



Regulation of VoIP Services: Access to the Emergency Services

Consultation

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Section 1

Executive Summary

Introduction

- 1.1 We (Ofcom) are the independent regulator of television, radio, telecommunications and wireless communications services in the UK. This consultation document sets out our proposed approach to regulating types of Voice over Internet Protocol services (VoIP services) that allow users to call ordinary fixed or mobile phone numbers. Our policy objective is to make sure consumers and other citizens are able to use them to contact the emergency services and that a high level of emergency services access is maintained for society as a whole.
- 1.2 This consultation will be relevant to all providers of VoIP services, but especially providers of VoIP services that allow calls out to ordinary fixed or mobile phones. It will be of interest to companies that provide public voice services using other technology. It is not aimed at operators using next-generation networks (NGNs), although some issues may be relevant. It will be relevant to the emergency services, consumers of voice services and other citizens.

VoIP voice call services

- 1.3 Traditional phone services have existed for over 100 years. Voice services using the Voice over Internet Protocol (VoIP) are changing the way voice services are delivered. These services normally use a broadband connection to provide voice calls using VoIP technology through a personal computer (PC) with a handset or headset, or a special adaptor connected to a traditional phone handset. VoIP services could benefit customers by reducing the cost of delivering existing services, providing new services and increasing competition in telephony and broadband. Ofcom aims to ensure that, as voice call services evolve, consumers and citizens are protected.

Calling the emergency services

- 1.4 One of the most important features of traditional phone services is that they enable users to call the emergency services. The UK's 999 emergency call service from fixed phones, the first of its kind in the world, was launched in 1937 and extended to all major towns and cities by 1948. The 999 service was introduced for mobile phone users in 1986. BT currently handles around 30 million calls a year from fixed and mobile phones¹.
- 1.5 Some VoIP services allow users to call the emergency services but others do not. Ofcom is concerned that consumers and citizens are confused about whether they can call 999 from VoIP service. That could cause delays in contacting the emergency services, which could result in serious harm.

¹ 112 is the single number for emergency calls in Europe. Throughout the rest of this document, references to 999 calls should be read as including 112 calls.

The regulatory and policy background

- 1.6 Ofcom has run two previous consultations on regulating VoIP services: *New Voice Services: a Consultation and Interim Guidance*, 6 October 2004² (the 2004 Consultation) and *Regulation of VoIP Services*, 22 February 2006³ (the 2006 Consultation), followed by a regulatory *Statement on the Regulation of VoIP Services*, 29 March 2007⁴ (the March 2007 Statement).
- 1.7 Regarding the ability to call 999 from VoIP services, in the 2004 Consultation Ofcom set out the policy aim of ensuring consumers are properly informed and protected about 999 access. In the 2006 Consultation, Ofcom added the objective of ensuring the maximum availability of high quality 999 access as voice call services and technology change.
- 1.8 To meet those aims, Ofcom mandated compliance with a Code of Practice⁵ drafted by an industry-Ofcom working group requiring VoIP providers to give their domestic and small business customers information about differences between VoIP services and fixed and mobile phone services. VoIP providers also had to provide labels on-screen or for equipment and an automated message indicating if users could not call 999, to inform users who had not purchased the service.
- 1.9 Additionally, Ofcom provided Guidelines⁶ to help certain VoIP providers (that allowed calls to and from ordinary numbers) to comply with requirements about the reliability of calls to 999 and providing caller location information for use by the emergency services.
- 1.10 Finally, Ofcom modified a requirement for voice call providers that enables consumers to keep their phone number when they change provider⁷, so that it doesn't give VoIP providers an incentive not to allow 999 calls.

The policy challenge

- 1.11 In its March 2007 Statement, Ofcom decided to review its approach to ensuring maximum availability of 999 access. That was because:
 - since the 2006 consultation, there had been a rapid increase in the use of VoIP services: 10% of UK households used VoIP in the last quarter of 2006, compared to 5% in the last quarter of 2005⁸;
 - significant developments in VoIP services and technology meant they were more likely to “look and feel” like traditional fixed and mobile phone services and to replace those services for the mass market in the future;
 - there was under provision of VoIP services that allowed 999 calls: in a survey of VoIP users conducted for Ofcom in October 2006 (the October 2006 research)

² http://www.ofcom.org.uk/consult/condocs/new_voice/aneu_voice/

³ <http://www.ofcom.org.uk/consult/condocs/voipregulation/>

⁴ *Statement on the Regulation of VoIP Services*, Ofcom, 29 March 2007

<http://www.ofcom.org.uk/consult/condocs/voipregulation/voipstatement/voipstatement.pdf>

⁵ *Code on the provision by Service Providers of consumer information to Domestic and Small Business Customers for the provision of Services*, which entered into force on 29 May 2007.

⁶ *Guidelines on the application of PATS obligations to VoIP service providers*, which entered into force on 29 March 2007.

⁷ General Condition 18.

⁸ Source: *Ofcom communications tracking survey Q.4 2006*.

64% of VoIP households surveyed said they had a service that Ofcom knew would not allow them to call 999⁹;

- a significant proportion of VoIP consumers were confused about whether they could call 999 from their service or not: the October 2006 research found that 78% of UK households with a VoIP service that did not provide 999 access incorrectly thought that it did provide 999 access or didn't know if it did;
- Responses to the 2006 Consultation from the emergency services, Government, the Royal National Institute of Blind People (RNIB) and the Royal National Institute for Deaf People (RNID) expressed similar concerns to Ofcom.

1.12 Therefore, Ofcom undertook to consult further in summer 2007 on 999 access over VoIP and in particular on whether, and if so how, certain VoIP services should be required to offer 999 access. This consultation meets that commitment. In assessing the need to require 999 access, Ofcom said it would carefully consider the possible impact on competition and on market entry and innovation by VoIP providers.

This consultation: policy objectives and options

1.13 The key policy objective of this consultation is to ensure a high level of access to the 999 call service.

- We consider two policy options:
- Option 1: do not require VoIP services to allow 999 calls; and
- Option 2: require all VoIP services that allow users to make calls to traditional fixed phones or mobile phones (called type 2 VoIP services in this consultation), or to make calls to and receive calls from traditional fixed phones or mobile phones (called type 4 VoIP services), to allow users to call 999. Ofcom considers the users of those services are likely to expect to be able to call 999.

1.14 In this consultation, Ofcom recommends implementing Option 2. Research suggests that customer information is unlikely to be enough to tackle under provision or consumer and citizen confusion; VoIP take-up is growing and VoIP services and technology are becoming increasingly similar to PSTN services, increasing the risk of confusion. VoIP is currently the only voice call service not required to allow 999 calls; and Ofcom's Impact Assessment of the potential costs and benefits of Option 2 estimates there would be significant benefits for consumers and citizens, which would exceed the costs of compliance for the VoIP providers affected.

Complying with Ofcom's preferred policy option

1.15 Considering what Ofcom's proposal would mean in practice, currently, all type 4 VoIP providers that offer a publicly available telephony service (known as PATS)¹⁰ are

⁹ More information about the results of the quarterly Ofcom communications tracking survey for Q.4 2006 and the October 2006 research are available in the Ofcom *Research Report: Voice over Internet Protocol (VoIP)*, www.ofcom.org.uk.

¹⁰ In summary, PATS are defined as (i) a service available to the public (i.e. a PECS) (ii) for making and receiving national and international calls and (iii) accessing emergency services (iv) through a standard national or international phone number. Those four points are known as the "gating criteria" for the PATS definition. For the full definition, see Article 2(c) of the Universal Services Directive (2002/20/EC) and Ofcom General Conditions (Schedule to the Notification under Section 48(1) of the Communications Act 2003) Part 1 para.1 and GC 18.

obliged to allow users to make 999 calls. Some other type 4 VoIP services and some type 2 VoIP services also allow 999 calls on a voluntary basis.

- 1.16 As mentioned from 1.8, in the March 2007 Statement, Ofcom set out Guidelines explaining how type 4 VoIP providers should try to ensure their service is reliable and type 2 and type 4 VoIP providers should provide caller location information to the emergency services. We also set out a Code of Practice on how VoIP providers should inform domestic and small business customers about their 999 service and any limitations. PATS providers also meet some other obligations on emergency planning; operator access and directories; publishing prices, tariffs and terms and conditions; billing accuracy; itemised billing; non-payment of bills; special measures for end-users with disabilities.
- 1.17 Extending the obligation to allow 999 calls to all type 2 and type 4 VoIP services would mean that providers that do not currently provide 999 access would have to do so and take the Guidelines into account as applicable. Type 4 VoIP providers would become PATS if they met the other PATS criteria and would have to meet the other obligations as well. The Code of Practice places a similar amount of obligations on VoIP services that allow 999 calls as on services that do not.
- 1.18 If implemented, Ofcom would enforce, monitor and review this policy to ensure VoIP providers are compliant and to enable us to see if our regulations need to be adapted.

Structure of this consultation

- 1.19 In this consultation, Section 3 provides an overview of VoIP services and the growth of VoIP service provision and take-up. It also sets out the regulatory framework and policy background to this consultation; Section 4 summarises Ofcom's policy objectives, sets out two policy options for meeting those objectives and explains Ofcom's reasoning for recommending one of those options; Section 5 considers some of the practicalities for VoIP providers when complying with policy Option 2, if it is introduced; Section 6 provides a summary of Ofcom's Impact Assessment, which estimates the costs and benefits of Ofcom's policy proposals; Section 7 and Annex 6 describe the modifications that Ofcom would make to its requirements in order to implement policy Option 2; Section 8 describes the next steps after this consultation closes, including Ofcom's planned approach to monitoring, review and enforcement. Ofcom's full Impact Assessment is in Annex 5. There is a Glossary in Annex 7.

Responding to this consultation

- 1.20 We welcome responses on this consultation to inform our decisions about regulating access to the emergency services from VoIP services. See Annex 1 for an explanation of how to respond, Annex 2 on how Ofcom consults, Annex 3 for the cover sheet for responses and Annex 4 for a list of all the consultation questions, which are also contextualised in this document. The consultation will close at **5pm on 20 September 2007**.

Section 2

Introduction

- 2.1 This consultation contains two proposals for regulating access to the emergency services over VoIP:
- Option 1: do not require VoIP services to allow 999¹¹ calls; and
 - Option 2: require all VoIP services that allow users to make calls out to traditional fixed phones or mobile phones (called type 2 VoIP services in this consultation), or to and from traditional fixed phones or mobile phones (called type 4 VoIP services), to allow users to call 999. Ofcom considers the users of those services are likely to expect to be able to call 999.
- 2.2 Ofcom recommends implementing Option 2. This proposal is consistent with Ofcom's duties to promote the interests of consumers and other citizens because it is likely to reduce harm and even help save lives in an emergency. The proposal is also consistent with our duties to promote competition because our Impact Assessment shows that compliance costs would not be sufficient to harm competition.
- 2.3 Requiring services to include emergency calls is likely to help save lives because, currently, some VoIP voice call services do not allow users to make these calls and research suggests that a significant number of users are not aware of this. Therefore, there is a risk some people will attempt to call 999 using a service that will not connect the call. The delay that this confusion would cause could be sufficient to result in harm.

VoIP in the UK

- 2.4 Our proposal addresses VoIP voice call services. One million VoIP services that exclude emergency calls are used in UK households to call ordinary numbers, but other VoIP and all fixed and mobile telephony services already allow emergency calls.
- 2.5 Consumers make VoIP calls in a variety of ways. For example, by loading VoIP onto a computer, a PDA or a mobile phone handset. Alternatively, consumers can make VoIP calls by plugging a standard fixed phone handset into an analogue telephone adapter (ATA) or router. VoIP calls are routed differently compared to fixed and mobile PSTN services, making some VoIP calls cheaper.
- 2.6 The number of households using VoIP telephony has grown rapidly; from 5% in 2005 to 10% in 2006¹²: there are now more households using VoIP telephony than using WLR, or LLU telephone services.
- 2.7 There is also a growing trend for VoIP to be marketed and used as a replacement for a fixed line service. In a survey of VoIP users conducted for Ofcom in October 2006¹³

¹¹ 112 is the single European emergency call number. All EU member states are required to ensure all end-users of PATS are able to call the emergency services using 112, in addition to any national emergency call numbers. Throughout the rest of this document references to "999" should be taken as also referring to "112".

¹² *Ofcom communications tracking survey Q.4 2006*. See *Ofcom Research Report: Voice over Internet Protocol (VoIP)*, 26 July 2007, www.ofcom.org.uk

(the October 2006 research), all the VoIP users surveyed had access to a landline or a mobile phone but 10% said their VoIP service was their main “landline” service: 3% had no landline and 7% said they had a landline but did not use it.

- 2.8 Moreover, Ofcom is aware that several PSTN and broadband providers are considering the business case for migrating customers from voice call services that use a PSTN fixed line to VoIP over broadband (also known as Voice over Broadband or VOB) through LLU or naked DSL. That would cause a step increase in the number of households with VoIP and reduce the number of households with a PSTN fixed line service, which is the main way to call the emergency services at present.
- 2.9 Those developments and the risk of user confusion about contacting the emergency services mean it is time to act.

Reducing harm and helping to save lives

- 2.10 The proposal to require inclusion of emergency calls would address the significant consumer confusion we have identified. Before the provision of consumer information about 999 access became mandatory in May 2007, many of the main industry players voluntarily provided information on 999 access on their website, in their terms and conditions and, for VoIP services without 999 access, when a consumer dialled 999. The October 2006 research found 78% of users with a service excluding emergency calls were not aware of this exclusion.
- 2.11 Given this level of confusion, some people may try to make emergency calls using these services. Our proposal aims to avoid any delay that might occur if people try to call the emergency services using a service that will not connect the call, even though the delays may be no more than minutes. Most users can reach for another phone to make emergency calls. However, even a delay of seconds can be vital.
- 2.12 Our proposal aims to avoid delays when people call for help in an emergency by regulating services were consumers might try to dial 999 or 112. Our proposal does not address PC-to-PC services (calls made using IP addresses instead of telephone numbers) because we consider it unlikely people will try to dial 999 or 112 using a service which is accessed using alphanumeric characters. Similarly, our proposal addresses concerns about services routing calls in IP format over the access network. This consultation does not address the use of IP in core networks.

An eight-week consultation

- 2.13 We are consulting on this proposal for eight weeks, which is shorter than the standard set in our consultation principles. In particular, this reflects the rate of growth in VoIP and hence the risks to consumers and citizens of delaying regulation. We consider an eight-week period is appropriate because we gave notice of this consultation in March 2007. In addition, we have met with trade associations and VoIP providers in advance of publication. We have also held pre-consultation discussions with Government departments that sponsor the emergency services.

¹³ See *Ofcom Research Report: Voice over Internet Protocol (VoIP)*, 26 July 2007, www.ofcom.org.uk

Section 3

Background

Introduction

- 3.1 This section provides an overview of VoIP services and the growth of VoIP service provision and take-up. It also sets out the regulatory framework and policy background to this consultation as regards access to the emergency services (hereafter “999 access”¹⁴), including *New Voice Services: a Consultation and Interim Guidance*, 6 October 2004¹⁵ (the 2004 Consultation) and *Regulation of VoIP Services*, 22 February 2006¹⁶ (the 2006 Consultation), followed by a regulatory *Statement on the Regulation of VoIP Services*, 29 March 2007¹⁷ (the March 2007 Statement).
- 3.2 In line with Ofcom’s policy objective of ensuring a high level of 999 access, the 2007 Statement included a commitment to consult in summer 2007 on whether we should require certain VoIP providers to provide 999 access. In assessing the need for that requirement, we undertook to carefully consider the possible impact on competition and on market entry and innovation by VoIP providers. This consultation fulfils that commitment.

What are VoIP Services?

- 3.3 VoIP services enable voice, data and multimedia services to be provided over a broadband Internet connection. This consultation focuses on the provision of voice call services, which is the feature common to all types of VoIP services.
- 3.4 There are four main types of VoIP voice call service:
- 3.4.1 Type 1: peer-to-peer services to make and receive voice calls over the Internet only, usually within the same application community;
 - 3.4.2 Type 2: VoIP Out services to make voice calls over the Internet to the PSTN (Public Switched Telephony Network, the standard public phone network), but not to receive calls from the PSTN;
 - 3.4.3 Type 3: VoIP In services to receive voice calls over the Internet from the PSTN, but not to make calls to the PSTN. Customers can be allocated an ordinary geographic number or a VoIP number (056); and
 - 3.4.4 Type 4: VoIP In and Out services to receive voice calls over the Internet from the PSTN and to make voice calls over the Internet to the PSTN. Customers can be allocated an ordinary geographic number or a VoIP number (056).

¹⁴ In the UK, the emergency services can be accessed by calling 999 or 112, which is the EU-wide emergency services number. For the purposes of this consultation, “999 access” encompasses 999 and 112 access.

¹⁵ http://www.ofcom.org.uk/consult/condocs/new_voice/aneu_voice/

¹⁶ <http://www.ofcom.org.uk/consult/condocs/voipregulation/>

¹⁷ *Statement on the Regulation of VoIP Services*, Ofcom, 29 March 2007

<http://www.ofcom.org.uk/consult/condocs/voipregulation/voipstatement/voipstatement.pdf>

- 3.5 A VoIP service can be fixed, i.e. for use at a single fixed location like the home. Or it can be for use at different fixed locations, e.g. at home, at the office and at a hotel, which is known as a nomadic service. In these cases, the broadband is connected to a personal computer (PC) that has VoIP software and a headset or an IP phone handset or to an adapter or “VoIP router” and a traditional phone handset. For the purposes of illustration, Figure 1 shows how VoIP services work from a PC or a standard phone handset out to and/or in from the PSTN.

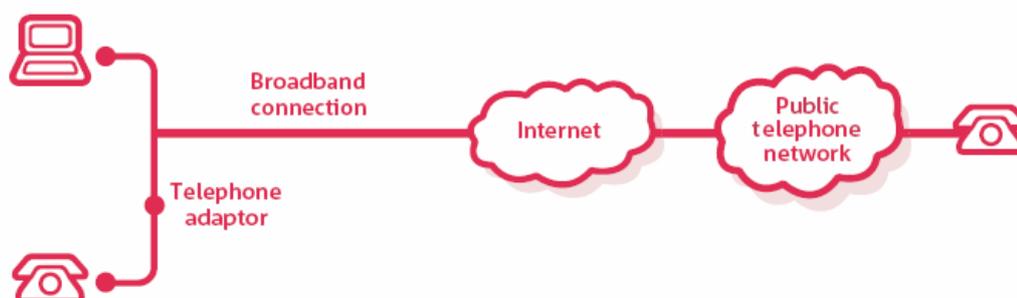


Figure 1: VoIP service from a PC or standard fixed phone out to and/or in from the PSTN.

Also, a VoIP service can be for use on the move using wireless broadband (WiMAX or Wi-Fi). VoIP can, therefore, be a mobile service, sometimes known as Voice over Wireless (VoWLAN). The broadband is connected to a wireless laptop PC, Personal Digital Assistant (PDA, a handheld computer), a 3G mobile phone or a dedicated VoWLAN phone, which has VoIP software.

- 3.6 Generally, where the broadband connection is connected to a PC (desktop, laptop or PDA) the service is known as PC-based VoIP. Where the broadband is connected to a phone handset (fixed or mobile) the service is known as phone-based VoIP.

Growth of VoIP service provision

- 3.7 Over the last five years, VoIP services have had an increasing impact on the UK communications market. They can deliver significant consumer benefits: offering new and innovative services like video calling, conference calling and computer file transfer, in addition to traditional services like call waiting, voice mail, call forwarding and call barring or fax; reducing network costs and user prices and introducing new pricing structures; enhancing competition in broadband and voice call services.
- 3.8 Often, type 1 VoIP services are marketed as PC-to-PC services because they allow calls from one PC to another, e.g. Skype and Google Talk; types 2 and 3 are marketed as providing a secondary phone line, e.g. Skype In/ Skype Out and Tesco; type 4 is also marketed as providing a secondary phone line, e.g. BT Broadband Talk, or as a replacement for making calls over the PSTN, e.g. Vonage. VoIP is marketed as a stand-alone service (Internet-based VoIP) or bundled with Internet access (on-net VoIP).
- 3.9 To date, no single combination of business model, functions or equipment has emerged to lead the market. Ofcom expects this diversity to remain for some time, although recent UK and international trends indicate that providers that seek to serve

the mass market in the future are likely to offer type 4 phone-based PSTN replacement services.¹⁸

- 3.10 As the type and number of VoIP service providers (hereafter VoIP providers) and service or equipment propositions has grown so has consumer awareness and take-up.
- 3.11 According to Ofcom's quarterly communications tracking survey, in Q4 2006, 60% of UK adults were aware of VoIP services, up from 49% in the same period of the previous year. As would be expected, awareness of VoIP in Q4 2006 was significantly higher among those who had Internet (74%) or broadband (77%) at home.
- 3.12 In an Ofcom survey of VoIP users in October 2006 (the October 2006 research), respondents most commonly claimed they had a type 1 service to call users with the same provider (86%); 40% claimed they had type 4; 25% claimed they had type 2; 3% claimed they had type 3. Almost a quarter (23%) said they used more than one provider; the figures suggest consumers were using different types of VoIP in combination.
- 3.13 In the October 2006 research, seven out of ten users said they used VoIP at least once a week and 14% claimed to use it daily. According to the communications tracking survey, in Q4 2006 an estimated 10% of UK households (2.4 million) used VoIP products, a significant increase from 5% of UK households in Q4 2005.
- 3.14 More information about the results of the communications tracking survey for Q.4 2006 and the October 2006 research are available in the *Ofcom Research Report: Voice over Internet Protocol (VoIP)*¹⁹.
- 3.15 Ofcom considers that, to benefit industry, consumers and citizens, regulation should not prevent VoIP service innovation or development and should enable competition with older services to occur on a level playing field and ensure that consumer protection measures keep pace with technology.

Regulatory Framework and Policy Background: Overview

- 3.16 In 1998, telecommunications were liberalised in principle in all Member States of the European Union (EU). In response to the convergence of telecommunications, information technology and the media and the growth of the Internet, in 2002 the European Parliament and the Council of Ministers adopted five Directives (the EC Communications Directives)²⁰, which set out a common regulatory framework for Electronic Communications Networks (ECN), Electronic Communications Services (ECS) and associated facilities in the EU. The common framework is intended to encourage competition, improve the functioning of the internal market and guarantee

¹⁸ For example, see *US Broadband Telephony Forecast, 2007 to 2012: Cable MSOs assert their dominance in the VoIP market*, JupiterResearch, 2007.

