from different base stations and report this back to the network allowing the network to decide which is the best base station for the mobile to work to. Additional power can be assigned to the CPICH to extend the cell range, but this additional power is no longer available to support customer voice or data connections and so reduces the base station's capacity.
49. By using accepted engineering values (or standards) Ofcom has, correctly in O2's view, sought to define a "service neutral" method of determining whether a 3G network is useable or not in a given location.
50. O2 agrees that the pilot channel (primary CPICH) is perhaps the one measurable value that remains constant irrespective of the instantaneous traffic load for cells designed to deliver up to 384kbit/s and is the only objective way to measure the link loss between the base station and the mobile.
51. O2 normally uses [✕] of total power in the CPICH. [✕
52.]

Assessment criteria (Question 3)

Mobile Receiver Sensitivity

53. It is true that the value of -117dBm is given as the reference sensitivity of a device in subclause 7.3.1 of the specified standard. However, this is for the power in a voice service bearer under static channel, noise limited conditions. It is essentially a test of the noise figure of the mobile receiver. It is not a reference to the CPICH power at the notional edge of coverage.
54. There is a level of received CPICH power, the value of which can be broadcast from the network to indicate to mobiles the minimum quality of network that they should attach to. This value is specified in 3GPP TS 25.331 Clause 10.3.2.3 under the name $Q_{rxlevmin}$ and can only take integer values in the range -25dBm to -115dBm. [X]
At received levels below the broadcasted reference level a mobile would indicate that it was out of coverage.

Fade Margin Adjustments

55. Ofcom appears to have chosen its adjustment to reflect the “broadcast” nature of the CPICH signal according to the relevant standard ITU-R P.1546-2.
56. In light of the above correction, this would suggest an appropriate test metric for defining the edge of cells in Ofcom’s model as a received CPICH power of -108dBm.

Population Data (Question 4)

57. The rollout obligation requires coverage to be provided and maintained in “*an area where at least 80% of the population of the UK live.*”
58. It is worth understanding that DTI felt that this “*was intended mainly as a safety net rather than a demanding target for operators to meet.*”⁸ If demand for “3G services” had materialised by this time it might be true that the target is not demanding. Such demand from consumers has demonstrably not appeared.
59. [X]. Were Ofcom to set a metric for compliance that focused on residential households, it will over incentivise operators to build in residential areas in order to achieve Ofcom’s compliance metric. That is unlikely to be to the benefit of citizens, [X]
60. As Ofcom highlights in its consultation, MNOs are likely to have invested in network that will provide coverage to places where their customers use mobile communications services. The rollout plans and targeted end user markets (personal or business or both) differ by operator.
61. Ofcom says at §7.31 in the consultation that “*Arguably, the utility of mobile communications is at its least in people’s homes and at its most when they are out and about. However, the rollout obligation is quite clear that it is ‘where people live’ which is to be evaluated.*”
62. Just because the obligation is clear does not mean that it is right or that it was correctly drafted to reflect the original rationale for the obligation. If, which O2 does not accept, some form of Pareto rule for determining the level of coverage is required then one must refer to the rationale for that rule.
63. If one looks at the DTI consultation at §6.10 it states “*licences should set a minimum acceptable coverage and roll-out obligation consistent with the efficient use of spectrum and the need for an operator to provide a reasonable level of service to its customers.*” [emphasis added]
64. There are two issues to address therefore, does a literal interpretation of “*an area where at least 80% of the population of the UK live.*” adequately
 - a. secure the efficient use of spectrum? and
 - b. ensure a reasonable level of service to the customers of the operator?

Efficient use of spectrum

65. What is the efficient use of spectrum? O2 understands that spectrum management authorities might define efficiency in a number of ways. However, two particular interconnected vectors would appear to be pertinent:
 - a. Ensure usage: Spectrum is a scarce resource and should be effectively utilised.
 - b. Avoid excessive sterilisation : If a spectrum package is sold that covers both an area which is commercially viable to serve and one that is less so, it was thought preferable that the area where spectrum remains “unused” should be minimised in some way.
66. Since the obligation was conceived Ofcom has adopted a market oriented approach to spectrum that, if applied to 3G licences, would allow objective (b) to be more efficiently achieved through economic means. Rather than force operators to address areas which are not commercially viable and consequently raise costs for all consumers, it is

⁸ Minutes of the first UACG meeting – 20th March 1998.

more efficient to allow the market to provide the appropriate incentives for operators to dispose of unused spectrum, retain the spectrum for future investment when the market requires that level of coverage or find an alternative (non-3G) use for it via liberalisation.