¹⁹ The report draws on three pieces of quantitative research among UK consumers commissioned by Ofcom: Ofcom's communications tracking survey of c.2,200 UK adults per quarter; a face-to-face survey of UK adults conducted in May 2006 to gain a better view of VoIP take-up; an online survey of 500 VoIP users in October 2006 to gain a better understanding of consumer usage. See www.ofcom.org.uk

²⁰ Directive on a common regulatory framework (2002/21/EC); Directive on access and interconnection (2002/19/EC); Directive on the authorisation of electronic communications networks and services (2002/20/EC); Directive on universal service and users' rights (2002/20/EC); Directive on Privacy and Electronic Communications (2002/58/EC).

the availability of a basic set of ECS that might not be guaranteed by market forces (universal service). The Communications Act 2003 (the Act) implemented a significant proportion of the EC Communications Directives in the UK²¹. The Directives entered into force on 24 April 2004.

- 3.17 In summary, the Directives and the Act define an ECN as a network used to transmit signals and any associated apparatus, software or stored data²² and an ECS as a service that uses an ECN to send signals, excluding content services (e.g. the provision of information or entertainment)²³. They set out sub-categories of ECS: Public Electronic Communications Services (PECS), which are ECS that are available to members of the public²⁴ and, in turn, a sub-category of PECS: Publicly Available Telephone Services (PATS). PATS are defined as (i) a service available to the public (i.e. a PECS) (ii) for making and receiving national and international calls and (iii) accessing emergency services (iv) through a standard national or international phone number²⁵. Those four points are known as the “gating criteria” for the PATS definition.
- 3.18 Depending on their individual characteristics, Ofcom considers type 1 VoIP services are unlikely to constitute an ECS. Type 2 and type 3 VoIP services are likely to be regarded as PECS²⁶. Type 4 VoIP services are likely to be PECS or, if they meet the PATS gating criteria, PATS.
- 3.19 The common regulatory framework abolished the requirement for those intending to provide an ECN, ECS or associated facilities to obtain permission or a licence from the National Regulatory Authority before entering the market. Today, persons are automatically entitled (or generally authorised) to provide them. As a result, in the UK the licensing regime under the Telecommunications Act 1984 was replaced with a General Authorisation Regime. Under general authorisation, VoIP and other telephony providers that enter the market must comply with certain regulatory conditions (known as conditions of entitlement or general conditions [GCs])²⁷ set by Ofcom. Some GCs apply to all ECS providers; others apply to a sub-category only, e.g. PATS providers.
- 3.20 Importantly, it is the provider’s responsibility to determine if it must comply with a particular GC. Ofcom does not send individual notifications that certain conditions apply. Failure to comply is subject to enforcement by Ofcom under procedures established in the Act.
- 3.21 Figure 2 illustrates the relationship between ECS or ECNs, PECS or PECN (Public Electronic Communications Network) and PATS or PTN (Public Telephone Network) and summarises the GCs that apply to each category.

²¹ The remainder is implemented by secondary legislation or administrative action.

²² See Section 32(1) of the Act and Article 2(a) of the Framework Directive (2002/21/EC).

²³ See Section 32(2) of the Act and Article 2(c) of the Framework Directive (2002/21/EC).

²⁴ See Section 151 of the Act.

²⁵ For the full definition, see Article 2(c) of the Universal Services Directive (2002/20/EC) and Ofcom General Conditions (Schedule to the Notification under Section 48(1) of the Communications Act 2003) Part 1 para.1 and GC 18.

²⁶ Under section 32(4)(b) of the Act, a VoIP service is likely to be regarded as an ECS if it employs or engages a third party to provide an ECS (or ECN) and the provision of the ECS is under the VoIP provider’s “direction or control”.

²⁷ Imposed on 25 July 2003 under Section 45 of the Act, and since revised. For more information, see http://www.ofcom.org.uk/telecoms/ioi/g_a_regime/gce/gcoe/

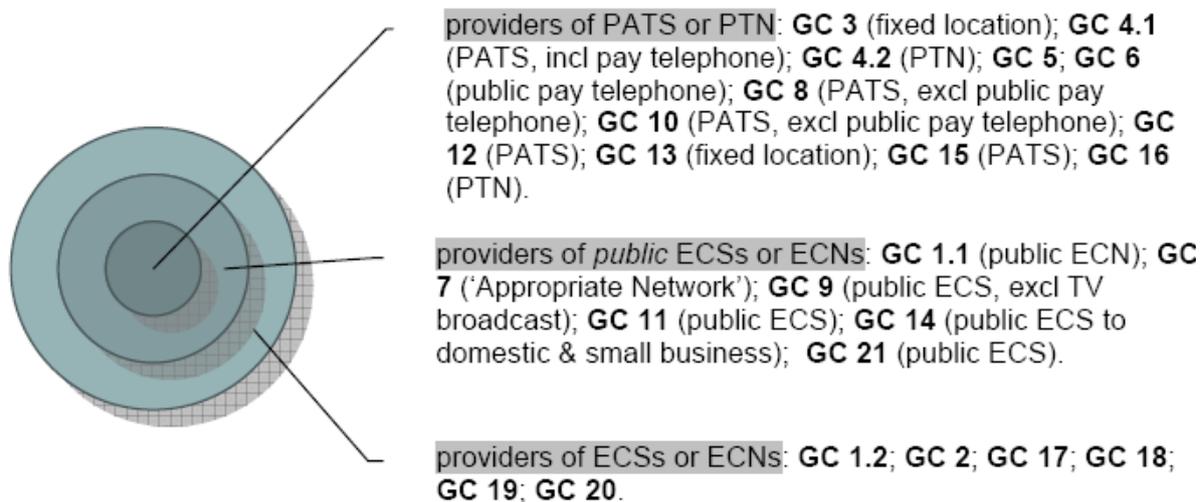


Figure 2: Type of provider and summary of the GCs.

Regulatory Framework and Policy Background: VoIP regulation

- 3.22 Ofcom has run two previous consultations on VoIP regulation.
- 3.23 The 2004 Consultation was launched in response to early developments in new voice services (NVS), including VoIP. Ofcom acknowledged the opportunities provided by NVS and the challenge of potentially lower consumer protection. Some services might “look and feel” like a traditional telephone service but might not be able to deliver, in the same way or to the same standard, the features consumers expect. In particular, some might not offer 999 access or might not offer 999 access to the same standard as traditional PSTN services. Unlike PSTN fixed phone services, VoIP depends on the availability of a power supply and a broadband connection. When on, a broadband connection can be less reliable than a PSTN fixed phone line, meaning that a voice call might be distorted or cut off.
- 3.24 In line with its principal statutory duty to promote the interests of citizens and consumers, Ofcom identified its aims as: (i) helping to create an environment in which new technologies can be developed and deployed successfully in the market so that consumers can benefit from a wider and more innovative range of services; (ii) ensuring consumers are properly informed and protected, e.g. regarding 999 access; and (iii) in doing so, being aware of the importance of technology neutrality and minimising distortions in the type of services offered to and used by consumers, without creating artificial incentives. Ofcom also asked some specific questions to inform its policy going forward, including what its policy on 999 access should be.
- 3.25 Ofcom favoured an approach that allowed new services to enter the market and enabled consumers to make informed choices when taking advantage of them. Ofcom also recognised that there was a clear public interest in ensuring that widespread, reliable 999 access was maintained in the UK as VoIP use grew.
- 3.26 At this stage, because they had strong expectations that all voice call services would offer 999 access and seemed to value that highly, Ofcom considered it was likely consumers would exercise a strong preference for VoIP services with 999 access, provided they were properly informed. Because the cost of providing 999 access was low, Ofcom considered it likely that consumers would be prepared to pay the additional cost for a service with basic 999 access, and that they would retain at least one service in the home with high quality access. Moreover, existing and potential

providers had indicated to Ofcom that most providers would choose to offer 999 access so that they could compete with other voice call providers and to avoid the possibility of a life being lost because a user was unable to access 999 from their service. Ofcom concluded, therefore, that it was not necessary or appropriate to require all voice call services to provide 999 access at that time, but undertook to keep that position under review as the voice call market developed. If it became apparent that the availability of 999 access was, or was likely to be, significantly reduced and that was likely to cause detriment to consumers and citizens, Ofcom would consider requiring certain VoIP services to offer 999 access, among other measures. An industry-Ofcom working group²⁸ was set up to draft a Code of Practice on consumer information, including about 999 access.

- 3.27 Ofcom understood that the European Commission considered a VoIP provider could choose if they were providing a PATS even if they met all of the PATS gating criteria²⁹. Ofcom sought clarification from the European Commission. In the interim, Ofcom adopted a policy to allow VoIP providers to enter the market and meet the PATS gating criteria, in particular offering 999 access, without becoming PATS and having to comply with all of the associated GCs like network integrity and reliability for 999 access under GC 3 (i.e. Ofcom would forbear from enforcing the PATS GCs). That allowed providers that could not provide the same level of 999 access as fixed PSTN providers to offer some (potentially less reliable) access, rather than none at all. That policy was known as the “interim forbearance policy”.
- 3.28 Under the interim forbearance policy, Ofcom provided that only subscribers to PATS services that met all of the associated GCs had a right to number portability³⁰. That meant that VoIP services that provided 999 access that did not meet the standard of reliability set by GC 3 did not have the right to offer new customers the possibility of retaining their previous telephone number. Ofcom hoped that would provide an incentive for services that met the PATS gating criteria to comply with the PATS-related GCs.
- 3.29 Ofcom also enabled VoIP providers to allocate their customers standard phone numbers (geographic number ranges) or a new 056 number range so that consumers could use familiar numbers with VoIP services.
- 3.30 In its 2006 Consultation, launched in response to market, technology and regulatory developments since 2004, Ofcom set out three main policy objectives, which built on its 2004 policy aims: (i) enabling innovation in a technologically neutral way; (ii) ensuring consumers are well-informed, particularly about 999 access; (iii) ensuring maximum availability of high quality 999 access as voice call services and technology change.
- 3.31 In light of clarification from the European Commission, Ofcom understood that, if the PATS gating criteria are met, a service automatically constitutes a PATS and must comply with the PATS obligations³¹. Therefore Ofcom discontinued its interim forbearance policy. But that created the risk that VoIP providers would decide not to

²⁸ The New Voice Services (NVS) Working Group was convened at the end of 2004 and involved BT, Centrica, Communications Management Association, Easynet, Gossiptel, ISPA, ITSPA, Kingston Communications, Level 3, Magrathea, Ntl, Ofcom, Telewest, Thus, Vonage, Wanadoo and Xconnect.

²⁹ European Commission, *Information and consultation paper on the regulatory treatment of Voice over Internet Protocol (VoIP) under the EU regulatory framework*, 14 June 2004.

³⁰ “Number Portability” enables subscribers to take their standard telephone number with them when they change provider.

³¹ As confirmed by the European Commission’s Expert Group on Emergency Access in a response dated 23 May 2006 to Ofcom’s 2006 consultation *Regulation of VoIP Services*.

provide 999 access to avoid becoming a PATS and subject to the relevant PATS GCs.

- 3.32 As set out in its March 2007 Statement on the 2006 Consultation, Ofcom modified GC 18 on number portability to clarify that number portability rights would only apply to services that provided 999 access (with an exception for receive-only services like type 3 VoIP services). Ofcom considered that would increase the incentive for VoIP providers to offer 999 access (March 2007 Statement, from paragraph 5.8, and Annex 4). The modification to GC 18 entered into force on 29 March 2007.
- 3.33 Also, Ofcom implemented the Code of Practice developed by the industry-Ofcom working group following the 2004 Consultation: *Code on the provision by Service Providers of consumer information to Domestic and Small Business Customers for the provision of Services* (the Code of Practice). That requires VoIP providers to provide information about any feature or limitation that differs from a standard phone service provided over the PSTN, in particular the availability or standard of 999 access (March 2007 Statement, Section 6 and Annex 1). The Code is included in GC 14 and entered into force on 29 May 2007.
- 3.34 As a result of the March 2007 Statement, the GCs that are directly relevant to 999 access over VoIP voice call services can be summarised as:
- PATS providers must take all reasonably practicable steps, to the greatest extent possible: to maintain the availability of PATS at fixed locations³² in cases of catastrophic network breakdown or *force majeure*; to provide uninterrupted 999 access (GC 3 implementing USD Article 23);
 - PATS providers must provide all end-users with 999 access at no charge and must make caller location information for all 999 calls available to the emergency organisations handling those calls, to the extent technically feasible (GC 4 implementing USD Article 26);
 - PECS providers must ensure domestic and small business customers are provided with information about the features of their service. In particular, type 2, 3 and 4 VoIP providers must make clear whether their service offers 999 access and the extent to which it depends on the user's home power supply. If the customer chooses to take up a service that does not offer 999 access or that depends on an external power supply, the code requires providers to: secure the customer's positive acknowledgement of that at point of sale (by ticking a box, for example); provide a physical label for equipment on request or information on the computer screen stating there is no 999 access; play an announcement each time a 999 call is attempted reminding the caller that 999 access is unavailable (GC 14 implementing USD Article 34);
 - ECS providers must provide, on request and on reasonable terms, number portability to subscribers of PECS that are for receiving national and international calls only through a standard national or international telephone number or to subscribers of PATS (GC 18 implementing USD Article 34).

³² For nomadic VoIP, "fixed locations" is understood as the contractually agreed fixed location. *New Voice Services: a Consultation and Interim Guidance*, Ofcom, 6 October 2004 and *Statement on the Regulation of VoIP Services*, Ofcom, 29 March 2007, Annex 5, *Guidelines on the application of PATS obligations to VoIP service providers*, from paragraph A5.53.

- 3.35 PATS providers are also obliged to comply with: GC 5 on emergency planning; GC 8 on operator access, directory enquiries and directories; GC 10 on publishing prices, tariffs and terms and conditions; GC 11 on billing accuracy; GC 12 on itemised billing; GC 13 on non-payment of bills; GC 15 on special measures for end-users with disabilities. The impact of complying with those is considered in more detail in Ofcom's Impact Assessment in Annex 5.
- 3.36 On applying GC 3, Ofcom withdrew the *Essential Requirements Guidelines*³³ because they were suited to traditional PSTN providers only; they implied that the provider had ownership or direct control over the end-to-end network used to provide the call (March 2007 Statement, from paragraph 4.16).
- 3.37 Ofcom also issued *Guidelines on the application of PATS obligations to VoIP service providers* (the Guidelines), which explain how Ofcom would investigate potential contraventions of GCs 3 and 4 on network reliability and 999 calls to aid transparency and understanding of the requirements and increase the incentive for VoIP providers to offer 999 access (March 2007 Statement, Annex 5)³⁴. Instead, Ofcom specified that VoIP providers should take all possible steps to ensure network integrity and reliability and should do so to the greatest extent possible, but only for the aspects of the network that they control.
- 3.38 Lastly, Ofcom undertook to encourage and enforce maximum compliance with relevant GCs by VoIP providers and to monitor market and technology developments to ensure regulation can be quickly adapted to meet consumer and citizen needs, especially the need to maintain the widespread availability of 999 access (March 2007 Statement, Section 5).
- 3.39 In that regard, in the 2006 Consultation and March 2007 Statement, Ofcom signalled that market forces combined with information provision might not lead to an optimum provision of 999 access for society: it may be inherently difficult for consumers to properly evaluate the potential costs and benefits of taking a service without 999 access; without any requirement to offer 999 access there was the risk that service operators and/or subscribers would be able to "free ride" by offering a low cost service with no or limited 999 access and rely on customers of other networks to allow them to make emergency calls, or to make emergency calls on their behalf.
- 3.40 Ofcom noted in the March 2007 Statement that a number of respondents to the 2006 Consultation considered the new measures were insufficient to combat the risk of consumer and citizen confusion about 999 access over VoIP. That could cause delays in accessing 999, possibly leading to serious harm.
- 3.41 Ofcom undertook, therefore, to consult in summer 2007 on whether we should require certain VoIP providers to provide 999 access and, in assessing the need for that requirement, we undertook to carefully consider the possible impact on competition and on market entry and innovation by VoIP providers. This consultation reflects that commitment.

³³ *Guidelines on the essential requirements for network security and integrity*, Oftel, 9 October 2002 http://www.ofcom.org.uk/static/archive/oftel/publications/ind_guidelines/guid1002.htm

³⁴ <http://www.ofcom.org.uk/consult/condocs/voipregulation/voipstatement/voipstatement.pdf>

International context

3.42 In June 2007, we polled other European regulators on their approach to regulating VoIP and in particular VoIP and emergency services access. Their responses are summarised in figure 3.

Figure 3: Ofcom poll of VoIP and emergency services access in Europe, June 2007

	Broadband penetration / population	Emergency services access from type 2 VoIP services?	Emergency services access from type 4 VoIP services?
Denmark	31.9%	Y	Y
Netherlands	31.8%	N	Y
Switzerland	28.5%	Y	Y
Norway	27.7%	N	Y
Finland	27.2%	Y	Y
Sweden	26.0%	N	Y
Belgium	22.5%	No response	
United Kingdom	21.6%	N	N
Luxembourg	20.4%	N	Y
France	20.3%	Y	Y
Austria	17.3%	Y	Y
Estonia	17.2%	N	Y
Germany	17.1%	No response	Y
EU	15.7%		
Spain	15.3%	N	Y
Italy	14.8%	No response	
Portugal	13.8%	No response	
Slovenia	12.6%	No response	Y
Ireland	12.5%	Best endeavours	Y
Hungary	11.9%	N	Y
Czech Republic	10.6%	N	Y
Latvia	9.3%	Y	Y
Poland	6.9%	N	Y

Source: OECD broadband statistics to December 2006; Ofcom survey of ERG regulators June 2007

3.43 The European Regulators Group (ERG) has established a VoIP Harmonization Task Force with the intention of reaching a common position on VoIP regulation later this year. That is likely to include a common position on emergency services access, which Ofcom considers would be consistent with the proposal it recommends in this consultation.

3.44 Regarding emergency services access over VoIP in other countries with high-broadband penetration, the USA requires type 4 VoIP services to offer 999 access; Canada, Australia and Hong Kong require type 2 and type 4 VoIP services to offer 999 access.

Section 4

Policy Proposal

Introduction

- 4.1 This section summarises Ofcom's policy objectives, sets out two policy options for meeting those objectives and explains Ofcom's reasoning for recommending one of those options.

Policy objectives

- 4.2 One of Ofcom's key policy objectives when regulating VoIP is to ensure there is a high level of 999 access. That forms the key objective of this consultation. Consumers and citizens in the UK traditionally enjoy high levels of 999 access. VoIP is currently the only public voice call service that is not required to ensure 999 access in the UK; all PSTN fixed services provide 999 access and all mobile PSTN services provide 999 access where there is coverage. This level of access is highly valued by consumers and citizens and helps the emergency services to provide high quality services. Accordingly, Ofcom regards it as important that these benefits are not lost as a result of changes in services or technology.
- 4.3 Secondly, in meeting that objective, we will take account of the desirability of regulating in a way that does not favour one technology over another or one means of providing technology over another³⁵.
- 4.4 Those policy objectives build on the policy aims and objectives set out in the 2004 and 2006 Consultations. As part of its 2006 Consultation and March 2007 Statement, Ofcom mandated the provision of VoIP customer information about the availability and standard of 999 access over VoIP and set out consumer education initiatives to raise awareness generally.

Ofcom's approach to date

- 4.5 As highlighted in Section 3 of this Consultation, in the 2006 Consultation, Ofcom discontinued its interim forbearance policy, which meant that type 4 VoIP services that met the PATS gating criteria had to comply with the PATS GCs, withdrew the *Essential Requirements Guidelines*, which were written with traditional PSTN services in mind, and modified GC 18 on number portability to ensure it did not contain a disincentive for VoIP providers to offer 999 access.
- 4.6 Ofcom proposed *Guidelines on the application of PATS obligations to VoIP service providers*, which entered into force on 29 March 2007 (the Guidelines), and a *Code on the provision by Service Providers of consumer information to Domestic and Small Business Customers for the provision of Services*, which entered into force on 29 May 2007 (the Code of Practice).

³⁵ Section 4(6) of the Act provides:

The fourth Community requirement is a requirement to take account of the desirability of Ofcom's carrying out their functions in a manner which, so far as practicable, does not favour—

(a) one form of electronic communications network, electronic communications service or associated facility; or

(b) one means of providing or making available such a network, service or facility, over another.

- 4.7 Ofcom considered that this approach, combined with strong consumer preference for services with emergency services access and the fact that most VoIP services were being used as secondary lines (which meant that existing services with emergency services access were not being substituted), would ensure good continued provision of 999 access.

Challenges in meeting the policy aims

- 4.8 In its March 2007 Statement, Ofcom decided to review the question of how to ensure maximum availability of 999 access. A number of developments led Ofcom to consider the issue should be reassessed, including:

- since the 2006 Consultation, there had been a rapid increase in the growth of VoIP services, increasing the potential for consumer detriment;
- generally, VoIP service providers did not appear to be offering emergency services access³⁶, despite Ofcom's original intention behind its interim forbearance policy and the incentives set out in the 2004 Consultation that were intended to encourage emergency services access; and
- there appeared to remain a large degree of confusion about the availability of 999 access from VoIP services, which could lead to delays in consumers successfully contacting the emergency services. The October 2006 research indicated that about three in four users of services using VoIP technology that did not offer emergency services access thought that the service provided emergency services access or did not know either way.
- various 2006 Consultation respondents supported those concerns.

- 4.9 Therefore, Ofcom considered ensuring access to emergency services could be a crucial issue moving forwards. Ofcom undertook to consult further in summer 2007 on 999 access over VoIP and in particular, on whether and, if so, how certain VoIP services should be required to offer 999 access. In assessing the need for that requirement, Ofcom said it would carefully consider the possible impact on competition and on market entry and innovation by VoIP providers.

Policy Options

- 4.10 In this section, Ofcom weighs up two policy options for responding to the question of 999 access over VoIP. Ofcom considers those options reflect its bias against regulatory intervention to encourage innovation and the need to regulate to protect citizens and consumers. The options are:

Option 1: Do not mandate 999 access for VoIP services

Option 2: Mandate 999 access for type 2 and type 4 VoIP services

Q.1 Do you consider Ofcom should consider any other policy options? Please describe your proposed option(s) and explain what you consider would be the advantages and any disadvantages.

³⁶ Ofcom communications tracking survey Q.4 2006.

- 4.11 Option 1 means a continuation of the status quo. VoIP providers could offer 999 access on a voluntary basis. Type 4 VoIP providers that offer 999 access and meet the other PATS gating criteria would become PATS and would have to comply with the PATS GCs, taking into account the Guidelines on complying with GC 3 and 4 as regards the reliability of 999 access over VoIP and the provision of caller location information to the emergency services. The Code of Practice requires VoIP providers to give their domestic and small business customers information about the availability and limitations of 999 access over VoIP.
- 4.12 The main arguments in favour of this option are that it would give Ofcom more time to monitor and review the impact of the Guidelines and the Code of Practice on the provision of 999 access by VoIP providers, given that they came into force in spring 2007. It might also limit the regulatory compliance costs on VoIP providers. Ofcom has considered that important in the past Ofcom to enable VoIP services to innovate and grow market share in order to bring more consumer choice and competition.
- 4.13 The arguments against Option 1 mirror the points in favour of Option 2, explored below. Essentially: there is an under provision of 999 access over VoIP; consumers and citizens are confused about 999 access over VoIP; research suggests that customer information is unlikely to be enough to tackle under provision or consumer and citizen confusion; VoIP take-up is growing and VoIP services and technology are becoming increasingly similar to PSTN services, increasing the risk of confusion.
- 4.14 According to the impact assessment, the incremental benefits of Option 1 would be zero (no extra contribution to consumer protection) and the incremental costs to VoIP providers would be zero (no extra compliance costs) (Impact Assessment, paragraph A5.26).

Q.2 Do you have any comments on Ofcom's evaluation of policy Option 1, which is to not require VoIP services to allow 999 calls?

Q.3 Do you consider Ofcom should adopt policy Option 1? Please give your reasons.

- 4.15 Under Option 2, Ofcom would modify GC 4 so that PECS that allow national and international calls to ordinary numbers would have to allow any user to access 999 free of charge. They would also have to make caller location information available to the network used to connect the call to the emergency services, to the extent technically feasible. Type 4 VoIP providers that meet the other PATS gating criteria would have to comply with the PATS obligations.
- 4.16 There are six main arguments in support of this option:
- 1) Stakeholder responses to the 2006 Consultation by the Government, the emergency services, the Royal National Institute of Blind People (RNIB) and the Royal National Institute for Deaf People (RNID);
 - 2) Under provision of 999 access over VoIP services;
 - 3) Consumer and citizen confusion about 999 access from VoIP services;
 - 4) Developments in VoIP take-up and technology;
 - 5) Technology neutrality; and
 - 6) Ofcom's Impact Assessment.

Stakeholder responses

4.17 Responses to Ofcom's 2006 Consultation, especially by Government, the emergency services, the RNID and the RNIB, expressed strong concern about Ofcom's policy on 999 access over VoIP services.

4.18 In summary, they considered consumers and other citizens were confused about whether VoIP voice call services offer 999 access. Delay in contacting the emergency services could result in serious harm. They considered the measures adopted, including the Code of Practice requiring VoIP providers to provide customer information on the availability and standard of 999 access, were not sufficient to address that.

4.19 A response on behalf of the Home Office, the Police Service and other agencies stated:

"We are dealing here with an important public safety issue, with the possibility of thousands of consumers living and working without immediate means of summoning emergency assistance and, very possibly, without the knowledge that they are in such a situation. That is too important an issue to leave entirely to the marketplace to resolve ...

... the Home Office does not believe that any of the advantages that New Voice Services [like VoIP] provide should be at the expense of public safety ... we have very serious concerns for those people who decide to opt for systems or for those people, who through circumstance, have to use a telephone service whose providers do not allow "999" access ...

The Home Office is particularly concerned, in the absence of regulation, about the following points:

- In the event of fire, accident or criminal offence (including domestic violence), a subscriber might be unable to make an immediate call to the emergency services from their phone ...
- Over half the estimated 80,000 annual rape incidents are perpetrated by a partner or a former partner of the victim. The absence of a home with immediate "999" access could assist the attacker ...
- Other vulnerable groups, e.g. people with learning disabilities and young people, might be similarly disadvantaged ...

The Home Office is very concerned that a proposal not to mandate access to emergency services for New Voice Services [like VoIP] will start to erode universal access to emergency services, something that would have detrimental public safety consequences"³⁷.

4.20 The Association of Chief Police Officers of England, Wales and Northern Ireland (ACPO) responded that:

³⁷ <http://www.ofcom.org.uk/consult/condocs/voipregulation/responses/homeoffice.pdf>

“... ACPO welcomes any new technology that affords access to more effective and efficient telecommunications services; however the embracing of new technology is subject to the overarching requirement that such innovations result in an improvement of existing services not degradation. There are certain requirements and capabilities that ACPO still feels must be incorporated with the provision of such services as a basic minimum: 1. Access to emergency services ...”³⁸

4.21 The Royal National Institute for Deaf People (RNID) stated:

“Consumers of telecommunications services are used to a certain scope and quality of service and have expectations about availability, functionality ... The evidence has demonstrated that unless measures are taken to protect vulnerable consumers, unregulated and unconstrained markets result in a very uneven playing field, in particular for people with disabilities. RNID is concerned that Ofcom’s proposed framework does not consider those vulnerable user groups in sufficient measure ...”³⁹

4.22 The Royal National Institute for the Blind (RNIB) raised similar concerns⁴⁰.

4.23 Respondents also raised points about specific areas of Ofcom’s policy to date, which we are included in the following paragraphs.

Under provision of 999 access from VoIP services

4.24 In the pre-consultation phase for the 2004 Consultation, when Ofcom first proposed the Code of Practice as a policy option, existing and potential VoIP providers indicated that most would want to offer 999 access. That was so they could compete with other providers and try to avoid any loss of life because a customer could not to call 999. That was one of the reasons why Ofcom recommended mandating the Code of Practice and considered mandating 999 access from VoIP services was not necessary.

4.25 However, the provision of 999 access by VoIP services has not occurred in the absence of regulation. For example, the October 2006 research suggests that 64% of VoIP consumers have services that do not provide 999 access.

4.26 As Ofcom flagged up in the 2006 Consultation, one reason why market forces might not be sufficient to deliver Ofcom’s policy aim of a high level of 999 access is the nature of 999 access itself (2006 Consultation paragraph 3.7, discussed here at paragraph 3.37). In particular, 999 access has some characteristics of a public good, which the market will not provide optimally. The benefits of 999 access can be enjoyed by any citizen, not only the subscriber. If Ofcom does not regulate to mandate 999 access, VoIP providers or subscribers would be able to “free ride” by providing or using a service that doesn’t offer 999 access and relying on other providers or other citizens to allow them to make a 999 call, or on other citizens to make it on their behalf (see the Impact Assessment, paragraph A5.13).

³⁸ <http://www.ofcom.org.uk/consult/condocs/voipregulation/responses/acpo.pdf>

³⁹ <http://www.ofcom.org.uk/consult/condocs/voipregulation/responses/rnid.pdf>

⁴⁰ <http://www.ofcom.org.uk/consult/condocs/voipregulation/responses/rnib.pdf>

- 4.27 Ofcom is concerned that may put individual consumers and citizens at risk and cause the under provision of 999 access to society as a whole and that, without regulation, that situation will grow worse as VoIP develops and consumer take-up grows (see below).

Consumer and citizen confusion about 999 access from VoIP services

- 4.28 The second key reason Ofcom chose to mandate the Code of Practice was because, provided they were well-informed about 999 access, we considered it was likely consumers would strongly prefer services with 999 access, including if they cost more.

- 4.29 An industry-Ofcom working group was set up to draft the Code of Practice in 2005. Before compliance with the Code of Practice became mandatory in May 2007, many of the main industry players voluntarily provided information on 999 access on their website, in their terms and conditions and, for VoIP services without 999 access, when a consumer dialled 999.

- 4.30 Ofcom acknowledges that it is too early to measure the impact of mandating the Code of Practice. However, at a time when the consumer information was provided voluntarily, the October 2006 research suggested that 64% of VoIP users did not have 999 access. 15% of VoIP users did not have 999 access but thought they did and 35% did not have 999 access but did not know if they did or not. 18% of VoIP users had a service with 999 access but didn't know if they had access and 8% had 999 access but thought they did not. A total of 76% of those surveyed were confused about whether they had access. 50% of VoIP users were at particular risk of trying to access 999 from a service without 999 access. Further research conducted in April-May 2007⁴¹ found that only 14% of respondents⁴² with VoIP types 1, 2 or 4 were aware that there are some types of voice call that could not be made from VoIP. 21% didn't know if there were or not.

- 4.31 The October 2006 research suggests that, in general, there is a breakdown between the provision of information by industry and how that information is received or used by VoIP users. Ofcom cannot ignore the risk that, even when they are given full information, it may be inherently difficult for new customers to recognise the importance of 999 access (and information about it) because they have other more immediate priorities like price and daily functionality; 999 access is something they might need in the distant future, if at all.

- 4.32 In response to the 2006 Consultation, the Home Office responded along those lines:

“the services that did not provide “999” access would tend to be cheaper and the inability to call the emergency services might not be a paramount concern at the time of purchase”.

- 4.33 The RNID commented:

“RNID does not believe that there is any evidence to support the notion that deaf and hard of hearing people will be informed suitably about the limitations of access to emergency services during the sales process and at the point of signature”.

⁴¹ Survey conducted for Ofcom by Jigsaw Research, from a representative sample of 1050 telephone consumers in the UK, April-May 2007, unpublished.

⁴² Question is based on a small sample of 83 respondents and therefore data is indicative.

- 4.34 Existing customers might not pay sufficient attention to information, fail to recall it at a later date or simply become confused in a stressful emergency situation when it is necessary to call 999.
- 4.35 Moreover, even if a VoIP provider provided full information to its own customers, other citizens might only realise they could not access 999 from a VoIP service when they tried to call 999. VoIP customers might not take into account the needs or awareness of visitors to their household like friends, relatives or a baby sitter, for example.
- 4.36 To inform other citizens if there is no 999 access, the Code of Practice requires VoIP providers to provide (on request) a physical label for equipment or information on the PC screen stating there is no 999 access and to play an announcement each time a 999 call is attempted reminding the caller that 999 access is unavailable.
- 4.37 Some respondents to the 2006 Consultation considered those measures were inadequate given the risk of consumer detriment. The Home Office said:
- “the person calling “999” might not be the one who purchased the phone and might not notice the sticker during the stress generated in an emergency; the sticker might not be in a language that the caller understood”.
- 4.38 ACPO responded:
- “This evidently poses another concern as to who will be required to ensure the “sticker” is in place on the handset? What are the implications for the blind, those who have reading difficulties or those whose first language is not English?... handset labels can easily, and in the interest of aesthetics will, be removed”.
- 4.39 RNID said:
- “obviously any spoken announcements about access to emergency numbers will not be heard by many deaf and hard of hearing people”,
- while RNIB commented
- “a printed label is clearly inadequate for many people, especially as it could not be in very large type ... if you try to make an emergency call and are then met, in the best scenario, with a clear spoken network announcement, valuable time may have been lost”.
- 4.40 Because the October 2006 research suggests that there are a significant proportion of VoIP consumers that, knowingly or unknowingly, take a VoIP service without 999 access, Ofcom is concerned that will lead to the lower provision of 999 access than is desirable for society as a whole. Ofcom is also concerned about the risk that consumer or citizen confusion about the availability of 999 access over VoIP will lead to delays in successfully contacting the emergency services and result in harm.

Developments in VoIP take-up and technology

- 4.41 When Ofcom decided in favour of mandating the Code of Practice and against mandating 999 access over VoIP, we undertook to review our position as VoIP

provision grew. There has been a significant development in VoIP take-up and technology since the 2004 and 2006 Consultations.

- 4.42 Ofcom's communications tracking survey in Q4 2006 found that 10% of UK households said they used a VoIP service (approx. 2.4 million), which was twice the proportion for Q4 2005 (5% of UK households)⁴³. For context, WLR is used by 2.3 million households, cable by 4.1 million households, and LLU by 2 million premises (of which just over 500,000 are MPF).
- 4.43 Also, VoIP voice services are becoming increasingly mainstream and less distinct from traditional PSTN services. In particular, UK and international trends suggest that VoIP providers that want to target the mass market will increasingly offer type 4 phone-based VoIP services that supplement or replace PSTN services⁴⁴. In the October 2006 research, although all the VoIP users surveyed had access to a landline or a mobile phone, 10% said their VoIP service was their main "landline" service; 3% had no landline and 7% said they had a landline but did not use it⁴⁵.
- 4.44 In their response to the 2006 Consultation, ACPO raised the point that
- "At present it is assumed that VoIP systems will be used as secondary devices and so a traditional system offering full functionality will also be available ... The VoIP technology however directly competes with the functionality of landline systems, and to an extent for the nomadic systems with that of mobile telephony. Consumers do not like paying for the same service twice ... The timescale for the take-up of VoIP systems as the primary telecommunications device may therefore be much shorter than Ofcom is anticipating ..."
- 4.45 Moreover, Ofcom is aware that several PSTN and broadband providers are considering the business case for migrating customers from voice call services that use a PSTN fixed line to type 4 VoIP by using naked DSL or LLU to provide a bundled voice and broadband service, with no PSTN service. That is likely to cause a step increase in the number of households with VoIP and reduce the number of households with a PSTN fixed line service, which is the principal source of 999 access at present.
- 4.46 Another point is that, as VoIP take-up grows, it will increasingly be used by less technology-aware consumers, so confusion may well increase. As VoIP is present in more homes and businesses, regardless of the other voice call services available in the same location, the risk of a consumer or citizen reaching for a VoIP service in an emergency that does not offer 999 access grows.

Taking into account technology neutrality

- 4.47 In meeting its key policy objective of ensuring a high level of 999 access, Ofcom will take account of the desirability of regulating in a way that does not favour one technology over another or one means of providing technology over another (see Section 4(6) of the Act).

⁴³ See the Ofcom *Research Report: Voice over Internet Protocol (VoIP)*, 26 July 2007, www.ofcom.org.uk

⁴⁴ For example, see *US Broadband Telephony Forecast, 2007 to 2012: Cable MSOs assert their dominance in the VoIP market, 2007*, JupiterResearch.

⁴⁵ See the Ofcom *Research Report: Voice over Internet Protocol (VoIP)*, 26 July 2007, www.ofcom.org.uk

4.48 In the 2006 Consultation, Ofcom stated:

“Consumers benefit most when new technology can be adopted quickly, when regulatory rules do not prevent new services from being offered, and when competition between old and new services occurs on a level playing field. It is also important that as technology develops, measures to protect consumers are revised to ensure that they are still fully effective (paragraph 3.3) ...

Ofcom has sought to strike a balance between creating a market where consumers’ choices of new and innovative services as individuals are not constrained by regulation while society collectively continues to benefit from widespread availability of 999 access” (paragraph 3.23).

4.49 Ofcom considers, because of under provision of 999 access over VoIP, consumer and citizen confusion about 999 access over VoIP and the developments in VoIP take-up and technology, mandating 999 access over type 2 and type 4 VoIP services is necessary to reach a balance between enabling innovation, choice and competition and protecting consumers and citizens. In the past, there also came a point when it was necessary to mandate 999 access over mobile phones.

Ofcom’s Impact Assessment

4.50 Ofcom has carried out an Impact Assessment (IA) to assess the potential benefits and costs of Option 2 as compared to Option 1. Specifically, the IA considers the potential for Option 2 to save lives by reducing consumer confusion about 999 access over VoIP and resulting delays in contacting the emergency services.

4.51 The IA concludes that, even using conservative estimates of benefits and high estimates of costs, the benefits for consumers and citizens of Option 2, if implemented, would significantly exceed the costs for type 2 and type 4 VoIP providers. See the summary of the IA in Section 6. The full IA is in Annex 5.

Mandating 999 access over type 2 and type 4 VoIP

4.52 Option 2 relates to type 2 and type 4 VoIP services only. That is because there is an important difference in functionality between types 2 and 4 and types 1 and 3.

4.53 Type 2 and type 4 VoIP services allow users to make voice calls out to the PSTN but type 1 and type 3 do not (type 1 does not allow users to receive calls from the PSTN either). Ofcom considers consumers and citizens are, therefore, much more likely to expect to be able to make 999 calls out to the PSTN from a type 2 or a type 4 VoIP service than from a type 1 or a type 3 VoIP service.

4.54 Therefore, Ofcom considers lives within this group of consumers are not materially at risk because of confusion about whether to use a VoIP service to call 999. Type 1 and type 3 VoIP services fall outside the scope of this consultation.

4.55 Ofcom gave separate consideration to the case for mandating 999 access for type 2 VoIP services and for type 4 VoIP services. Ofcom recognises that there are some differences between these services, especially in terms of the service features and the regulations that apply to providers.

- 4.56 To date, it has been most common for type 2 VoIP services to be PC-based. Type 4 VoIP services are often phone-based. The higher prevalence of PC-based services with type 2 VoIP might suggest consumers of those services are at less risk of reaching for a service in an emergency that does not offer 999 access: usually their PC would have to be on and, especially where a headset is used, the service might “look and feel” less like a PSTN service, which would offer 999 access.
- 4.57 However, Ofcom considers any difference in service features or risk of consumer confusion between type 2 and type 4 VoIP services is likely to become negligible or disappear: traditional telephone handsets are increasingly capable of supporting type 2 or type 4 VoIP services and some new VoIP phones do not require the PC to be switched on in order to function. Trends in VoIP development suggest providers targeting the mass market will increasingly promote type 4 services). It is also worth noting that, in the October 2006 research, 65% of households with VoIP claimed to have a type 2 or type 4 VoIP service⁴⁶.

Policy Recommendation

- 4.58 Ofcom’s previous position of mandating consumer information about 999 access over VoIP has allowed VoIP providers to innovate and develop, offering more consumer choice and increasing competition. Going forward, Ofcom considers the Code of Practice will play an important role in providing information about 999 access and the standard of that access.
- 4.59 However, Ofcom considers the under provision of 999 access by VoIP services, consumer and citizen confusion about 999 access, and developments in VoIP take-up and technology mean that the Code of Practice will not be sufficient to ensure a high level of 999 access in the UK from now on. Option 2, which would apply in addition to the Code of Practice, would enable Ofcom to meet its policy aim of maintaining a high level of 999 access throughout the UK and to fulfil its overarching duty under the Act to protect consumers and citizens.
- 4.60 The six factors discussed in the section provide a robust rationale for recommending Option 2. We consider our proposal is likely to deliver significant benefits (lives saved), which would exceed the costs of compliance, as shown in the IA.

Q.4 Do you have any comments on Ofcom’s evaluation of policy Option 2, which is to require VoIP services that allow calls out to ordinary numbers to allow 999 calls?

Q.5 Do you agree that Ofcom should adopt policy Option 2? Please give your reasons.

⁴⁶ The figures suggest some respondents use different types of VoIP in combination, especially with type 1.

Section 5

Mandating access to the Emergency Services

Introduction

5.1 Ofcom considers that, in addition to mandating the Code of Practice in its March 2007 Statement, it should mandate the provision of 999 access for type 2 and type 4 VoIP services. This section will consider some of the practicalities of complying with that requirement for providers, if it is introduced.

Modifying GC 4

5.2 Ofcom proposes to modify GC 4 so that it applies to PECS that enable calls to be made out to ordinary numbers over the PSTN (type 2 and type 4 VoIP voice call services), instead of PATS only. Annex 6 contains a marked up version of GC 4 showing the proposed changes. Annex 7 contains the Notification of a proposed modification under Section 48(2) of the Communications Act 2003.

Complying with GC 3, the proposed modification to GC 4 and the Code of Practice included in GC 14

5.3 The following sections set out the standards VoIP providers would have to meet if Option 2 was implemented, regarding providing caller location information (GC 4, for type 2 and type 4 VoIP providers) and ensuring network integrity and service reliability (GC 3, for type 4 VoIP PATS providers only). The Code of Practice (part of GC 14) contains additional obligations for complying with those requirements.

5.4 It is vital to note that these measures are currently in force for the VoIP providers that already provide 999 access. The impact of mandating 999 access for all type 2 and type 4 VoIP providers would be that those that do not currently provide 999 access would also have to comply with the relevant standards.

Caller location information

5.5 To meet the proposed GC 4, type 2 and type 4 VoIP providers would have to enter into an agreement to interconnect with a network for emergency services access (directly with BT or C&W or indirectly through a third party). GC 4 requires providers of a Public Telephone Network (PTN) to make caller location information available to the emergency services handling a 999 call, to the extent technically feasible. So type 2 and type 4 providers would be obliged to provide those interconnecting networks with location information, to the extent technically feasible.

5.6 Ofcom recognises that some VoIP providers are concerned about providing caller location information to the emergency services because they often offer geographical numbers for use outside of their usual area, e.g. a VoIP consumer registered in Manchester can request a Bristol number. Moreover, for nomadic or mobile VoIP services, the provider cannot be sure where the user will call from.

5.7 Ofcom's *Guidelines on the application of PATS obligations to VoIP service providers* (the Guidelines) set out in the Annex 5 of the March 2007 Statement entered into

force on 29 March 2007. They describe Ofcom's approach to applying certain requirements of GC 3 or GC 4 to VoIP providers by providing clarity on some of the legal concepts and by describing the factors Ofcom would take into account when investigating possible contraventions.

5.8 On the provision of location information, the Guidelines provide that (from paragraph A5.81):

A5.81 It is possible for a VoIP service provided over a xDSL, cable modem or Wi-Fi broadband connection to provide its location or location of its associated broadband access network termination point in a number of ways, as outlined below. This information could then be passed directly to the emergency operator service. Some options on how this could be provided are discussed below.

A5.82 The simplest approach is for the emergency operator (the operator who receives the 999/112 call in the first instance), to request location information when the call is received. They could be prompted to do this in the case of a 999 call by use of a flag that highlights that the call is from a VoIP service.

A5.83 A second broad approach is for the user to input location details prior to using the VoIP service. This information could then be matched against the E.164 number when a call is received by the emergency operator. For this approach to be effective location information would need to be obtained from the VoIP user prior to calls being made and this information would need to be populated in the emergency operator database and matched against the E.164 number received. In addition the E.164 number could be flagged as being from a VoIP service which could prompt the emergency operator to confirm the location with the caller.

A5.84 Where a service is used in a nomadic manner (i.e. there are multiple locations that the VoIP service is being used from) then the user would need to input location information at each new location they are at. This could be facilitated by the VoIP service provider requesting their customer to periodically update the location at which they are using the service, or for the VoIP service provider to monitor the customer's IP address and request revised location information when the IP address changes.

A5.85 A third approach is to use the IP network and IP addressing to provide location information. Location based solutions are used in the commercial world in particular with respect to control of TV content rights and ecommerce. The BBC uses software which locates an IP address down to city/country level in the UK. They use this to be able to restrict access to certain content rights (e.g. where the rights are for UK only) and users are only allowed to view the content if their source IP address matches part of the IP address range assigned to UK. In the US similar software and topology information is used to stop baseball matches being shown 'live' to internet subscribers living near baseball grounds with granularity achieved down to zip code level.

A5.86 The granularity of such a solution could reach the targets required by emergency services but only if ISPs collaborate in providing IP address and topology information to a central database. It would be of interest to understand how granular can location be made based on IP v4 addressing. Ofcom understands that such a solution would be constrained by the use of private addressing and NAT. However, it is likely that that future NGN deployment will largely use IPv6 so that a higher level of granularity could be achieved. Standards work to provide location in IP network is ongoing, NICC has a working group looking at providing location in IP networks, as indeed has ETSI and the IETF, eCall proposals from the EC propose a minimum data set, including location, should be provided to support the emergency services across Europe.