67. In relation to (a), if in practice the market evidence suggests that the demand for “3G services” is very limited, how can forcing operators to install base stations that carry no “3G service” traffic from customers and just utilise the signalling channels be an efficient use of spectrum? Similarly in relation to (b), having base stations operating with little more than signalling data passing backwards and forwards hardly contributes towards reducing sterilisation.
68. This does not mean that operators might not choose to rollout networks beyond a point where research evidence suggests their customers will make use of services that can only be effectively delivered by 3G networks. The new entrant in particular will have plenty of incentives to build adequate network coverage for voice and text services to reduce its expenses from relying on national roaming services from its competitors.

Reasonable level of service to the customers of the operator

69. As Ofcom highlights, MNOs may have invested considerable sums of money in covering urban centres and highways that might provide lots of traffic from business customers but contribute little towards achieving an arbitrary coverage objective. By choosing a metric that focuses solely on residential consumers to the exclusion of business customers discriminates against MNOs which for commercial reasons have focussed on the business segment. O2 believes that Ofcom would wish to foster a mobile market that allowed a diversity of business models and infrastructure designs.
70. Evidence from the reported 3G customer bases of the MNOs suggests that coverage does not currently play a large part in the customer’s determination of “a reasonable level of service”. (see §41).
71. [X⁹.
72.] O2 assumes that Ofcom would not wish to make regulatory Decisions that resulted in inefficient investment behaviour that increases costs and hence consumer prices. That would appear to fail to reflect many of Ofcom’s statutory duties.
73. We note Ofcom’s statutory duties also require that the interests of citizens should not be ignored in the desire to benefit consumers. It would appear to O2 that futile investment in base stations does not benefit citizens (as opposed to consumers of 3G services), as those citizens do not always appear to appreciate the benefits to consumers that mobile masts bring.

⁹ [X]

Consistency between the service level measurement and the “population” data

74. Finally, Ofcom is proposing that the appropriate test for coverage relates to received CPICH powers out of doors. Consequently the compatible measure of coverage should include some factor to reflect where people use their mobiles, which includes out of doors and not necessarily at home, rather than just “*where people live*”. Other objective measures
75. In light of the above analysis if, which O2 does not accept, a Pareto rule is required, O2 suggests that a measure that achieves both the objectives outlined at §64 would be an area accounting for 80% of the traffic originating and terminating on 2G mobile networks.
76. Such a measure might not have been the most appropriate in 1997/8 when the obligation was formulated as not all 2G operators had achieved near ubiquitous coverage and the market had not saturated such that all consumers who wished to have a mobile were served.
77. However, 2G networks are now mature and the market is saturated, such that O2 believes that 80% of 2G traffic would be better fit for the mobile nature of the service and would make a better correction for the differences in commercial focus between operators, on consumer or business segments for example.
78. At Annex 3 we have provided a graph which shows how both the voice and GPRS traffic on O2’s network is concentrated in relation to residential population. If Ofcom believes that 2G network traffic is now a more appropriate proxy for acceptable coverage then this might be definable in one of two ways, depending on the use to which operators might put their 3G networks:
- a. 80% of GPRS data traffic on 2G networks in the UK, which equates to about [X] population coverage; or
 - b. 80% of all 2G traffic on 2G networks in the UK, which equates to about [X] population coverage.
79. The choice of measure would depend on whether 3G is viewed as a replacement for 2G or an adjunct to 2G. O2 does not believe that the 3G Information Memorandum stipulated any view as to the use to which 3G spectrum might be put. Consequently, O2 believes that the choice of (a) or (b) above, might depend on the strategy adopted by a particular operator. Otherwise to apply test (b) on an operator with a “3G overlay” strategy might appear to discriminate against that operator and its chosen business model.
80. Ofcom’s model already has data on population coverage built into it. So all that is required is a simple benchmarking exercise against comparable data to that shown in Annex 3, provided by all four 2G MNOs.

Annex 1 – Confidential

Annex 2 – Confidential

Annex 3 – Confidential