A5.87 Another approach could be to incorporate GPS/A-GPS or other GNSS (such as Galileo) receivers in the broadband adaptors which provide connectivity for the voice service. It is worth noting however, that GPS receivers suffer from the limitation that indoor coverage is problematic, not many users would attach an external antenna and CPE cost would increase.

A5.88 Another alternative would be for all 999 calls to be made from a PSTN line in the case where a PSTN line remains in place. This could be done by using intelligence in a broadband adaptor (when using xDSL service) to force all 999 calls to PSTN line. This solution enables the continued provision of location to the emergency services based on the PSTN network termination point and associated service location.

- 5.9 The approaches currently used by VoIP providers that provide 999 access are for the emergency operator to request location information when the call is received or for the user to input location details before using the VoIP service, and to keep those updated. IP address tracking and GPS are under development but are not, to the best of Ofcom's understanding, technically feasible at present. However, the technically feasible test should be reviewed periodically as technology develops. Ofcom will continue to discuss the practicalities of providing caller location information over VoIP with VoIP providers and the emergency services. The priority for the emergency services is that a high level of 999 access is maintained.
- 5.10 In any case, PSTN mobile phone users have 999 access, where they have coverage, and also have to give their location when calling because the location information available over mobile networks is usually limited to cell site information and cannot necessarily pinpoint a specific address.
- 5.11 The Code of Practice under GC 14 requires VoIP providers to give domestic and small business customers with information on emergency location information (from paragraph 12):

12. In respect of Emergency Location Information:

a) where the Service provided by the Service Provider does provide access to Emergency Calls and the Service is to be used principally at a single fixed location, the Service Provider shall require its Domestic and Small Business Customers to register with it the address of the place where the Service is going to be used prior to

activation of the Service (the location information), so that up-to-date location information can be used for Emergency Location Information;

b) where the Service Provider has reasonable expectation that, or has been informed that, the service is to be accessed from several locations, the Service Provider shall recommend that its Domestic and Small Business Customers register and update the location information with it, whenever accessing the Service from a new location, so that up-to-date information can be used for Emergency Location Information;

c) the Service Provider shall advise its Domestic and Small Business Customer at the Point of Signature, in any User Guide, and in any Terms and Conditions of Use of any limitations on the location information that will be provided to the Emergency Services as Emergency Location Information, if the location information they have provided is not up-to-date. This advice shall be clear and readily accessible;

d) where the Service Provider does not provide Emergency Location Information, it shall provide clear and easily accessible information to this effect to all Domestic and Small Business Customers at the Point of Signature, in any User Guide, and in any Terms and Conditions of Use. The same information shall also be made available to prospective Domestic and Small Business Customers as part of the Sales Process.

Q.6 Ofcom invites information on (a) the current means, future possibilities and limitations for providing caller location information; (b) how long it is likely to take a VoIP provider to meet current requirements on caller location information, in the event that Option 2 is adopted.

Network integrity and service reliability

- 5.12 Type 4 VoIP providers that offer PATS at a fixed location also have to comply with GC 3, which requires network integrity and uninterrupted 999 access. Type 2 VoIP services are PECS and do not have to comply with GC 3, even if they provide 999 access under a modified GC 4.
- 5.13 In the Guidelines we acknowledge that VoIP providers cannot ensure network integrity and service reliability to the same extent as PSTN fixed network operators. PATS VoIP providers subject to GC 3 should take all possible steps to ensure network integrity and reliability and should do so to the greatest extent possible, but only for the aspects of the network that they control.
- 5.14 In any case, it is rare for a single provider to control all aspects of call conveyance end-to-end. An LLU operator, for example, depends on BT's management of the copper loops, but LLU operators are not exempt from the requirement to provide 999 access. Certainly, there are technical measures type 2 and type 4 VoIP providers can take to prioritise 999 call traffic where they have control, and some providers already do so.
- 5.15 Specifically, the Guidelines provide that (from paragraph A5.63):

A5.63 A provider who does control all aspects of the network from end-to-end may be able to provide a high level of network integrity through controlling quality of service and prioritising traffic.

A5.64 In respect of the service/application and IP network layers, there are a number of steps that a VoIP service provider (including those offering nomadic services) could take in respect of the elements they do control. Possible measures include:

- engineering the VoIP service to minimise latency and specifying minimum requirements for use of the service such as bandwidth and contention ratios;
- marking the VoIP traffic for priority (QoS) in an IP network in accordance with an agreed DiffServ or IntServ class of service⁵⁶ scheme. This can then be used between interconnected IPv4 networks and may be maintained both in IP headers (precedence bits) and interconnected MPLS networks (EXP bits);
- designing their networks to minimise routing hops, providing sufficient redundancy including call servers, gateways and network capacity, to deal with any throughput issues during re-routing or congestion;
- proactively managing any customer premise equipment to dynamically alter the properties, such as packet and or window size, to maximize throughput for voice traffic in response to observed network performance;
- implementing deep packet inspection to identify and prioritise voice traffic in those parts of the network in which it has control;
- implementing home subscriber server, gateways and call servers close to significant sources and sinks of traffic to other networks;
- in the case of an xDSL service, using the associated PSTN line (which is provided with the DSL service) for 999 access. This would ensure that in the event of power cut/failure or broadband service outage, all 999 calls would be routed to the associated PSTN line, by use of software or control in the CPE/broadband adaptor.

A5.65 Ofcom is not suggesting that any of these specific measures should be regarded as mandatory in order to demonstrate compliance with GC 3. Indeed, these guidelines are intended to provide certain general assistance as to how Ofcom might assess compliance, bearing always in mind more generally that:

- the word “reasonably” imports an objective test, but the onus is on the relevant communications provider to establish that “all reasonably practicable steps to maintain, to the greatest extent possible” have been taken to secure compliance with the applicable obligations in GC 3; and
- while “reasonably practicable” is in isolation a somewhat less strict standard as compared to simply what is “practicable”, the relevant

communications must show that not only that *all* such steps have been taken but also that they have so been taken “to the greatest extent possible”.

A5.66 We do, however, consider that all communications providers providing 999 access can reasonably be expected to carry out a formal risk assessment for that service. Such a formal assessment is expected to include:

- producing a model of the network elements used to provide that service;
- defining a set of performance parameters which characterise the end to end performance of that service (e.g. MTBF);
- identifying which of the elements are most likely to fail, or suffer from degraded performance, and what the consequence would be for the performance parameters;
- determining which elements are critical in relation to the end-to-end service performance, and what risk mitigation strategy might reasonably be adopted in relation to those elements; and
- determining and implementing a risk mitigation strategy that might reasonably be adopted in relation to those critical elements.

A5.67 In some cases, there are likely to be elements of the end-to-end network that VoIP service providers do not directly control. For example, they may rely on a different broadband provider (xDSL, cable modem, licensed wireless or UMA) to provide access to their VoIP services. Since reliability of the service provided over the network depends on the integrity of the underlying access and interconnected networks, this could present problems for VoIP service providers in complying with their obligations under GC 3.

A5.68 In the 2004 Consultation, Ofcom raised the issue of how a VoIP service provider who does not control the underlying network may ensure network integrity. Most respondents were of the opinion that service level agreements (“**SLAs**”) between VoIP service providers and infrastructure providers were an effective way of ensuring network integrity and reliability. Ofcom is of the view that such agreements may help improve network integrity.

A5.69 Therefore, in investigating any potential breaches of GC 3 by VoIP service providers, Ofcom would consider what SLAs on quality and reliability VoIP service providers have entered into with their respective providers of underlying network services. For example, where a broadband access is provided by a different provider, then it may be appropriate that the commercial agreements between the VoIP service provider and broadband access provider would include agreement on the priority mechanisms employed to ensure that any agreed marking or classification of traffic is maintained. Ofcom may expect that such SLAs make provision for service classes and characteristics for VoIP traffic.

A5.70 Nomadic use presents particular challenges in respect of ensuring network integrity since the user may use a wide range of access networks and so putting in place SLAs may present greater difficulties.

A5.71 Another consideration that Ofcom will examine in an investigation would be any provisions to ensure continuity of service in the case of a power outage at the customer premise. In the case of a PSTN service, continuity of service is ensured through line powering which provides power from the exchange.

A5.72 The provision of VoIP services (particularly when provided over existing xDSL, cable modem, licensed wireless and UMA) involves the use of Customer Premise Equipment (“CPE”) which is not powered by the broadband service or network termination point or equipment. In the 2004 Consultation, Ofcom asked whether line powering was appropriate for VoIP services (question 23). It was not considered a viable option by any respondent. In light of this, Ofcom would not currently expect a VoIP service provider to provide line powering to VoIP CPE.

A5.73 In the absence of line powering, there are other options to ensure continuity of service in the case of a power outage at customer premises (such as the use of battery back-up or uninterruptible power supply (“UPS”)). Ofcom’s view is that the decision to provide battery backup for CPE should be left to the VoIP service provider, who may provide such a facility as part of a service offering.

A5.74 However, it is worth noting in respect to network termination equipment:

- in the US, at least one cable operator provides a cable modem with battery backup which ensures the service is still available as a result of local power outages;
- some VoIP service providers focussing on the business market carry out comprehensive audits when providing IP voice services (such as a review of power requirements including battery and UPS options when specifying solutions for business critical purposes);
- cable operators in the US advise customers on UPS options for their network terminating equipment.

5.16 The Code of Practice under GC 14 requires VoIP providers to give domestic and small business customers information on the reliability of 999 access and calls (from paragraph 5):

Service reliability

5. Each Service Provider shall provide to its Domestic and Small Business Customers clear and readily accessible information regarding whether its Service may cease to function if there is a power cut or power failure, or a failure of the Broadband Connection.

6. The information in paragraph 5 above shall be provided during the Sales Process, within the Terms and Conditions of Use, and in any User Guide issued by the Service Provider.

7. The following text is an indicative example of the information to be provided in paragraph 5 above, that can be adapted to the specific requirements of Service Providers:

“IMPORTANT INFORMATION: If your Broadband Connection fails, your voice service will also fail. Your service may cease to function if there is a power cut or failure. These failures may be caused by reasons outside our control.”

Reliability of Access to Emergency Calls

11. Where the Service Provider provides access to Emergency Calls but the Service may cease to function if there is a power cut or failure or a failure of the Broadband Connection the Service Provider shall:

a) provide its Domestic and Small Business Customers with clear and readily accessible information, during the Sales Process, in the Terms and Conditions of Use and in any User Guide; that, although access to Emergency Calls is provided, the Service may cease to function if there is a power cut or failure, or a failure of the Broadband Connection;

b) take reasonable steps to ensure that Domestic and Small Business Customers acknowledge in the form of a signature (or online equivalent), at the Point of Signature, that they understand that Emergency Calls will fail if there is a power cut or failure or a failure of the Broadband Connection, (the following text is an example of the wording that could be used):

c) provide evidence to Ofcom of the acknowledgement in paragraph 11 (b) above, within five working days; following a written request from Ofcom;

d) during the sales process, give the Domestic and Small Business Customer the choice whether to receive (at no charge other than reasonable postage and packaging if applicable), Labels which state that Emergency Calls may fail:

- where a screen or display is used with the Service, a Label would normally be an on-screen message or display using a clear and readily accessible graphic, words or icon that Emergency Calls cannot be made using the Service; and

- in other circumstances a Label would normally be (at the Customer’s choice) either a piece of paper to be attached to the Service Access Terminal or software facilities for producing such labels (e.g. a PDF file).

“I understand that this service allows calls to the emergency services numbers 999 and 112. However I understand that calls will fail if there is a power cut or my broadband connection fails.”

- 5.17 Ofcom will continue to discuss the implications of the possible difference in 999 service quality between VoIP services and PSTN services with the emergency services. The priority for the emergency services is that a high level of 999 access is maintained.
- 5.18 Ofcom considers it likely that consumers will expect a similar call quality to the one they receive when they call a PSTN number over VoIP, which is the case for mobile phone 999 access.
- 5.19 Our cost-benefit assessment (CBA) uses current statistics on reported modem connection failure rates (2%) to adjust any estimated benefits from Ofcom’s proposal down by 2% to proxy the reduction in the quality of service when accessing 999 from a VoIP service compared to the PSTN. We consider we would be able to justify our proposal to mandate 999 access even if there was a significantly larger difference in quality of service.

Q.7 Ofcom invites information on (a) the current means, future possibilities and limitations for providing network integrity and service reliability; (b) how long it is likely to take a VoIP provider to meet current requirements on network integrity and service reliability, in the event that Option 2 is adopted.

Q.8 Do you have any comments on complying with the other PATS General Conditions, in the event that Option 2 is adopted?

Section 6

Summary of the Impact Assessment

Introduction

- 6.1 In Section 4, Ofcom has discussed two policy options for meeting its policy aim of ensuring a high level of 999 access as VoIP take-up and technology develop: do not mandate 999 access (Option 1) and mandate 999 access over type 2 and type 4 VoIP services (Option 2).
- 6.2 Ofcom recommends Option 2 because we have identified significant benefits, which exceed the costs. This section summarises the analysis that enabled us to reach that conclusion. A full Impact Assessment (IA) is included in Annex 5.
- 6.3 IAs provide a valuable way of assessing different options for regulation and showing why the preferred option was chosen. They form part of best practice policy-making and are commonly used by other regulators. This is reflected in Section 7 of the Communications Act 2003, which generally means we have to carry out IAs where our proposals would be likely to have a significant effect on businesses or the general public, or where there is a major change in Ofcom's activities.

Summary of the Impact Assessment

- 6.4 Ofcom's IA considers the impact on different stakeholders of requiring 999 access to be provided over VoIP. Both costs and benefits are taken into account and quantified where possible. The IA takes account of the fact that market forces and consumer information might not be enough to ensure a high level of 999 access because of the nature of 999 access itself. The IA also considers the result of Ofcom's communications tracking survey for Q.4 2006 and the October 2006 research: VoIP take-up is growing, a significant proportion of VoIP users do not have a services that provides 999 access and many VoIP users are confused about whether they have 999 access.
- 6.5 The IA considers two policy options:
- "do not mandate 999 access" (Option 1), and
 - "mandate 999 access for type 2 and type 4 VoIP" (Option 2)
- 6.6 Ofcom's IA assessed the costs and benefits of Option 2 relative to Option 1.

The benefits of requiring 999 access over type 2 and type 4 VoIP

- 6.7 The key benefit identified in the IA for Option 2 was:
- Eliminating critical delays resulting from confusion about 999 access, potentially saving lives.

6.8 Ofcom estimates that expected benefits range between £24 - £34 million in terms of net present value (NPV)⁴⁷.

The costs of providing 999 access

6.9 The key costs identified in the IA for Option 2 were:

- The costs to type 2 and type 4 VoIP providers of enabling 999 access, and
- Compliance costs of meeting additional GCs for type 4 VoIP PATS providers

6.10 Ofcom estimates that industry costs will be approximately £10 million in NPV terms over the next 5 years.

6.11 The cost of Ofcom's proposal for type 2 and type 4 VoIP providers that don't currently provide 999 access would be approximately £4.11 in NPV terms over 5 years per household. That equates to approximately £0.91 per household per year on an annuity basis⁴⁸.

Conclusion

6.12 Ofcom estimates Option 2 would provide a net benefit of between £14 - £24 million in NPV terms.

Q.9 Referring to the full Impact Assessment in Annex 5, do you agree with Ofcom's approach to assessing the potential costs and benefits of policy Options 1 and 2?

⁴⁷ The NPV of future costs and benefits ("net" means that costs are subtracted from benefits) occurring over a number of years is the value of an equivalent single sum today, calculated by applying an appropriate discount rate to future amounts.

⁴⁸ Ofcom derived a cost per household by dividing the NPV industry cost of compliance over 5 years by the number of households that by 2011/12 (a) would use a VoIP service that does not have 999 access and (b) would use a type 2 or type 4 VoIP service (i.e. £10,204,664/2,480,400 households).

Section 7

Modifying General Condition 4: Emergency Call Numbers

Introduction

- 7.1 Under Option 2, we propose to require type 2 and type 4 VoIP services to provide 999 access. We would do that by modifying General Condition (GC) 4: Emergency Call Numbers to extend the obligation currently on PATS providers to all PECS that allow calls to ordinary numbers. GC 4.1 currently requires providers of PATS to:

ensure that any End-User can access Emergency Organisations by using the emergency call numbers "112" and "999" at no charge

General Condition 4.1: Emergency Call Numbers

- 7.2 Ofcom's powers to modify GCs are set out in Sections 47 and 48 of the Communications Act 2003 (the Act) and the scope of GCs is limited by Section 51. In turn, these sections implement a number of Articles from European Directives.

- 7.3 General Condition 4.1 implements USD Article 26(1):

Member States shall ensure that, in addition to any other national emergency call numbers specified by the national regulatory authorities, all end-users of publicly available telephone services, including users of public pay telephones, are able to call the emergency services free of charge, by using the single European emergency call number "112".

- 7.4 This Article reflects the aims set out in the recitals (12 and 36):

For the citizen, it is important ... for users to be able to call emergency telephone numbers and, in particular, the single European emergency call number ("112") free of charge from any telephone, including public pay telephones, without the use of any means of payment.

It is important that users should be able to call the single European emergency number "112", and any other national emergency telephone numbers, free of charge, from any telephone, including public pay telephones, without the use of any means of payment.

Scope of General Conditions

- 7.5 The Act establishes categories of conditions that Ofcom may set. We propose to extend GC 4.1 under the category of Section 51(1)(a):

conditions making provisions such as Ofcom consider appropriate for protecting the interests of end-users of public electronic communications services.

- 7.6 This in turn derives from paragraph 8 of the annex to the Authorisation Directive.

Tests for modifying General Conditions

7.7 In modifying conditions, Ofcom is required to meet various tests set out in the Act. These tests and Ofcom's assessment of how these are met in connection with the proposed modification to GC 4 are set out below.

Section 3 – Ofcom's general duties

7.8 Section 3(1) of the Act sets out the principal duty of Ofcom:

- To further the interests of citizens in relation to communications matters; and,
- To further the interests of consumers in relevant markets, where appropriate by promoting competition.

7.9 Ofcom is required by this section to carry out its functions in line with this duty. Ofcom considers that its proposal to require type 2 and type 4 VoIP services to provide 999 access falls within the scope of section 3 of the Act.

Section 4 – European Community requirements for regulation

7.10 Section 4 of the Act requires Ofcom to act in accordance with the six European Community requirements for regulation. In summary these requirements are to:

- Promote competition in the provision of electronic communications networks and services, associated facilities and the supply of directories;
- Contribute to the development of the European internal market;
- Promote the interests of all persons who are citizens of the European Union;
- Not favour one form of or means of providing electronic communications networks or services, i.e. to be technologically neutral;
- Encourage the provision of network access and service interoperability for the purpose of securing:
 - i) Efficient and sustainable competition; and
 - ii) The maximum benefit for customers of Communications providers; and
- Encourage compliance with certain standards in order to facilitate service interoperability and secure freedom of choice for the customers of communications providers.

7.11 For the reasons set out above, and in particular, that it would promote the interests of consumers and citizens by reducing the risk of delays in contacting the emergency services, Ofcom believes that its proposed decision would meet these requirements.

Section 47 – Test for setting or modifying conditions

7.12 As set out under 47(1) of the Act, in modifying a condition, Ofcom must be satisfied that the test set out under 47(2) has been met. The test is that the modification is:

- Objectively justifiable in relation to the networks, services, facilities, apparatus or directories to which it relates;
- Not unduly discriminatory against particular persons or against a particular description of persons;
- Proportionate to what it is intended to achieve; and
- Transparent in relation to what it is intended to achieve.

The modification must be objectively justifiable

7.13 Ofcom considers that modifying GC 4 is justified because it will reduce confusion about 999 access over VoIP services used to call the PSTN, reducing the risk of delays in contacting the emergency services. It is likely to reduce harm to consumers and citizens and, potentially, help save lives.

The modification must not discriminate unduly against particular persons or against a particular description of persons

7.14 Ofcom considers requiring emergency calls to be included with all services used to call ordinary numbers will not discriminate unduly between providers. It might be argued that to allow the existing situation to continue could discriminate in favour of VoIP providers and against conventional PSTN services, which would continue to bear the cost of the 999 service. We also consider compliance costs are insufficient to materially harm competition.

The modification is proportionate

7.15 We conclude from the Impact Assessment that our proposal is proportionate; we conclude the benefits of regulation far outweigh the costs of regulation. As explained in Section 5 Ofcom has also taken into account the particular circumstances of VoIP providers in providing Guidance on the application of various regulatory provisions.

The modification is transparent

7.16 We consider the proposal clearly sets out what is expected of providers as a consequence of the proposal.

Procedure for modifying General Conditions

7.17 Section 48 requires Ofcom to publish a notification of any proposal to modify a General Condition. This is set out at Annex 7.

Section 8

Next Steps

Regulatory Statement

- 8.1 This consultation lasts eight weeks and will close on 20 September 2007. Ofcom will consider all responses before issuing a regulatory statement with its conclusions in the autumn.
- 8.2 If Option 2 is adopted, Ofcom aims to apply a compliance period that gives VoIP providers adequate time to comply with the regulation and ensures that consumers have 999 access over type 2 and type 4 VoIP services as soon as practicable. Based on the information we currently have available, Ofcom proposes that the modification to GC 4 should enter into force 3 months after publication of our regulatory statement. Ofcom invites detailed calculations and reasoning about the technically feasible implementation time for 999 access, if Option 2 is adopted. Ofcom will carefully consider that information and use it to review the compliance period, if necessary.

Q.10 Do you agree that 3 months would be a suitable compliance period, taking into account the steps VoIP providers would have to take to comply with the modification to General Condition 4 and any additional General Conditions and the need to reduce the risk of harm to consumers and citizens? Please give detailed calculations and reasoning to support your response.

Monitoring, review and enforcement

- 8.3 Ofcom considers its proposed approach is, in the present environment, a robust solution to meet its policy objective of ensuring a high level of 999 access.
- 8.4 However, we recognise the dynamic nature of VoIP services and technology and the potential for changes in consumer behaviour. We propose, therefore, to continue to monitor and research developments in those areas to inform our approach to VoIP regulation in general. We will also continue our consumer education activities in order to increase awareness about any differences between VoIP voice call services and PSTN services.
- 8.5 Ofcom is resolute about achieving a high level of compliance with its regulations. We will proactively monitor compliance and, if necessary, take enforcement action. The initial steps we will take are: inform industry of the new obligation; invite industry to provide an overview of compliance activity and market developments.
- 8.6 If evidence suggests that a provider is not complying, Ofcom can act swiftly to instigate compliance procedures. Where Ofcom determines there are reasonable grounds to believe a GC has been contravened, it can issue a provider with a notification under Section 94 of the Communications Act 2003 (the Act). A Section 94 notification will set out the steps that Ofcom believes a provider should take to ensure that it becomes compliant with the condition, along with the consequences of the breach that Ofcom believes should be remedied. Failure to fully comply with a Section 94 notification will lead Ofcom to consider issuing an enforcement notification under Section 95 of the Act and/or imposing a penalty under Section 96 of the Act. Penalties may be as much as 10% of the provider's relevant turnover. Under Section

100 of the Act, Ofcom ultimately has the power to suspend a provider's right to provide ECS where the provider consistently fails to comply with conditions.

- 8.7 As part of its March 2007 Statement, Ofcom issued Guidelines for VoIP providers on complying with GC 3 on network integrity and service reliability and GC 4 on providing 999 access, which will aid compliance (see Section 5).

Q.11 Do you have any comments on Ofcom's proposed approach to monitoring, review and enforcement?

Annex 1

Responding to this consultation

How to respond

- A1.1 Ofcom invites written comments on the issues raised in this document, including supporting evidence, **by 5pm on 20 September 2007**.
- A1.2 We strongly prefer to receive responses using the online web form at <http://www.ofcom.org.uk/consult/condocs/voip/howtorespond/form> because that helps us to process responses quickly and efficiently. It would be helpful if you completed a response cover sheet to indicate if some or all of your response is confidential (it is incorporated in the online web form questionnaire). See Annex 3 for more information.
- A1.3 For larger consultation responses - particularly those with supporting charts, tables or other data - please email Helen.Keefe@ofcom.org.uk, attaching your response in Microsoft Word format, together with a consultation response coversheet.
- A1.4 Alternatively, you may submit your response by post or fax, marked with the title of the consultation, to:
- Helen Keefe
Floor 4
Competition Policy
Riverside House
2A Southwark Bridge Road
London SE1 9HA
- Fax: 020 7783 4109
- A1.5 Note that we do not need a hard copy in addition to an electronic version. Ofcom will acknowledge receipt of responses if they are submitted using the online web form but not otherwise.
- A1.6 It would be helpful if your response included direct answers to the questions asked in this document, which are listed in Annex 4. It would be helpful if you explained why you hold your views and how Ofcom's proposals could affect you.

Further information

- A1.7 If you would like to discuss the issues and questions raised in this consultation, or need advice on the appropriate form of response, please contact Helen Keefe on 0207 7783 4963.

Confidentiality

- A1.8 We believe it is important for everyone interested in an issue to see the views expressed by consultation respondents. We therefore usually publish all responses on our website, www.ofcom.org.uk, ideally on receipt. If you would like your response to be kept confidential, please specify what part or whether all of your response should be kept confidential, and why. Please place confidential parts in a separate annex.

- A1.9 If someone asks us to keep part or all of a response confidential, we will treat that request seriously and try to respect it. But sometimes we will have to publish all responses, including those that are marked as confidential, in order to meet legal obligations.
- A1.10 Please also note that copyright and all other intellectual property in responses will be assumed to be licensed to Ofcom to use. Ofcom's approach on intellectual property rights is explained further on its website at <http://www.ofcom.org.uk/about/accoun/disclaimer/>

Next steps

- A1.11 Following the end of the consultation period, Ofcom intends to issue a statement with its conclusions. That is likely to be published at the end of 2007.
- A1.12 Please note that you can register to receive free mail Updates alerting you about the publication of relevant Ofcom documents. For more details please see: http://www.ofcom.org.uk/static/subscribe/select_list.htm

Ofcom's consultation processes

- A1.13 Ofcom seeks to ensure that responding to a consultation is as easy as possible. For more information please see our consultation principles in Annex 2.
- A1.14 If you have any comments or suggestions on how Ofcom conducts its consultations, please call our consultation helpdesk on 020 7981 3003 or e-mail us at consult@ofcom.org.uk. We would particularly welcome thoughts on how Ofcom could more effectively seek the views of groups or individuals, such as small businesses or particular types of residential consumers, who are less likely to give their opinions through a formal consultation.
- A1.15 If you would like to discuss these issues or Ofcom's consultation processes more generally you can alternatively contact Vicki Nash, Director Scotland, who is Ofcom's consultation champion:

Vicki Nash
Ofcom
Sutherland House
149 St. Vincent Street
Glasgow G2 5NW

Tel: 0141 229 7401
Fax: 0141 229 7433

Email vicki.nash@ofcom.org.uk

Annex 2

Ofcom's consultation principles

A2.1 Ofcom has published the following seven principles that it will follow for each public written consultation:

Before the consultation

A2.2 Where possible, we will hold informal talks with people and organisations before announcing a big consultation to find out whether we are thinking in the right direction. If we do not have enough time to do this, we will hold an open meeting to explain our proposals shortly after announcing the consultation.

During the consultation

A2.3 We will be clear about who we are consulting, why, on what questions and for how long.

A2.4 We will make the consultation document as short and simple as possible with a summary of no more than two pages. We will try to make it as easy as possible to give us a written response. If the consultation is complicated, we may provide a shortened version for smaller organisations or individuals who would otherwise not be able to spare the time to share their views.

A2.5 We will normally allow ten weeks for responses to consultations on issues of general interest.

A2.6 There will be a person within Ofcom who will be in charge of making sure we follow our own guidelines and reach out to the largest number of people and organizations interested in the outcome of our decisions. This individual (who we call the consultation champion) will also be the main person to contact with views on the way we run our consultations.

A2.7 If we are not able to follow one of these principles, we will explain why. This may be because a particular issue is urgent. If we need to reduce the amount of time we have set aside for a consultation, we will let those concerned know beforehand that this is a 'red flag consultation' which needs their urgent attention.

After the consultation

A2.8 We will look at each response carefully and with an open mind. We will give reasons for our decisions and will give an account of how the views of those concerned helped shape those decisions.

Annex 3

Consultation response cover sheet

- A3.1 In the interests of transparency and good regulatory practice, we will publish all consultation responses in full on our website, www.ofcom.org.uk.
- A3.2 We have produced a coversheet for responses (see below). It would be very helpful if you sent one with your response (the coversheet is incorporated in the online web form if you respond in that way). That will speed up our processing of responses, and help to maintain confidentiality where appropriate.
- A3.3 The quality of consultation can be enhanced by publishing responses before the consultation period closes. In particular, this can help individuals and organisations with limited resources or familiarity with the issues to respond in a more informed way. Therefore Ofcom encourages respondents to complete their coversheet in a way that allows Ofcom to publish their response upon receipt, rather than waiting until the consultation period has ended.
- A3.4 We strongly prefer to receive responses via the online web form, which incorporates the coversheet. If you are responding via email, post or fax you can download an electronic copy of the coversheet in Word or RTF format from the 'Consultations' section of our website at www.ofcom.org.uk/consult/.
- A3.5 Please put any parts of your response that you consider should be kept confidential in a separate annex to your response and explain why they should not be published. Confidential parts can include information such as your personal background and experience. If you want your name, address, other contact details, or job title to remain confidential, please provide them in your cover sheet only, so that we don't have to edit your response.

Cover sheet for response to an Ofcom consultation

BASIC DETAILS

Consultation title:

To (Ofcom contact):

Name of respondent:

Representing (self or organisation/s):

Address (if not received by email):

CONFIDENTIALITY

Please tick below what part of your response you consider is confidential, giving your reasons why

Nothing

Name/contact details/job title

Whole response

Organisation

Part of the response

If there is no separate annex, which parts?

If you want part of your response, your name or your organisation not to be published, can Ofcom still publish a reference to the contents of your response (including, for any confidential parts, a general summary that does not disclose the specific information or enable you to be identified)?

DECLARATION

I confirm that the correspondence supplied with this cover sheet is a formal consultation response that Ofcom can publish. However, in supplying this response, I understand that Ofcom may need to publish all responses, including those which are marked as confidential, in order to meet legal obligations. If I have sent my response by email, Ofcom can disregard any standard e-mail text about not disclosing email contents and attachments.

Ofcom seeks to publish responses on receipt. If your response is non-confidential (in whole or in part), and you would prefer us to publish your response only once the consultation has ended, please tick here.

Name

Signed (if hard copy)

Annex 4

Consultation questions

List of questions in this document

Q.1 Do you consider Ofcom should consider any other policy options? Please describe your proposed option(s) and explain what you consider would be the advantages and any disadvantages.

Q.2 Do you have any comments on Ofcom's evaluation of policy Option 1, which is to not require VoIP services to allow 999 calls?

Q.3 Do you consider Ofcom should adopt policy Option 1? Please give your reasons.

Q.4 Do you have any comments on Ofcom's evaluation of policy Option 2, which is to require VoIP services that allow calls out to ordinary numbers to allow 999 calls?

Q.5 Do you consider Ofcom should adopt policy Option 2? Please give your reasons.

Q.6 Ofcom invites information on (a) the current means, future possibilities and limitations for providing caller location information; (b) how long it is likely to take a VoIP provider to meet current requirements on caller location information, in the event that Option 2 is adopted.

Q.7 Ofcom invites information on (a) the current means, future possibilities and limitations for providing network integrity and service reliability; (b) how long it is likely to take a VoIP provider to meet current requirements on network integrity and service reliability, in the event that Option 2 is adopted.

Q.8 Do you have any comments on complying with the other PATS General Conditions, in the event that Option 2 is adopted?

Q.9 Referring to the full Impact Assessment in Annex 5, do you agree with Ofcom's approach to assessing the potential costs and benefits of policy Options 1 and 2?

Q.10 Do you agree that 3 months would be a suitable compliance period, taking into account the steps VoIP providers would have to take to comply with the modification to General Condition 4 and any additional General Conditions and the need to reduce the risk of harm to consumers and citizens? Please give detailed calculations and reasoning to support your response.

Q.11 Do you have any comments on Ofcom's proposed approach to monitoring, review and enforcement?

Annex 5

Impact Assessment

Impact Assessment

- A5.1 The analysis presented in this annex represents an Impact Assessment (IA), as defined in Section 7 of the Communications Act 2003 (the Act).
- A5.2 Please send any comments on this IA to us by 5pm on 20 September, which is the closing date for this consultation. We will consider all comments before deciding whether to implement our proposals.
- A5.3 IAs provide a valuable way of assessing different options for regulation and showing why the preferred option was chosen. They form part of best practice policy-making. This is reflected in Section 7 of the Act, which provides that generally we have to carry out IAs where our proposals would be likely to have a significant effect on businesses or the general public, or when there is a major change in Ofcom's activities. As a matter of policy Ofcom is committed to carrying out and publishing IAs in relation to the great majority of our policy decisions. For further information about our approach to IAs see the guidelines, *Better policy-making: Ofcom's approach to impact assessment*, which are on our website.
- A5.4 The structure of this IA is as follows:
- i) the citizen and consumer interest in having access to the emergency services (hereafter 999 access) over VoIP and why market failure could justify mandating 999 access for some VoIP providers (paragraphs A5.5-A5.17);
 - ii) Ofcom's policy objectives (paragraphs A5.18-A5.21);
 - iii) the policy options that we are consulting on, which are "do not mandate 999 access" (Option 1) and "mandate 999 access for type 2 and type 4 VoIP"⁴⁹ (Option 2) (paragraphs A5.22-A5.27);
 - iv) the impacts of both options on stakeholders, especially VoIP providers and consumers (paragraph A5.28-A5.32);
 - v) the impacts of both options on competition and innovation, including market entry and exit decisions by VoIP providers (paragraphs A5.33-A5.38);
 - vi) the costs and benefits of each option. Under Method A we explicitly estimate (a) the costs and (b) the benefits of mandating 999 access over type 2 and type 4 VoIP services to derive (c) the estimated net benefits (paragraphs A5.42-A5.210). Under Method B, instead of explicitly estimating the benefits, we consider what is

⁴⁹ Type 2: VoIP Out services to make voice calls over the Internet to the PSTN (Public Switched Telephony Network) but not to receive calls from the PSTN.

Type 4: VoIP In and Out services to receive voice calls over the Internet from the PSTN and to make voice calls over the Internet out to the PSTN. See paragraph 3.3 of the consultation document. Ofcom would seek to mandate 999 access in respect of any VoIP services that fell under those definitions.

the minimum probability of saving a life by mandating 999 access for the benefits to at least cover the costs⁵⁰ (paragraphs A5.211-A5.229);

vii) policy recommendation (paragraph A5.230-A5.238).

The citizen and consumer interest

- A5.5 All PSTN services offer 999 access. However, some VoIP services offer 999 access and others do not. As discussed at paragraph 4.8 of the consultation document, Ofcom is concerned that consumers may be confused by the differences in the provision of 999 access over voice call services; they may attempt to dial 999 from a VoIP service that does not offer 999 access, leading to critical delays in reaching the emergency services. That could increase the risk of damages to property, personal injury or loss of life.
- A5.6 Ofcom is consulting on extending the protection of 999 access currently provided to users of PSTN services to users of VoIP services that offer calls out to the PSTN (type 2 and type 4 VoIP services).
- A5.7 This IA takes account of the effect of market failures such as imperfect information, externalities and the possible "merit good" nature of 999 access.⁵¹

Imperfect Information

- A5.8 Ofcom research shows that approximately 78% of UK households with a VoIP service that does not provide 999 access incorrectly think that it does provide 999 access or don't know if it does.⁵² They might only find out that their service does not provide 999 access when they try to use it in an emergency. This suggests a substantial lack of consumer awareness. Generally, that arises because there is a lack of information in the market or because the consumer fails to internalise (i.e., read, understand or take on board) the information that is made available.
- A5.9 To enable consumers to make informed decisions when signing up to a VoIP service and to reduce confusion among VoIP users, in the March 2007 statement⁵³ Ofcom set out a modification to GC 14, which requires VoIP providers to provide new and existing customers with information about the availability and standard of 999 access (see March 2007 Statement from paragraphs 5.11 and 5.16). Providers were required to comply with that code by 29 May 2007.
- A5.10 But Ofcom considers that, even where VoIP providers provide relevant information to prospective customers, it may be inherently difficult for them to recognise the importance of 999 access (and information about it) because they have other more immediate priorities like price and daily functionality; 999 access is something they

⁵⁰ Where the implied minimum probability is plausible (i.e. sufficiently low) it suggests that intervention is justified.

⁵¹ In theory, market failure represents a necessary, but not a sufficient, condition for justifying intervention in markets. An IA should consider not only the presence of market failure, but also recognise risks that are associated with regulatory intervention and the possibility that intervention itself could make society worse off (regulatory failure). Our Cost-Benefit Assessment (CBA) considers the costs of regulation, and therefore explicitly takes the concept of regulatory failure into account.

⁵² Ofcom communications tracking survey, Q4, 2006. See Ofcom *Research Report: Voice over Internet Protocol (VoIP)*, www.ofcom.org.uk

⁵³ *Regulation of VoIP Services: Statement and publication of statutory notifications under section 48(1) of the Communications Act 2003 modifying General Conditions 14 and 18*, Ofcom, 29 March 2007 <http://www.ofcom.org.uk/consult/condocs/voipregulation/voipstatement/voipstatement.pdf>

might need in the distant future, if at all. Existing users might not pay sufficient attention to information, fail to recall it at a later date or simply become confused in a stressful emergency situation when it is necessary to call 999.

- A5.11 Another point is that a consumer who knowingly signs up to a VoIP service without 999 access might fail to consider the benefits of 999 access for others who might need to call 999 in the future. For example, consumers might not take into account flatmates, relatives or visitors to their household.
- A5.12 In this respect, it can be argued that 999 access is a merit good, meaning it is a highly socially desirable service (like schooling) that should be made mandatory (i.e. no-one should be able to opt out).

Externalities

- A5.13 Also, Ofcom has considered the question of free riding in relation to 999 access. Free riding is often associated with externalities, especially the provision of public goods like 999 access or street lighting or defence. Free riding occurs when a person (a free rider) receives the benefits of a product or service but does not contribute to its cost. In our case, a VoIP provider that does not provide 999 access could free ride on providers that do offer 999 access by relying on its customer using another provider to make a 999 call or on another provider's customer calling on its customer's behalf. Because providers must provide 999 access free of charge, free riding could enable VoIP providers that don't offer 999 access to save costs. Consumers could free ride on other consumers in the same way.
- A5.14 Free riding is only a problem if it reaches a level that puts the provision of higher quality services in jeopardy because they can no longer be funded. As such, free riding needs to be assessed on an individual basis. VoIP take-up is growing and VoIP is increasingly promoted as a complement to or a substitute for PSTN services, which provide 999 access (see from paragraph A5.155). There would be a free riding problem if the high level of provision of voice call services with 999 access fell, increasing the number of 999 calls made through the providers that did provide access, until they struggled to fund the service. That would affect general social welfare.
- A5.15 Depending on the costs and benefits, regulation could provide the mechanism to extend the current obligation on PSTN providers to provide 999 access to type 2 and type 4 VoIP providers.
- A5.16 Present regulation requires PATS providers to provide 999 access free of charge and, to the extent technically feasible, provide caller location information to the emergency organisations to help them handle 999 calls efficiently (GC 4). Regulating to ensure a high level of 999 access is maintained could help limit damage to property or physical injury and could help save lives.
- A5.17 For the purposes of this IA, Ofcom has assessed the costs and benefits of its policy options regarding the potential to save lives only.

Ofcom's policy objective

- A5.18 As discussed from paragraph 4.2 of the consultation document, Ofcom's policy objective is to ensure consumers and other citizens have a high level of 999 access as VoIP services develop and consumer take-up grows. The provision of 999 access by all providers offering VoIP voice calls out to the PSTN has not occurred

in the absence of regulation. Ofcom is now consulting, therefore, on its proposal to mandate the provision of 999 access by all type 2 and type 4 VoIP providers (Option 2). The proposed modifications to GC 4, set out in Annex 6, are intended to implement that proposal.

- A5.19 This Impact Assessment considers two options:
- Option 1: Do not mandate 999 access for VoIP services
 - Option 2: Mandate 999 access for type 2 and type 4 VoIP services
- A5.20 The question for Ofcom in the IA is whether Option 2 represents the most appropriate course of action, in light of other options including that of doing nothing (Option 1).
- A5.21 Ofcom's principal duty in carrying out its functions, as set out in Section 3(1) of the Act, is to further the interests of citizens in relation to communications matters, and to further the interests of consumers in relevant markets, where appropriate by promoting competition. Section 4 of the Act sets out Ofcom's duties for the purposes of fulfilling community obligations. In relation to the policy proposals set out in this document, Ofcom has considered all the requirements in those sections and, in particular, its duty to further the interests of citizens and consumers in relevant markets, where appropriate by promoting competition.

Analysis of policy Options 1 and 2

- A5.22 In this IA, Ofcom weighs up two options for responding to the question of 999 access over VoIP. Ofcom considers those options reflect its bias against regulatory intervention to encourage innovation and the need to regulate to protect citizens and consumers. The options are:
- Option 1: Do not mandate 999 access for VoIP services
 - Option 2: Mandate 999 access for type 2 and type 4 VoIP services
- A5.23 Option 1 represents the counterfactual market or benchmark against which we assess the incremental net effects of Option 2.
- A5.24 In principle, Option 1 should reflect any market-based or regulatory developments to date that might affect compliance, consumer awareness about 999 access over VoIP or the potential for lives to be saved.
- A5.25 Ofcom has made an exception for the *Code on the provision by Service Providers of consumer information to Domestic and Small Business Customers for the provision of Services* (the Code of Practice) included in GC 14, which entered into force following Ofcom's March 2007 Statement (see from paragraph A5.79). Ofcom considers it is difficult to precisely estimate the impact of greater information provision on factors like consumer awareness, as necessary for inclusion in the counterfactual. Ofcom considers it is more appropriate to consider any impact in a sensitivity analysis as part of Option 2.
- A5.26 For the purposes of this IA, therefore, Ofcom considers the net benefit of Option 1 is zero because there are no additional compliance costs and no additional benefits

(i.e. no lives saved). Option 2 (Method B) will include a sensitivity analysis to consider any net benefits arising from compliance with the new Code of Practice and the incremental effects of mandating 999 access.

A5.27 Under Option 2, Ofcom proposes to mandate 999 access for type 2 and type 4 VoIP services only. A survey of VoIP users conducted for Ofcom in October 2006 (the October 2006 research) showed that, combined, these services are used by approximately 65% of all VoIP households.⁵⁴ With regard to its policy objectives, Ofcom considers it is appropriate to assess the costs and benefits of mandating 999 access for all VoIP services that offer outbound calls to ordinary numbers in aggregate. See from paragraph 4.52 of the consultation document for an explanation.

What are the impacts of policy Options 1 and 2 on different types of stakeholders?

- A5.28 This section summarises the costs and benefits of Option 1 and Option 2 for VoIP providers, consumers and other citizens.
- A5.29 Option 1 means maintaining the status quo. It has no net benefits and no costs incurred. Accordingly, it would have no incremental impacts on stakeholders.
- A5.30 Ofcom considers Option 2 would deal with the possibility of lives being at risk because of confusion about 999 access over VoIP. That would benefit consumers who have a type 2 or type 4 VoIP service in particular and citizens in general. Type 2 and type 4 VoIP providers would incur some incremental costs.
- A5.31 We assume that consumers who have type 2 or type 4 VoIP services remain on those services over the period of analysis (i.e. 2007/08 - 2011/12). One possibility is that, if compliance costs for Option 2 are passed on to consumers, consumers might switch to a type 1 VoIP service (no 999 access) or substitute towards a PSTN service (999 access). That would reduce the incremental benefits of Option 2 for consumers and other citizens.
- A5.32 Also, if they meet the other PATS gating criteria, providing 999 access under Option 2 would make type 4 VoIP providers PATS providers and liable to comply with the PATS GCs (see from paragraph 3.17 of the consultation document). Type 2 VoIP providers would remain PECS providers because they offer outgoing calls only to the PSTN. PECS providers are subject to fewer GCs than PATS providers, which means the cost of complying with Option 2 is higher for type 4 VoIP providers. But Ofcom considers the benefits would still significantly exceed the costs.

Identifying any impacts on competition and innovation

- A5.33 Option 1 represents the counterfactual market, where Ofcom does not mandate 999 over any type of VoIP. Accordingly, there is no incremental impact on market entry, exit, off shoring or innovation by VoIP providers.
- A5.34 Regarding Option 2, Ofcom recognises that some VoIP providers consider they provide an innovative service that is intended to be differentiated from PSTN

⁵⁴ Base 500 VoIP users. More information about the results of the quarterly Ofcom communications tracking survey for Q.4 2006 and the October 2006 research are available in the Ofcom *Research Report: Voice over Internet Protocol (VoIP)*, www.ofcom.org.uk.

services and should not be subject to regulation that requires them to offer traditional PSTN services like 999 access.

- A5.35 But Ofcom also recognises that, from a consumer perspective, many VoIP services “look and feel” similar to traditional PSTN services (despite the different technologies and costs underpinning them). Consumer and citizen confusion about the availability of 999 access over VoIP is of serious concern to Ofcom.
- A5.36 In general, if companies are deterred from entering a market that can result in efficiency losses because the innovation and dynamic efficiency benefits of additional entry are forgone. Based on a survey of VoIP providers and potential providers conducted for Ofcom by Intercai Mondiale (the Intercai survey),⁵⁵ Ofcom considers only the smallest providers in the market would be likely to consider the cost of complying with Option 2 a deterrent to entry. Because there are already over 30 providers in the market, Ofcom considers additional small firm entrants that provide type 2 or type 4 VoIP services are unlikely to significantly contribute to overall welfare (e.g. net benefit).
- A5.37 Ofcom is not aware that any providers have considered exiting the market (or would consider deferring entry to the UK) on the basis of Option 2 and does not consider Option 2 is likely to have a medium or long term impact on entry or exit conditions.
- A5.38 In conclusion, Ofcom considers any reduction in innovation by type 2 and type 4 VoIP providers or in dynamic gains in the voice call market as a result of Option 2 would not be significant.

Assessing impacts and choosing the best option

- A5.39 Ofcom has conducted a Cost-Benefit Assessment (CBA) to compare the costs and benefits of policy Option 2 with the counterfactual market in Option 1.
- A5.40 Given its bias against regulatory intervention, Ofcom considers a clear case must be made for any imposition of regulation and that prospective benefits should exceed any costs.
- A5.41 This section explores the key costs and benefits of Option 1 and Option 2 in more detail, including which stakeholders would be likely to incur costs or receive benefits, and the net costs or benefits.

Option 1: Do not mandate 999 over VoIP

- A5.42 By definition, Option 1 has no net benefits (i.e. because there are no lives saved) and no costs incurred (i.e. no compliance costs). Option 1 leaves the market to determine economic efficiency and social outcomes, subject to existing regulation.

Option 2: Mandate 999 access for type 2 and type 4 VoIP services

Methodology

- A5.43 Ofcom takes two approaches to developing its CBA: Method A and Method B. In part, these approaches reflect the availability of quantitative and qualitative data.

⁵⁵ M. Norris and S. Hodson, *Emergency Service Access and the Impact of Compliance with General Conditions on VoIP Providers*, Intercai Mondiale, October 2006, www.ofcom.org.uk

Method A

- A5.44 This approach assesses whether Option 2 is likely to have a net benefit when the quantifiable costs are deducted from the quantifiable benefits.
- A5.45 Ofcom is able to make what we consider plausible conservative estimates of close to 100% of the identified costs.
- A5.46 But we can only quantify the benefits of a fraction of all 999 calls. Specifically, we are only able to reliably quantify the benefits of lives saved in relation to life-threatening 999 calls to ambulance services (see from paragraph A5.135). We quantify, therefore, the benefits of Option 2 in relation to approximately 4.3% of all 999 calls made⁵⁶ (i.e. 653,580 out of approximately 15.3 million 999 calls).

Table 1 Quantifiable benefits based on 4.3% of all 999 calls

	Ambulance service	Police, Fire, or Coastguard service
Life-threatening 999 calls	4.3%	X%
Non-life-threatening 999 calls	31.4%	64.3%-X%

Source: Ofcom, 911/112 Liaison Committee

- A5.47 Hence under Method A, we identify the net benefits that arise when 100% of costs are deducted from the benefits, in relation to only 4.3% of 999 calls.⁵⁷ If we use “B” for benefits and “C” for costs, where $B - C = \text{net benefit}$, we can be confident that any positive net benefit will be understated.
- A5.48 Under this method, however, Ofcom must make an assumption about the probability that lives are saved (see from paragraph A5.132). Although Ofcom estimates a range of probabilities and then relies on the low end estimate, the true underlying values remain uncertain. In response, Ofcom has considered an alternative formulation of the CBA in Method B.

Method B

- A5.49 To overcome the need to specify the probability of a life being at risk or saved under Method A, Ofcom’s second approach is to ask a slightly different question:

“What is the minimum probability that confusion would result in loss of life in the absence of mandated 999 access, which is consistent with the benefits of mandating 999 access at least equalling the cost.”

⁵⁶ 911/112 Liaison Committee. 999 calls to ambulance services represent 35.7% of all 999 calls. Calls to fire, police and coastguard services represent 65% of all 999 calls. In respect of 999 calls to ambulance services, 12% are classed as life-threatening (35.7% times 12% = 4.3%) and 88% as non life-threatening calls (35.7% times 88% = 31.4%).

⁵⁷ This is not to say that the benefits would necessarily scale linearly (i.e. you could not infer that the benefits for 100% of 999 calls would be equivalent to grossing the benefits from 4.3% of calls up to 100% e.g. by multiplying those benefits by 25). Clearly, life-threatening calls will result in greater incidents where lives are at risk than non life-threatening calls.

A5.50 Under this approach, instead of assuming the probability of a life being at risk, we derive the probability as a parameter by setting up the CBA as follows:

$$B - C \geq 0 \text{ or } B \geq C.$$

A5.51 Under this formulation, for any level of costs, there will be a benefit equal to or greater than costs, for which there is an associated probability that lives are at risk or can be saved (see from paragraph A5.211). The policy decision then turns on whether that probability of loss of life is plausible and justifies Option 2.

Method A

Costs

A5.52 This section identifies the quantitative and qualitative costs of Option 2.

A5.53 Ofcom considers regulatory compliance costs are the key costs. We analysed them as follows. First, we identified the individual GCs that type 2 and type 4 VoIP providers would have to comply with if they provided 999 access. Second, we considered the cost estimates reported by VoIP providers in the Intercai survey by taking the average costs for groups of providers with similar cost structures. Here we describe in more detail what compliance with each GC would entail. Third, using Ofcom consumer research data, we grossed up those cost estimates using weights to reflect the estimated structure of the VoIP industry.

Step 1: Identifying new areas of compliance for type 2 and type 4 VoIP providers

A5.54 Under Option 2, type 2 and type 4 VoIP providers would incur the costs of complying with GC 4, as modified (see Annex 6 of the consultation document). That would include the cost of providing 999 calls free of charge to the consumer, the cost of interconnecting to a network operator (directly or indirectly) to access the emergency services and the cost of providing consumer location information data to that operator.

A5.55 The Code of Practice included in GC 14 would place a similar amount of obligations on type 2 and type 4 VoIP providers under Option 1, where they don't provide 999 access, and under Option 2, where they do provide 999 access. The costs of complying with that, therefore, are not considered in this CBA.

A5.56 For type 4 VoIP providers, we also consider the cost of complying with additional GCs that are relevant to PATS providers (i.e. GCs 3, 5, 8, 10-13 and 15), where they are met at the relevant PATS provider standard.

Step 2: the Intercai survey – providers' own estimates of compliance costs

A5.57 The Intercai survey focuses on 12 VoIP providers and potential providers, which fall into three groups: six on-net VoIP providers⁵⁸ (BT, Orange, Tiscali, Thus, Verizon and Easynet), four Internet-based VoIP providers⁵⁹ (Skype, Vonage Gradwell and Viatel) and two wholesale VoIP providers⁶⁰ (Gamma and Magrathea). It presents

⁵⁸ A provider that provides a VoIP service and a broadband service over their own network.

⁵⁹ A provider that provides a VoIP service only; the consumer has a broadband service from another provider.

⁶⁰ This includes providers of interconnect services.

their estimates for the costs of (a) enabling 999 access and (b) meeting other relevant GCs. Some of those estimates are projections and some are based on experience.⁶¹

A5.58 Providers typically graded the estimated costs of enabling 999 access and meeting GC 4 as low, medium or high.

A5.59 Providers that were or would become a PATS provider as a result of Option 2 also graded the estimated cost of complying with the additional GCs (i.e. GCs 3, 5, 8, 10-13 and 15) as low, medium or high. Table 2 sets out the cost ranges assigned to those grades.

Table 2: Cost ranges for complying with GCs 3, 5, 8, 10-13 and 15

Cost range	Set-up costs (range) (£)	Ongoing costs (range) (annual) (£)	Set-up costs (midpoint) (£)	Ongoing costs (midpoint) (annual) (£)
Low	0 - 49,999	0 - 19,999	25,000	10,000
Medium	50,000 - 499,999	20,000 - 199,999	275,000	110,000
High	>500,000	>200,000	750,000 ⁶²	300,000 ⁶³

Source: *Intercai*

A5.60 When interpreting the survey results for medium and high cost categories, Ofcom took the midpoint of the cost range given by each provider to represent their cost of complying with a particular GC. We didn't do that for the low cost range; in almost all cases, providers stated that the costs would be business as usual (i.e. incremental costs were zero). Accordingly, we treat those costs as zero.⁶⁴

A5.61 The following section describes the providers' estimated compliance costs for each GC and Ofcom's estimate of the average costs.

Costs of type 2 and type 4 VoIP providers providing 999 calls

A5.62 GC 4, as modified under Option 2, would require type 2 and type 4 VoIP providers to ensure that any end-user has 999 access at no charge. It would still require providers of a Public Telephone Network to make caller location information available to the emergency services handling a 999 call, to the extent technically feasible.

A5.63 Set-up costs of compliance, therefore, would include the cost of entering into an agreement to interconnect with a network for emergency services access (directly with BT or Cable & Wireless or indirectly through a third party) and, because those

⁶¹ Costs reported by individual suppliers were provided to Intercai on a confidential basis and therefore Ofcom does not attribute reported costs to named suppliers (i.e. where individual costs are referred to we anonymise the reported cost).

⁶² Following discussions with the author of the Intercai survey, Ofcom assumed the ceiling of high category costs was approximately £1,000,000, implying a mid-point cost of £750,000.

⁶³ Following discussions with the author of the Intercai survey, Ofcom assumed the ceiling for ongoing costs was £400,000, implying a mid-point cost of £300,000.

⁶⁴ But when interpreting the Intercai survey results for 8 providers we have assumed an "overhead" cost of meeting all remaining GCs of £25,000 each.

interconnecting networks would be obliged to provide location information, the cost of collecting, formatting and sending customer location data to them.

A5.64 Some providers (principally on-net providers and some larger Internet-based providers) already comply with the GC 4 requirements so for them the incremental cost of meeting Option 2 would be zero. In the next step, where average costs are grossed up to reflect the estimated industry structure, the industry provider weights are reduced to reflect that fact (see from paragraph A5.111). But Ofcom considered it appropriate to include their reported costs when calculating the average costs that are incremental to Option 2 because they are reliable (i.e. they are actual costs) and they could reasonably be expected to be the costs faced by similar VoIP providers that aren't yet GC 4 compliant.

A5.65 Estimates of set-up costs ranged from zero to £750,000.⁶⁵ The variance in reported costs broadly reflects the variance in the size of providers and their installed consumer base. For instance, one smaller Internet-based VoIP provider reported:

“In terms of costs, it is likely that the additional interconnect would not be significant.”⁶⁶

A5.66 Another smaller Internet-based VoIP provider said:

“The set-up costs for 999 access is in the order of £15,000, split between the writing of the data input utility for the consumer information and the additional equipment cost for secure physical interconnect.”⁶⁷

A5.67 Those cost estimates contrast with the higher costs reported by the larger Internet-based VoIP providers and on-net providers. One of those providers stated:

“The anticipated set up costs for 999 access would be high. In addition to the task of ensuring the data is correctly formatted, there would also be equipment cost in building the physical interconnect.”⁶⁸

A5.68 Ofcom's interpretation is that costs appear higher for larger providers mainly because they have large installed consumer databases, some of which are on one or more legacy systems that require or have required significant software upgrades to ensure data is in the relevant format so that consumer location information can be transferred to the emergency services for a 999 call.

A5.69 Ongoing costs of compliance would reflect the cost of subsidised 999 calls (approximately £0.50-£0.60 per call)⁶⁹ although, assuming there are a fixed number of 999 calls, it's likely that those explicit monetary call costs would be offset by a corresponding reduction in 999 calls provided by PSTN providers so that there would be no net cost to society of per call costs.^{70,71}

⁶⁵ Intercai survey, as before.

⁶⁶ Intercai survey, as before.

⁶⁷ Intercai survey, as before.

⁶⁸ Intercai survey, as before.

⁶⁹ Intercai survey, as before.

⁷⁰ Ofcom has assumed that the costs of providing 999 calls over VoIP networks are the same as for PSTN networks. If it were the case that the cost of providing such calls on VoIP was cheaper than for PSTN networks, this could imply a net benefit to society. In those cases where 999 calls over VoIP

A5.70 Based on all of the survey results, Ofcom estimates the average set-up cost per on-net provider would be £220,500, which reflects actual costs already incurred. We estimate the average set-up cost per Internet-based VoIP provider would be £157,500, which reflects costs already incurred (by larger VoIP providers) and estimated costs. Ofcom has not included the ongoing costs of providing 999 calls free of charge, for the reasons explained above.

Costs of type 4 VoIP PATS providers complying with other PATS General Conditions

Proper and effective functioning of the network (GC 3)

- A5.71 GC 3 requires providers of PATS at fixed locations to take all reasonably practicable steps, to the greatest extent possible: (i) to maintain the availability of PATS in cases of catastrophic network breakdown or *force majeure*; (ii) to provide uninterrupted 999 access as part of any PATS.
- A5.72 In its March 2007 Statement, Ofcom said it considers nomadic VoIP services are subject to requirement (i) on network integrity and reliability when they are provided at a contractually agreed location that is fixed in nature (e.g. the end user's residential home or business) but not when they are used in locations that are not fixed like a Wi-Fi hotspot at a hotel or cafe⁷². GC 3 does not apply to mobile VoIP services.
- A5.73 Under the Ofcom Guidelines on the application of PATS obligations to VoIP service providers (the Guidelines),⁷³ Ofcom considers providers should take all possible steps to ensure network integrity and reliability and should do so to the greatest extent possible, but only for the aspects of the end-to-end network that they control. If we were to investigate possible breaches of that requirement, Ofcom would: expect a VoIP provider that provides 999 access to have carried out a formal risk assessment for that service;⁷⁴ consider what Service Level Agreements (SLAs) on quality and reliability the VoIP provider has entered into with their underlying network service providers – Ofcom may expect those SLAs to provide for the

are unsuccessful, the issue is then whether the householder has sufficient time to revert to a PSTN service. One of the key considerations of the proposal in this IA is that in some cases, attempting a 999 call using a VoIP service can lead to critical delays leading to a reduction in life chances. Here the social costs could be considerable.

⁷¹ Ofcom notes that in some cases, individual suppliers will bear a greater per 999 call cost (e.g. where they do not at present subsidise the cost of 999 calls made using PSTN services). However, Ofcom considers these additional costs would not be disproportionate relative to the benefit that would accrue to users whose lives would be protected if Ofcom mandated 999 access.

⁷² Statement on the Regulation of VoIP Services, 29 March 2007, paragraph 4.86: Ofcom considers this position is not satisfactory in the long-term because VoIP services are increasingly used on the move. Ofcom will consider this matter further in its forthcoming review of the GCs. It will also contribute to the Commission's ongoing review of the EU regulatory framework.

<http://www.ofcom.org.uk/consult/condocs/voipregulation/voipstatement/voipstatement.pdf>

⁷³ Ofcom, *Guidelines on the application of PATs obligations to VoIP service providers*, Statement on the Regulation of VoIP Services, 29 March 2007.

⁷⁴ That is expected to include: producing a model of the network elements used to provide that service; defining a set of performance parameters which characterise the end to end performance of that service (e.g. MTBF); identifying which of the elements are most likely to fail, or suffer from degraded performance, and what the consequence would be for the performance parameters; determining which elements are critical in relation to the end-to-end service performance, and what risk mitigation strategy might reasonably be adopted in relation to those elements; and determining and implementing a risk mitigation strategy that might reasonably be adopted in relation to those critical elements.

service classes and characteristics of VoIP traffic; consider any provisions to ensure continuity of service in the case of a power outage at a customer's premises.

A5.74 In the Intercai survey, some on-net VoIP providers argued that guaranteeing the integrity and reliability of VoIP services across their broadband networks would require high set-up and ongoing costs, especially because the networks can get congested at peak times, causing the transport of VoIP traffic to deteriorate. One on-net provider commented:

“On the basis of past GC3 conditions, the estimated costs both for set up and ongoing costs would be high. For the former, there is the cost of building resilience into the network; the latter involves more maintenance costs.”

A5.75 Another on-net provider said:

“To carry out the risk assessments, negotiations to secure the desired level of network resilience and to build platform resilience carries a high one-off cost. Ongoing costs are expected to be high as we would aim to maintain reliability as the customer base grows.”

A5.76 But some on-net VoIP providers have already incurred those network-related costs in relation to their own PATS VoIP service, meaning the incremental costs of Option 2 would be zero for them. The level of costs incurred by all on-net providers remains relevant to the analysis of costs – see from paragraph A5.107).

A5.77 Estimates of compliance costs varied more among Internet-based VoIP providers than on-net providers because of differing interpretations of the network integrity requirements under GC 3.

A5.78 Some Internet-based VoIP providers thought GC 3 would require them to ensure network integrity for the end-to-end network by entering into SLAs with all of the broadband providers involved in call conveyance. Based on that view, two large Internet-based providers indicated very high additional compliance costs.⁷⁵ One large Internet-based VoIP provider stated:

“This condition cannot be realistically met unless the operator has direct control over the network. A VoIP operator [i.e. an on-net VoIP provider] has direct control over the network. A VoIP provider [i.e. an Internet-based VoIP provider] often has no visibility of the network that underpins their service, so cannot guarantee availability. Service level agreements do not solve the problem as they primarily serve as a contract tool between providers”.⁷⁶

A5.79 Another large Internet-based VoIP provider stated:

“Because VoIP operators do not operate in the traditional vertical network supply chain, when considering service level agreements it must be recognised that it is the customer who determines the means of broadband access and a VoIP provider will not know the

⁷⁵ They did not provide quantitative estimates but instead implied costs would be prohibitively high.

⁷⁶ Intercai survey, as before. In Ofcom's 2004 consultation, most respondents were of the opinion that service level agreements (“SLAs”) between VoIP service providers and infrastructure providers were an effective way of ensuring network integrity and reliability. Ofcom is of the view that such agreements may help improve network integrity.

identity of the access provider. Any requirement to negotiate service level agreements at the network provider level over which [supplier's name] has no control is therefore impracticable and unenforceable, and would require a significant amount of technical, operational and legal resource.

In addition, there is no obligation on network providers to negotiate and conclude service level agreements with VoIP providers on reasonable, commercial terms and within reasonable timescales. To maintain a competitive advantage, ISPs are also unlikely to provide service level agreements at all on the basis that to do so would encourage their customers to contract for services elsewhere. Given that no ISP has significant market power, it will be impossible to force any ISP to provide service level agreements.

[supplier's name] would not view the establishment of service level agreements as feasible given the number of relationships that would need to be established and with all possible carriers of [supplier's name] service, it is unlikely that a guaranteed level of end-to-end service could be derived from the combination of its components.”⁷⁷

A5.80 Those that interpreted GC 3 in line with Ofcom's Guidelines assessed the costs of compliance as business as usual (i.e. incremental costs of compliance would be zero or close to zero). One Internet-based VoIP provider stated:

“There is an inherent drive to meet the general condition for effective functioning, as failure to do so results in a loss of customer confidence and, ultimately, business. Hence the available mechanisms to assure services are being exercised irrespective of any general conditions.”⁷⁸

A5.81 Ofcom considered that, for Internet-based VoIP providers, the more relevant cost estimates are those on a business as usual basis.

A5.82 In summary, VoIP provider estimates of compliance set-up costs ranged from zero to £750,000, and ongoing costs ranged from zero to £300,000.⁷⁹

A5.83 Based on all of the survey results, Ofcom estimates the average set-up/ongoing costs per on-net provider would be £295,833/£118,333, reflecting actual incurred costs and estimated costs. Ofcom estimates the average set-up/ongoing costs per Internet-based VoIP provider would be zero/zero.

Emergency Planning (General Condition 5)

A5.84 GC 5 requires PATS providers to make arrangements for the provision or rapid restoration of communications services as practicable and as may reasonably be required in disasters.

A5.85 Ofcom interprets the Intercai survey results as showing compliance costs would be largely business as usual costs and would not be incremental to Option 2. For instance, a large Internet-based VoIP provider responded:

⁷⁷ Intercai survey, as before.

⁷⁸ Intercai survey, as before.

⁷⁹ Intercai survey, as before.

“Contingency and emergency planning is in place for all network elements under [provider’s name’s] control. Furthermore, the ability to reroute traffic via alternative data centres allows [provider’s name] to provide high resilience”.⁸⁰

A5.86 But one on-net provider suggested differently. It indicated its estimates are “notional only” and that it hadn’t sought to estimate a figure reflecting “relative unknowns” including “natural disaster, emergency planning or network restoration”. This provider claimed set-up and ongoing costs would be high (£750,000 and £300,000, respectively).

A5.87 Based on all of the survey results, Ofcom estimates the average set-up/ongoing costs would be £125,000/£50,000 per on-net provider and zero/zero per Internet-based VoIP provider.

Provider assistance, Directories and Directory Enquiry Facilities (General Condition 8)

A5.88 This GC requires PATS providers to provide operator assistance, access to Directory Enquiries with information on all subscribers in the UK that have a telephone number regardless of their network, and a directory of all numbers in the subscriber’s local area or beyond on request.

A5.89 Ofcom considers that in the Intercai survey, only one provider reasonably estimated costs to be other than business as usual. This on-net provider reported set-up and ongoing costs as medium (£275,000 and £110,000, respectively). The provider said,

“the directories requirements will be included on a product by product basis and will require system and order processing changes”.

A5.90 Based on all of the survey results, Ofcom estimates the average set-up/ongoing costs would be £45,833/£18,333 per on-net provider and zero/zero per Internet-based VoIP provider.

Transparency and publication of information (General Condition 10)

A5.91 GC 10 requires PATS providers to publish clear and up to date information on applicable prices and tariffs and standard terms and conditions.

A5.92 Two on-net providers indicated set-up costs of £275,000 and ongoing costs of £110,000 each. One of the on-net providers justified those costs as follows:

“The proposed VoIP Code has required a lot of changes to systems covering orders, product information or terms and conditions”.⁸¹

But Ofcom interprets the survey as indicating compliance costs would be largely business as usual.

A5.93 Based on all of the survey results, Ofcom estimates the average set-up/ongoing costs would be £91,667/£36,667 per on-net provider and zero/zero per Internet-based VoIP provider.

⁸⁰ Intercai survey, as before.

⁸¹ Intercai survey, as before.

Metering and billing (General Condition 11)

- A5.94 This GC requires PECS providers to ensure the accuracy of end user bills and to retain billing records as necessary. It places additional billing requirements on PATS providers but only if they have a turnover (after sales rebates and tax) from PATS services of over £40 million in the most recent complete financial year.
- A5.95 Most providers viewed the costs of complying with this condition as largely business as usual. Among the on-net providers, one considered that if there were incremental set-up and on-going costs, they would be low. Another estimated that they would be medium. A third estimated high set-up costs and medium on-going costs; a fourth considered compliance would be a “major expense”.
- A5.96 Based on all of the survey results, Ofcom estimates the average set-up cost/ongoing costs would be £170,833/£36,667 per on-net provider and zero/zero per Internet-based VoIP provider.

Itemised Bills (General Condition 12)

- A5.97 This condition requires providers to provide a basic level of itemised billing that enables consumers to verify and monitor their expenditure.
- A5.98 Most providers viewed the costs of complying with this condition as business as usual. Two on-net providers considered there would be incremental set-up and on-going costs and that they would be medium.
- A5.99 Based on all of the survey results, Ofcom estimates the average set-up/ongoing costs would be £91,667/£36,667 per on-net provider and zero/zero per Internet-based VoIP provider.

Non-payment of bills (General Condition 13)

- A5.100 This condition sets out measures that may be taken by a communications provider to effect payment or disconnection in the event of non-payment of bills.
- A5.101 Most VoIP providers considered the costs were business as usual. Two on-net providers considered the costs would be incremental and estimated set-ups costs as medium and on going costs as medium and low, respectively.
- A5.102 Based on all of the survey results, Ofcom estimates the average set-up/ongoing cost would be £91,667/£18,333 per on-net provider and zero/zero per Internet-based VoIP provider.

Special measures for end users with disabilities, including consultation with representative bodies and support for disabled users, such as text relay (General Condition 15)

- A5.103 GC 15 requires providers to offer deaf users an approved text relay service and to ensure that provides 999 access, among other things.
- A5.104 Most VoIP providers said they could readily meet the spirit of GC 15 by providing a text support service like instant messaging, but that it would be difficult to provide a text relay service that complies with the standard set in GC15 (which was written with PSTN technology in mind), based on their interpretation of GC15. One on-net provider said that, to meet parts of GC 15, set-up and on-going costs would be medium.

A5.105 Based on all of the survey results, Ofcom estimates the average set-up/ongoing cost would be £170,833/£18,333 per on-net provider and zero/zero per Internet-based VoIP provider.

Summary of compliance costs

A5.106 Table 3 summarises Ofcom's estimates of the key compliance costs based on the Intercai survey of October 2006, adjusted to give cost estimates for the beginning of 2007/2008.

Table 3: Average set-up and ongoing costs (£) for on-net and Internet-based VoIP providers (2007/08 prices)⁸²

	GC 3	GC 4	GC 5	GC 8	GC 10	GC 11	GC 12	GC 13	GC 15	Other
Set up costs										
on-net	299,135	224,983	126,395	46,345	92,690	172,740	92,690	92,690	172,740	12,639
Internet-based	-	159,258	-	-	-	-	-	-	-	25,279
Ongoing costs										
on-net	119,654	-	50,558	18,538	37,076	37,076	37,076	18,538	18,538	-
Internet-based	-	-	-	-	-	-	-	-	-	-

Source: Ofcom, Intercai

Step 3: Grossing-up average provider costs to reflect estimated industry structure

A5.107 In the preceding sections, Ofcom derived estimated average compliance costs for on-net and Internet-based VoIP providers from the costs provided by providers. We will now multiply the average of those costs by the estimated number of on-net VoIP and Internet-based VoIP providers in the market to derive total industry compliance costs. Ofcom has information on many of the providers that are active in the market from its consumer research.

A5.108 The October 2006 research⁸³ identified 31 providers, which we assume to be a fair reflection of the industry's size.⁸⁴ The 31 named providers belonged to one of two provider types: there were 4 on-net VoIP providers and 27 Internet-based VoIP providers. Ofcom considers it is reasonable to gross up costs derived from the sample in the Intercai survey based on the consumer research, although the consumer research identified some smaller providers not included in the Intercai survey.

A5.109 We applied some adjustments to the provider group weightings before multiplying through average costs to represent the scenario where costs are not incremental to

⁸² Using the RPI (all items index excluding housing), reported costs were adjusted to reflect two quarters of inflation (up to Q1 2007) and therefore reflect cost estimates for the beginning of 2007/08. "Other" relates to unspecified costs for complying with the PATS GCs.

⁸³ See the Ofcom Research Report: *Voice over Internet Protocol (VoIP)*, www.ofcom.org.uk

⁸⁴ Some of these providers are white label brands (e.g. Tesco's is provided by Freshtel; MSN's is provided by Verizon; VoIPBuster, VoIPCheap, and VoIPStunt are all provided by Betamax). However, we have made an assumption that each has a different wholesale provider in the case of this example. This assumption may overstate the costs because it could include some costs that might need to be incurred only once (e.g. because a cost has been included for each retailer even though, if they share a wholesaler, the costs might need to be incurred only once). Ofcom has not adjusted this number on the grounds that it generates the highest possible cost, ensuring that any net benefit calculations are robust.

Option 2 for some providers because they already offer 999 calls to GC 4 standard and, for type 4 VoIP, meet the PATS GCs at PATS standard.

- A5.110 On-net providers that already offer 999 calls include BT, Orange and AOL. Vonage and MSN (via Verizon)⁸⁵ are Internet-based VoIP providers that already offer 999 calls. We have, therefore, deducted three providers from the weighting for on-net providers and deducted two providers from the weighting for Internet-based VoIP providers.⁸⁶ The weighting for costs for offering 999 calls (i.e. complying with GC 4) is $4-3=1$ for on-net providers, and $27-2=25$ for internet-based VoIP providers.
- A5.111 In respect of compliance with the additional PATS GCs (i.e. GC 3, 5, 8, 11-15), Ofcom has, for the purpose of this particular calculation only, assumed that on-net providers BT and Orange are already compliant. Internet-based VoIP providers MSN and Skype should also be deducted on the basis that they offer type 2 VoIP, which is PECS. The weighting for costs of complying with the PATS GCs is $4-2=2$ for on-net providers and $27-2=25$ for Internet-based VoIP providers.
- A5.112 Ofcom has not applied a weighting for wholesale providers like Gamma or Magrathea. That is because they do not bear retail costs. We have used their cost information to crosscheck retailers' estimates of interconnection costs only; they seem consistent.

⁸⁵ MSN/Verizon should be in the on-net group for deriving average cost because Verizon's cost estimates included investment in their broadband network. However, when scaling up to reflect the market structure, MSN/Verizon is in the internet-based VoIP group because MSN does not sell broadband.

⁸⁶ Although these providers are removed from the weighting because they have already incurred the cost of meeting these GCs and the incremental cost of Option 2 is zero, their costs are included in the average cost for their provider group because they provide valuable information on the actual costs that would need to be incurred by others.

A5.113 Table 4 illustrates some of the key results. It shows the average costs of complying with GC 4 and the PATS GCs at 2007/08 prices.⁸⁷ It also shows the relevant weighting (or multipliers) used to gross the average costs for a sample of providers to represent industry costs. The grossed up industry costs are in the final column. In 2007/08, we estimate industry compliance with all relevant GCs would cost a total of approximately £7.7 million.

Table 4: Option 2: Estimated industry costs (£) (2007/08 prices)⁸⁸

	Average costs (£)	Number of firms estimated to incur incremental costs from proposal (£)	Grossed up industry costs (£)
Set-up costs			
On-net			
GC4	224,983	1	224,983
other GCs	1,095,423	2	2,190,847
other costs	12,639	2	25,279
Internet-based VoIP			
GC4	159,258	25	3,981,445
other GCs	0	25	0
other costs	25,279	25	631,963
Ongoing costs			
On-net			
GC4	0	1	0
other GCs	337,053	2	674,105
Internet- based VoIP			
GC4	0	25	0
other GCs	0	25	0
Total			7,728,622

Source: Ofcom, Intercai

⁸⁷ Using the RPI (all items index excluding housing), reported costs were adjusted to reflect two quarters of inflation (up to Q1 2007) and therefore reflect cost estimates for the beginning of 2007/08.

⁸⁸ Using the RPI (all items index excluding housing), reported costs were adjusted to reflect two quarters of inflation (up to Q1 2007) and therefore reflect cost estimates for the beginning of 2007/08.

A5.114 Ofcom also estimated costs per year over the five-year period of analysis between 2007/08 and 2011/12:

Table 5: Net Present Value (NPV) of grossed-up industry costs (2007/08–2011/12) (2007/08 prices)⁸⁹

	2007/08	2008/09	2009/10	2010/2011	2011/2012	Total (NPV)
Set-up costs (£)	7,054,516					7,054,516
Ongoing costs (£)	674,105	651,310	629,285	608,005	587,444	3,150,148
Total industry costs (£)	7,728,622	651,310	629,285	608,005	587,444	10,204,664

Source: Ofcom, Intercai

⁸⁹ Using the RPI (all items index excluding housing), reported costs were adjusted to reflect two quarters of inflation (up to Q1 2007) and therefore reflect cost estimates for the beginning of 2007/08.

A5.115 Ofcom then undertook a sensitivity analysis of the reported costs. Ofcom's approach was to consider the maximum possible costs that could be incurred by providers under Option 2. Wherever costs were reported in the medium or high cost bands, we considered those costs would be incurred at the maximum of that cost range.⁹⁰ Table 6 illustrates how we interpreted set-up and ongoing costs:

Table 6: Maximum costs applied for sensitivity analysis (2007/08 prices)

	Maximum costs (£)	Number of firms estimated to incur incremental costs from proposal (£)	Grossed up industry costs (£)
Set-up costs			
On-net			
GC4	1,011,161	1	1,011,161
other GCs	1,685,266	2	3,370,532
other costs	25,279	2	50,557
Internet-based VoIP			
GC4	505,580	25	12,639,509
other GCs	0	25	0
other costs	25,279	25	631,963
Ongoing costs			
On-net			
GC4	0	1	0
other GCs	539,284	2	1,078,568
Internet-based VoIP			
GC4	0	25	0
other GCs	0	25	0
Total			18,782,290

Source: Ofcom, Intercai

A5.116 We then took the average of the maximum reported costs to derive an upper-bound cost estimate of complying with Option 2 and meeting all relevant GCs for on-net and Internet-based VoIP providers.

⁹⁰ Costs that were not reported in the high or medium cost ranges were almost always reported as business as usual costs. Because the incremental costs would be zero (and any scaling of those costs would not increase the cost estimate) the values remain unadjusted.

A5.117 Table 6 reports the grossed up costs for the sensitivity check for 2007/08. Those costs are over double the costs reported in the base case (Table 4).

A5.118 Ofcom also estimated grossed up industry costs over the five-year period of analysis 2007/08 to 2011/12. Those costs are reported in Table 7. Ofcom's sensitivity analysis suggests that the maximum possible costs over that period could be £22.7 million.

Table 7: NPV of grossed up industry costs (2007/08–2011/12) (2007/08 prices) (sensitivity analysis)

	2007/08	2008/09	2009/10	2010/2011	2011/2012	Total (NPV)
Set-up costs (£)	17,703,722					17,703,722
Ongoing costs (£)	1,078,568	1,042,095	1,006,855	972,807	939,910	5,040,234
Total industry costs (£)	18,782,290	1,042,095	1,006,855	972,807	939,910	22,743,956

Source: Ofcom, Intercai

A5.119 Increased compliance costs could, in theory, raise barriers to entry for some VoIP providers or result in contraction or even exit by others. The Intercai survey suggests that the costs of providing 999 access and meeting other GC obligations would not be insignificant, meaning that it could deter the smallest providers (see paragraph A5.36). Ofcom considers the detrimental impact on overall entry (including innovation and dynamic efficiency losses) is likely to be small.

A5.120 Conversely, to the extent that compliance costs have a fixed element, additional entry could increase total compliance costs for the industry as a whole. We are not aware of any data that would enable us to make a reliable estimate of the rate of entry of VoIP providers over the coming years.

A5.121 Considering the past, of the 56 current members of ITSPA⁹¹, 16 providers were founding members in March 2004. Although it cannot be inferred that members who were not founding members all entered the market after March 2004, that indicates that there has been a high rate of entry into the provision of VoIP services to date. If that continued, Ofcom would need to take the additional industry compliance costs into account.

A5.122 In the absence of empirical data about the future rate of entry, therefore, we have conducted a sensitivity test to consider how industry compliance costs would vary with entry.

A5.123 First, Ofcom assumed that in each year between 2007/08 and 2011/12, there would be 2 new VoIP providers (i.e. 10 new providers over 5 years). We assumed that they would be Internet-based VoIP entrants.

⁹¹ Internet Telephony Services Providers Association, <http://www.itspa.org.uk>

A5.124 We estimated both the additional set-up costs and on-going costs borne by the industry through new entry in Table 8, which shows total industry costs would increase slightly to a total of approximately £11.5 million over the five-year period.

Table 8: NPV of grossed up industry costs (2007/08–2011/12) (2007/08 prices) (sensitivity analysis for Internet-based VoIP entry)

	2007/08	2008/09	2009/10	2010/2011	2011/2012	Total (NPV)
Set-up costs (£)	7,074,742	344,380	332,734	321,482	310,611	8,383,950
Ongoing costs (£)	674,105	651,310	629,285	608,005	587,444	3,150,148
Total industry costs (£)	7,748,848	995,690	962,019	929,487	898,055	11,534,098

Source: Ofcom, Intercal

A5.125 Ofcom also considered the scenario where, in addition to two Internet-based VoIP entrants, there is also one new on-net entrant every year between 2007/08 and 2011/12. Clearly this is a less likely scenario but it could be argued to represent a higher bound estimate of entry costs. Those costs are illustrated in Table 9.

Table 9: NPV of grossed up industry costs (2007/08–2011/12) (2007/08 prices) (sensitivity analysis for Internet-based and on-net VoIP entry)

	2007/08	2008/09	2009/10	2010/2011	2011/2012	Total (NPV)
Set-up costs (£)	8,407,788	1,677,426	1,577,147	1,523,813	1,472,283	14,613,378
Ongoing costs (£)	1,011,158	988,362	943,927	912,007	881,166	4,725,222
Total industry costs (£)	9,418,946	2,609,311	2,521,074	2,435,820	2,353,449	19,338,600

Source: Ofcom, Intercal

A5.126 The results show that total industry costs increased to approximately £19.3 million for the five-year period when we assumed 2 new Internet-based VoIP entrants per year and one new on-net entrant per year (i.e. 3 new entrants every year from 2007/08-2011/12).

A5.127 Ofcom considers that the assumption of 10 additional Internet-based VoIP entrants and 5 additional on-net VoIP entrants over 5 years (in addition to the existing 27 Internet-based providers and 4 on-net providers) is likely to overstate rather than understate the extent of entry and is, therefore, likely to overstate industry compliance costs going forward. VoIP entry rates were high several years ago and are presently high with the emergence of LLU competition, but Ofcom expects that

as the market matures over the next 5 years, entry will be more modest. The fact that on-net providers need to make a substantial investment at entry further supports this view. Accordingly, we consider our entry assumption is robust.

Summary

- A5.128 Ofcom's analysis of costs is based on three steps. First, we identified the individual GCs that type 2 and type 4 VoIP providers would have to comply with if they provided 999 access. Second, we considered the cost estimates reported by VoIP providers in the Intercai survey by taking the average costs for groups of providers with similar cost structures. Third, using Ofcom consumer research data, we grossed up those cost estimates using weights to reflect the estimated structure of the VoIP industry.
- A5.129 We estimated costs for the period 2007/08 to 2011/12. We took the set-up costs (i.e., one-off investment costs of enabling 999 access and meeting other GCs at PATS standards) and assumed they are incurred in 2007/08. For the purpose of being conservative, we assumed that ongoing costs reported by the providers represented annual ongoing costs (and not the NPV⁹² of ongoing costs that would ever be incurred). We estimated the annual ongoing costs that would be incurred over a 5 year period between 2007/08 and 2011/12. We discounted the costs over the period using the social discount rate of 3.5% as recommended in the HM Treasury Green Book,⁹³ to reflect the fact that society prefers to delay rather than incur costs.
- A5.130 We estimate the total industry compliance costs would be approximately £10.2 million, comprising an estimated £7.1 million of total set-up costs and an estimated £3.2 million of total ongoing costs (e.g. see Table 5).
- A5.131 We also undertook a range of sensitivities to consider the highest possible costs that could be attributed to Option 2 to mandate 999 access for type 2 and type 4 VoIP providers (e.g. see Table 6-Table 9).

Benefits

- A5.132 This section considers the benefits that could arise from requiring all type 2 and type 4 VoIP providers to provide 999 access (Option 2). Some benefits are quantified, while others are considered in a qualitative manner.

Quantitative assessment

- A5.133 The intended benefits of Option 2 are eliminating the consumer or citizen confusion that could result in critical delays in accessing the emergency services, potentially leading to loss of life. To determine the number of lives that are potentially at risk and that adopting Option 2 could save, we quantified the benefits of avoiding delays in contacting the ambulance service.
- A5.134 A delay of minutes or even seconds in successfully accessing 999 can reduce life chances to zero in certain situations. For instance, statistics produced by the

⁹² "NPV" is net present value. The NPV of future costs and benefits ("net" means that costs are subtracted from benefits) occurring over a number of years is the value of an equivalent single sum today, calculated by applying an appropriate discount rate to future amounts. The discount rate used by Ofcom to discount both future cost and benefit streams is the Social Time Preference Rate of 3.5% (in real terms).

⁹³ <http://greenbook.treasury.gov.uk/annex06.htm>

American Heart Association⁹⁴ suggest that a 30 second delay in ambulance services administering defibrillation to an individual suffering a cardiac arrest reduces life chances by 5%. This suggests that in this type of an emergency a delay of 30 seconds (resulting from a wasted attempt at dialling 999 from a VoIP service without 999 access) could result in an additional 5% of 999 calls being associated with a reduction in life chances to zero.⁹⁵

A5.135 We restricted our quantitative estimates of potential lives saved to life-threatening 999 calls to ambulance services, which represent just 4.3% of 999 calls (see Table 10 below). That is because we don't have sufficient information about:

- i. adverse impacts on consumers in relation to non-life-threatening 999 calls to the emergency services (e.g. 999 calls about personal injury or damage to property); or
- ii. how life chances vary with delays to life-threatening 999 calls for the fire, police or coastguard emergency services.

A5.136 Ofcom also undertook a different analysis of the possible benefits of Option 2 by considering only the life-threatening 999 calls to ambulance services that relate to sudden cardiac arrests, which account for 15% of the base of 4.3%. This highly restrictive analysis of the benefits provides a useful illustration of the benefits if Option 2 because we have specific data on how life chances are reduced because of delays in receiving treatment for sudden cardiac arrest.

Table 10: Quantifiable benefits based on 4.3% of all 999 calls (Table 1 Reproduced)

	Ambulance service	Police, Fire, or Coastguard service
Life-threatening 999 calls	4.3%	X%
Non-life-threatening 999 calls	31.4%	64.3%-X%

Source: 911/112 Liaison Committee

A5.137 The quantifiable benefit of Option 2 would be the number of lives saved among type 2 and type 4 VoIP users, which is likely to significantly understate the quantitative benefits (i.e. in relation to the remaining 95.7% of 999 calls). In general, it is reasonable to expect that more lives could be saved in respect of life-threatening calls than non-life-threatening calls.

A5.138 The benefit analysis needs to reflect a number of input assumptions. The key input statistics we used in our estimates are described below.

Estimating the proportion of UK households with VoIP where confusion could arise

A5.139 Ofcom used data from two surveys to derive estimates of the proportion of UK households with VoIP where confusion could arise. These are:

⁹⁴ Ofcom is not aware of comparable UK data.

⁹⁵ http://www.azshare.gov/cardiac_arrest_faq.pdf. The article states that "For every minute that passes after a victim suffers a cardiac arrest their chances of survival decrease by about 10%". The article refers to a graph by the American Heart Association, from ed. Richard O. Cummins, *Textbook of Advanced Cardiac Life Support*, 1994, Chapter 4 Defibrillation.

- i. Ofcom's communications tracking survey, Q4 2006, and
- ii. Ofcom Research of VoIP Users, October 2006 (the October 2006 research)⁹⁶.

- A5.140 Ofcom's communications tracking survey is conducted on a quarterly basis among a representative sample of around 2200 UK adults aged 15 and over. The sample reflects the UK profile of sex, age, social grade, region and employment status and is representative of cabled/non-cabled areas, rural/urban areas and varying levels of deprivation. Data is weighted to represent the UK adult population.
- A5.141 The October 2006 research was conducted online using a sample of 500 respondents. All were aware of VoIP and they or someone in their household currently used a VoIP service. Because VoIP is a fairly new and growing service, little is known about the profile of the UK VoIP population and little data was available to weight the survey respondents against. Data from this research is not, therefore, weighted to represent the general UK population or the online population.
- A5.142 As discussed from paragraph 3.5 of the consultation document, type 2 and type 4 VoIP services can be pc-based or phone-based. For the purposes of the following analysis, when Ofcom refers to the risk that confusion could cause time critical delays leading to possible loss of life, we are referring to a weighted average risk between phone-based and pc-based services. Given the inherent uncertainties, we did not take a view about the risks specifically attached to the lack of 999 access on pc-based VoIP services compared with phone-based VoIP services.
- A5.143 The Tracking Study estimated that 10% of UK households had a VoIP service as at Q4 2006 (approximately 2.4 million households).⁹⁷ In the October 2006 research, around 64% of VoIP users said they had a VoIP service that Ofcom knows did not offer 999 access. If we combine those results, up to 1,526,400 households could, in the event of a life-threatening incident, attempt to access 999 from a VoIP service that does not provide 999 access.
- A5.144 In the October 2006 research, of VoIP users whose service did not offer 999 access (64% of all users), 78% incorrectly thought that the service did provide access or did not know if they had access (approximately 1,190,400 households). The number of households potentially subject to confusion regarding 999 access lies, therefore, between 1,526,400 and 1,190,400. Although approximately 22% (or 336,000) of households whose VoIP service does not offer 999 access are aware of that, it is conceivable that in the event of a life-threatening incident a resident of that household or a visitor (e.g. a baby sitter, relative or friend) could, through stress or unknowingly, attempt unsuccessfully to access 999 using the VoIP service.
- A5.145 For the purpose of quantifying the benefits of policy Option 2, Ofcom has taken a conservative approach and has taken the lower estimate of 1,190,400, reflecting the 78% of respondents who were wrong about whether they could access 999 from their VoIP service or didn't know if they could access 999 (Ofcom considers this could underestimate the total base by up to 336,000 households).
- A5.146 We use this as the base number of consumers in the base year who could be confused and use their VoIP service to access 999 resulting in critical delays (note

⁹⁶ More information about the results of the quarterly Ofcom communications tracking survey for Q.4 2006 and the October 2006 research are available in the Ofcom *Research Report: Voice over Internet Protocol (VoIP)*, www.ofcom.org.uk

⁹⁷ Of the sample of 2315 adults, 10% said they had a VoIP service they were currently using.

1,190,400 million/ 2.4 million households with VoIP represents approximately 50% of all VoIP households).

Estimating the number of 999 calls from VoIP households where confusion could arise

A5.147 We now need to estimate the number of 999 calls from households where a VoIP service is present and where confusion could arise. First, we estimated 653,580 life-threatening 999 calls will be connected to the ambulance services in 2007/08 (see Table 11). Second, we know that all life-threatening 999 calls to ambulance services made as a proportion of all UK households is 653,580/24 million households or 2.7%. Accordingly, in 2007/08, the number of 999 calls made from households with VoIP and where confusion could arise is:

$$1,190,400 * 2.7\% = 32,418 \text{ calls.}$$

A5.148 By multiplying 1,190,400 (the number of households with VoIP where confusion could arise) by 2.7% (the proportion of life-threatening 999 calls being made from all UK households), we are able to identify the number of life threatening 999 calls made from VoIP households where confusion could arise.

A5.149 Importantly, of all VoIP services on offer across the UK, only households that use a type 2 or type 4 VoIP service are relevant to our proposal to mandate 999 access (see paragraph A5.27). Approximately 65%⁹⁸ of all UK households with VoIP use a type 2 or type 4 service.

A5.150 Of the 32,418 calls identified above, Ofcom considers only 65% should be counted in the base of all possible calls in which confusion could arise:⁹⁹

$$28,573 * 65\% = 21,071$$

A5.151 The estimates discussed above are set out in Table 11.

⁹⁸ The October 2006 Research. The following question was asked to derive this statistic "For each of the following statements, please state whether they apply to your internet telephony service?"

1 I can make calls to people using exactly the same brand of internet telephony (VoIP);

2 I can make calls to people using another brand of internet telephony (VoIP) service;

3 I can make calls to landline or mobile telephone numbers (for example beginning with 01, 02, 07); or

4 I can receive calls from landline telephone numbers (for example beginning with 01, 02).

65% answered yes to the third statement.

⁹⁹ As discussed earlier at paragraph A5.26. Ofcom has made the implicit assumptions in its estimates that consumers with VOIP are as likely to make a life-threatening call to the ambulance services as PSTN-only customers and that consumers with VoIP make the same number of multiple calls as PSTN-only consumers. In practice, the demographic characteristics of the two types of consumers might be different – e.g. those that most commonly suffer from heart attacks might be 40-60 years of age and most VOIP users might be younger. But in the absence of robust data in this area, Ofcom has assumed the two groups have the same propensity to dial 999.

Table 11 Deriving the base number of 999 calls where confusion could arise (estimates for 2007/08)

	Estimate	% (a)	Total calls (b)	Total households (c)
1	Number of 999 calls made in the UK (estimate for 2007/08 based on 2007/07 actual figure)		35,383,000 ¹⁰⁰	
2	Percentage and number of 999 calls made from households only	74% ¹⁰¹	26,183,420	
3	Percentage and number of 999 calls put through to the emergency services (i.e. excluding silent calls)	58.3%	15,251,842	
4	Of those not silent, percentage and number of calls then passed on to the ambulance service	35.7%	5,446,497	
5	Of (4) 12% are deemed Category A "life threatening calls" ex post (Ofcom applies this lower estimate to conservatively estimate households at risk)	12% ¹⁰²	653,580	
6	Number of UK households			24,000,000
7	Percentage and number of households in the UK with a VoIP service	10%		2,400,000
8	Percentage and number of VoIP households without 999 access	63.6%		1,526,400

¹⁰⁰ In 2006/07, approximately 35.3 million 999 calls were made in the UK. Ofcom assumes that this number will not increase in 2007/08. Ofcom notes that in correspondence with the ambulance services, it has been suggested that a 6% year on year growth in 999 call volumes to 2006/07 should be reflected in Ofcom's 2007/08 999 call volume estimate. Ofcom has, however, chosen to take its lower estimate as a conservative approach to estimating the possible benefits of mandating 999 access.

¹⁰¹ The October 2006 research indicates that just under half (47%) of UK adults have called 999 at some point: 29% used their home landline but 18% used their mobile phone, even though a third (6%) had a landline as well. This implies $(29\% + 6\%)/47\% = 74\%$ of all 999 calls are made from households. Emergency operators have reported that more than half of 999 calls are made from mobiles. Ofcom has considered the case where a small proportion of mobile calls are made from the home (i.e. roughly one-third), in addition to the proportion of calls made from a fixed phone, and consider the benefits would not be different enough to alter Ofcom's results.

¹⁰² Ofcom recognises that the ambulance services have indicated that approximately 30% of all connected 999 calls are deemed life-threatening "ex ante" (i.e. that reflects the risk associated with clinical assessment over the telephone). Ofcom recognises this point, but has chosen to rely on the 12% ex post estimate so that in aggregate Ofcom can conservatively estimate the potential benefits.

9	Percentage and number of households who consider they have 999 access over VoIP (or do not know either way) when they do not	78%		1,190,400
10	Percentage of Category A 999 calls made from UK households [i.e. (5)(b) / 6(c)]	2.7%		
11	Number of Category 999 calls where a 999 call may be attempted from a VoIP service without 999 access when they do not know they do not have access (or do not know either way) [i.e. (9)(c) * (10)(a)]		32,418	
12	Percentage and number of 999 calls in (11) that may be attempted from a VoIP service without 999 access to ordinary phone numbers using a one-way or two-way VoIP service [i.e. (12)(a) * 11(b)]	65%	21,071	

Source: Ofcom, 999/112 Liaison Committee

A5.152 Next, Ofcom considers the base number of calls where confusion could arise over a five year period (not just in 2007/08) and estimates the Net Present Value of the annual benefits from mandating 999 over VoIP over the period 2007/08 – 2011/12 by removing confusion that could lead to critical delays and loss of life. Key to this estimate is the estimate of future VoIP growth, which is discussed below.

Estimating the proportion of UK households with VoIP: present to 2011/12

A5.153 Ofcom considers there are a number of possible scenarios that could arise in relation to the development of VoIP services and that could impact take-up rates. Ofcom's estimates should, therefore, reflect a range of values rather than a single estimate¹⁰³.

A5.154 To date, 10% of households have a VoIP service that they currently use (reflecting an increase of 5% points between December 2005 and December 2006). This largely reflects organic growth with take-up primarily by early adopters.

A5.155 As the technology is simplified, Ofcom considers VoIP communication services will be targeted increasingly at the mass market. Examples of how large retailers are targeting the mass market include:

- i. dual-mode VOIP / PSTN phones
- ii. dual-mode VoIP / PSTN routers for use with a traditional phone handset

A5.156 Ofcom is also aware that several providers are considering the business case for migrating existing PSTN fixed line (including Carrier Pre-Select (CPS)) consumers from a traditional PSTN service to broadband with a type 4 VoIP service (also known as Voice over Broadband or VOB), either through Local Loop Unbundling

¹⁰³ For the avoidance of doubt, Ofcom's estimates of future VoIP growth are not forecasts of likely substitution from PSTN services to VoIP services. The only concern of this IA is whether VoIP services are present in UK households, regardless of whether they are the only service or one of many.

(LLU) or naked DSL. From discussions with three retailers, Ofcom estimates migrations of existing PSTN consumers to VoIP could double the number of VoIP households, increasing the proportion of households with VoIP to approximately 20%, assuming no further organic growth.

- A5.157 Ofcom has also considered independent forecasting sources to help develop an estimated range for VoIP growth. For instance, Ovum has estimated that there will be a VoB service in 6 million homes by 2008 (as published in Ofcom's 2005 Network Charge Control Review [NCCR]).¹⁰⁴
- A5.158 Finally, Ofcom has considered comparative data including the growth in residential retail broadband subscriptions. In this market, where the mass market has successfully taken up the service, almost 50% of households had a broadband service by December 2006 (the product was first introduced to the mass market in mid-2002). This take up was made possible in part because many ISPs were able to migrate an existing set of narrowband Internet consumers to broadband.
- A5.159 Ofcom considered its VoIP estimates should cover a range of values to reflect the scenarios identified above. Accordingly, Ofcom considered that VoIP growth should be estimated at between 25% and 40% of all UK households by 2011/12. The low end of this range assumes that growth is primarily organic¹⁰⁵ and that there is limited expansion into the mass market. The high end of the range assumes that, in addition to organic growth, existing PSTN consumers are migrated across to a type 4 VoIP service and that services are successfully marketed and taken up by the mass market.
- A5.160 Some commentators suggest that within 5 years, most consumers will be using VoIP and PSTN networks will be redundant.¹⁰⁶ But Ofcom sees that as uncertain and has not included the scenario in this CBA.
- A5.161 Now we have determined the base number of 999 calls from UK households with VoIP where confusion could arise, the next step is to determine the probability that this confusion could lead to lives being at risk. This is discussed below.

¹⁰⁴ http://www.ofcom.org.uk/telecoms/ioi/netw_intercon_index/pcancc/netchacon/

¹⁰⁵ i.e. Growth is organic because subscribers are acquired through sales rather than through purchasing (e.g. through a merger/takeover) or through a block transfer of subscribers from an existing product.

¹⁰⁶ For instance, John Naughton states in the Ofcom publication *Communications: the next decade*, 30 November 2006, Section 1, page 45

"Already, the signs of the net's encroaching centrality are everywhere. We see it in, for example, the remarkable penetration of broadband access in developed countries; the rapid growth of e-commerce; the streaming of audio – and, increasingly, video across the net; the interest of Rupert Murdoch and other broadcasters in acquiring broadband and other Internet companies; declining newspaper sales and the growth of online news; the expanding use of the web as a publication medium by public authorities; the spread of public Wi-Fi; and in the stupendous growth of Internet telephony – spurred by the realisation that, sooner rather than later, all voice telephony will be done over the net".

And

"It is now no longer a question of whether VoIP will wipe out traditional telephony, but a question of how quickly it will do so. People in the industry are already talking about the day, perhaps only five years away, when telephony will be a free service offered as part of a bundle of services as an incentive to buy other things such as broadband access or pay-TV services. VoIP, in short, is completely reshaping the telecoms landscape." Taken from the Economist, 15 September, 2005.
<http://www.ofcom.org.uk/research/commsdecade/section1.pdf>.

Estimate of the probability of a life being at risk

- A5.162 Ofcom considers there are two elements to estimating the probability that lives are at risk when attempting to make a 999 call using a VoIP service where the provider doesn't offer 999 access. First, there is the probability that, in the event of a life-threatening incident, a consumer will attempt unsuccessfully to use a VoIP service (rather than a PSTN service) to access 999. The second is the probability that, in attempting to make that call, there would be a critical delay in getting through to the emergency services (e.g. because the consumer has to call again from a PSTN service) and that this delay would reduce life chances to zero.
- A5.163 In relation to the first element, Ofcom is not aware of any empirical evidence on which to base the probability that a consumer would attempt to call 999 from their VoIP service. It could, however, be argued that if there were equal chances of attempting a 999 call from a VoIP or a PSTN service, then there would be a 33% chance the consumer would attempt to call 999 using the VoIP service (i.e. if the choice is made at random). In the absence of empirical evidence, Ofcom assumes that this percentage could be between 1% and 33%, where 1% is a conservative, arbitrary lower bound assumption.
- A5.164 For the second probability, Ofcom has considered comparative data on critical delays in responding to an individual suffering a cardiac arrest and the impact on their prospective life chances. If we take The American Heart Association statistics,¹⁰⁷ which suggest that a 30 second delay in administering defibrillation to an individual suffering a cardiac arrest reduces life chances by 5%, a delay could result in an additional 5% of calls being associated with a reduction in life chances to zero. Because only 15% of life-threatening 999 calls relate to cardiac arrest and given the relatively short period in which defibrillation must be administered, the 5% estimate may overstate the probability of a delay resulting in life chances falling to zero. Ofcom has decided, therefore, to consider this probability falls between 1% and 5%, where 1% is a conservative, arbitrary lower bound assumption.¹⁰⁸
- A5.165 A critical delay leading to possible loss of life might be made up of a number of factors like time taken to: decide which voice call service to use, call 999 using a VoIP service¹⁰⁹, realise that the 999 call will not be successful, switch to using a PSTN service, and attempt to access 999 again. That might include switching a traditional telephone handset from a VoIP router or adaptor to a PSTN line to enable a PSTN call, for example.
- A5.166 Under the code of practice on information about 999 access over VoIP set out in CG 14, VoIP providers that don't provide 999 access must play an announcement

¹⁰⁷ http://www.azshare.gov/cardiac_arrest_faq.pdf.

¹⁰⁸ Ofcom notes that the 1% and 5% estimates are only comparable where ambulance response rates are the same in the UK as they are in the US. It may be that the 5% increase in loss of lives from a 30 second delay depends on the time the ambulance takes to get to the patient. If an ambulance takes an average of 30 minutes to reach a patient, a 30 second delay might increase the probability of loss of life by 5%, but if the ambulance takes an average of 45 minutes a 5% increase might make the probability of loss of life higher. Similarly, if the average ambulance response time is very fast or very long adding 30 seconds may not make much difference (this clearly depends on the probability distribution of the risk of loss of life in relation to the time from the start of the heart attack).

¹⁰⁹ Where the consumer has a pc-based VoIP service and the pc is switched off, it seems unlikely that they would decide to switch the pc on to access 999 in an emergency. That does not mean that it would never happen, however, and it is more likely that minutes rather than seconds would be lost before the individual realised they could not access 999 (on hearing the recorded announcement) and chose another voice call service.

when a 999 call is attempted, reminding the caller that 999 access is unavailable. Consumers should, therefore, quickly realise there is no 999 access. But in an emergency situation, valuable seconds could still be lost because the consumer would have to make another decision about which service to use and attempt a second 999 call.

A5.167 The product of these two probabilities represents the estimated probability of a life at risk in the absence of mandated 999 access. Taking the most conservative approach, the probability of a life at risk is:

$$1/100 \times 1/100 = 1/10,000 \quad (1)$$

A5.168 The higher bound probability is:

$$33/100 \times 5/100 = 165/10,000 \quad (2)$$

As part of its CBA, Ofcom has chosen to take the lower of the two estimates when estimating the benefits from mandating 999 over VoIP (although Ofcom does consider the possibility that a time critical delay leads to a 5% reduction in life chances with respect to calls to 999 in relation to sudden cardiac arrest – see from paragraph A5.206). These percentages are assumed to be constant over the period 2007/08 to 2011/12.¹¹⁰

A5.169 Based on the above calculations, the estimated number of lives saved over 5 years ranges between 18 lives saved (where VoIP reaches 25% of all UK households by 2011/12) and 26 lives saved (where VoIP reaches 40% of all UK households by 2011/12).

A5.170 Importantly, and as illustrated in Table 12, Ofcom's base for estimating the number of lives lost represents a fraction of all 999 calls (i.e. 4.3%). There are two points worth making here. First, as set out in the table below, we exclude any calls that are not life-threatening but that might result in personal injury or damage to property (i.e. 30.9%). Clearly, personal injury might cause lasting detriment to the individual. Because we haven't included those in our estimates, we underestimate the benefits of mandating 999 over VoIP. Second, we identify benefits based on 1/10,000 of calls where a life could be saved by mandating 999 over VoIP types 2 and 4. That percentage does not include an estimate of the injury or loss to property that could be prevented. It also understates the extent of the benefits, which are not explicitly identified in Table 12.

¹¹⁰ It could be argued that the 1% chance of a delay resulting from confusion will fall over time. Consumers might become more aware of the limitations of their service through experience of the product, word of mouth or more information and become less inclined to use their VoIP service to make a 999 call. But it could equally be argued that confusion rates might increase over time. As early adopter consumers (who arguably possess greater technical understanding of the service) are replaced by mass market consumers (who might have less technical understanding), confusion about 999 access could grow. Ofcom considers that in the absence of evidence providing clear support for one assumption over the other, Ofcom should, on balance, assume that the percentage chance of delay because of confusion remains unchanged over the period.

Table 12: Quantifiable benefits based on 4.3% of all 999 calls (Reproduced Table 1)

	Ambulance service	Police, Fire, or Coastguard service
Life-threatening 999 calls	4.3%	X%
Non-life-threatening 999 calls	31.4%	64.3%-X%

Source: 911/112 Liaison Committee

Estimate of value of life (VoL)

- A5.171 Ofcom considers it does not have any expertise in estimating the value of an individual life. In order to estimate the benefits of saving individual lives by mandating 999 over VoIP, Ofcom considered estimates about the value of a statistical life that have been developed in the context of policy proposals to save lives in other sectors of the economy.
- A5.172 Specifically, the Department for Transport (DfT) has developed a methodology for valuing/avoiding loss of life from road traffic accidents. It accounts for medical costs, output and human costs. Human costs account for by far the largest part (94%) of the total cost (estimated using a willingness to pay¹¹¹ [WTP] methodology) used to value a statistical life. The estimate is based on the mode age of traffic accidents in the range 20-29 years.
- A5.173 Two issues are relevant to whether the DfT methodology could be applied in the context of life-threatening 999 calls.
- A5.174 Life-threatening 999 calls may or may not be made principally by the 20-29 age group (Ofcom is not aware of any data identifying the age of individuals in relation to 999 calls). The question is whether any difference in the age of those involved in road traffic accidents and those making life-threatening 999 calls could affect the estimated value of a statistical life.
- A5.175 The impact of age on willingness to pay to avoid risk¹¹² will depend on, among other things, attitudes to risk and marginal utility of money. If, for instance, older people were more risk averse and had lower marginal utility of money than younger age groups, perhaps as a result of higher incomes and wealth, then they may also have a higher willingness to pay for safety. If principally older individuals were associated with life-threatening 999 calls, this could imply a higher value of statistical life than implied by the DfT methodology. (Note this does not imply the more subjective view that older persons' lives are of higher value, or that their level of utility is higher).

¹¹¹ That is, measuring an individual's willingness to pay to reduce the risk of injury or loss of life from a road traffic accident.

¹¹² As indicated in paragraph A5.172, the DfT methodology uses a willingness to pay approach (i.e. measuring an individual's willingness to pay to reduce the risk of injury or loss of life from a road accident) to derive a statistical value of life. Ofcom notes that for a given value of life, the greater the degree of risk aversion, the greater the willingness to pay to avoid injury or loss of life.

A5.176 According to the HM Treasury appraisal guidance note,¹¹³ research indicates that, in practice, willingness to pay values might be affected by a range of factors including: fear, old age, attitude to risk, factors specific to the risk context (such as a sense of personal control) etc. Specifically in the case of old age the guidance note reports that:

“[M]ost studies have indicated that values tend to decline significantly only with those aged over around 70 years old; but some suggest that the values do not decline as significantly.” (p.49)

A5.177 This suggests that the “pure” value of life component in the DfT estimate could remain significant throughout most of a person’s life and could still be important in an estimate of the value of a statistical life that could be saved by mandating 999 over VoIP, where life-threatening 999 calls involve elderly people.

A5.178 Accordingly, Ofcom considers that the DfT methodology based on the mode age of traffic accidents in the range 20-29 years is reasonable given that willingness to pay may remain significant regardless of age (at least up to the age of 70).

A5.179 Second, loss of productivity and health costs represent only 7% of DfT’s VoL estimate. (That is because net productivity loss is lost income less lost consumption, which is low in net terms, and NHS costs are typically short term when dealing with the loss of life).

A5.180 Although hospital costs can be avoided by preventing traffic accidents, it is not necessarily the case that by saving a life by mandating 999 over VoIP, hospital costs would be avoided. By mandating 999 over VoIP, Ofcom seeks to eliminate the confusion that could result in critical delays in getting through to the ambulance service and getting to hospital. Whereas introducing safety measures in respect of road transport might reduce the demand for hospitalisation, mandating 999 access might simply enable the individual to get to hospital with fewer delays. Accordingly, Ofcom considered that this component of the value of life should be deducted from the estimate of a value of a statistical life. That would represent no more than 6% of the estimated value (since the WTP element itself comprises 94% of the overall value, with productivity and health costs making up the remaining 6%).

A5.181 The DfT methodology estimated the value of a statistical life at £1.31m¹¹⁴ in July 2003 to assess the benefits (i.e. protecting lives) from proposing safety measures to reduce road traffic accidents. Ofcom also notes that the FSA (in its submission to Ofcom on the Food and Advertising to Children consultation) adjusted the DfT estimate of £1.31m using a GDP per capita deflator from Q3 2003 to Q4 2004, giving an estimated value of statistical life at £1.42m in Q4 2004.

A5.182 Ofcom has taken the FSA adjusted figure of £1.42 million and reduced it by 6% to reflect the fact that hospitalisation costs will, unlike the prevention of road traffic accidents, not be avoided by mandating 999 over VoIP and these costs should not be factored into the value of life calculation. Ofcom uses £1.33m to represent the value of a statistical life for the purpose of estimating benefits of saving lives by mandating 999 over VoIP.

¹¹³ HM Treasury, *Managing risks to the public: appraisal guidance*, 17 June 2005. http://www.hm-treasury.gov.uk/media/0/B/Managing_risks_to_the_public.pdf Supplement to Treasury guidance the Green Book, Appraisal and Evaluation in Central Government.

¹¹⁴ As referred to by Ofcom in *Food Advertising to Children, Impact Assessment*, 22 February 2007, page 12, paragraph 3.15.

A5.183 Ofcom then takes the £1.33m and applies a GDP deflator to convert the VoL estimate in Q4 2004 prices into 2007/08 prices. This generates a final VoL estimate of £1.43m.

A5.184 Ofcom applies the social discount rate of 3.5% (in real terms) to the £1.43m VoL estimate over the subsequent years up to 2011/2012. HM Treasury¹¹⁵ defines discounting as:

“a technique used to compare costs and benefits that occur in different time periods. It is a separate concept from inflation, and is based on the principle that, generally, people prefer to receive goods and services now rather than later. This is known as ‘time preference’.”

A5.185 HM Treasury also notes that:

“Society as a whole... prefers to receive goods and services sooner rather than later, and to defer costs to future generations. This is known as ‘social time preference’; the ‘social time preference rate’ (STPR) is the rate at which society values the present compared to the future.”

A5.186 Lastly, an adjustment is made to reflect the higher failure rate of 999 access over VoIP compared to the PSTN. Research suggests that of all broadband connections attempted, 2% result in failure. To ensure we are comparing the same quality service to that provided using the PSTN, we adjust the benefits down by 2%.

A5.187 As a result, Ofcom estimates that the monetary value of lives saved by mandating 999 access for type 2 and type 4 VoIP services ranges between £23,833,805 (where VoIP reaches 25% of all UK households by 2011/12) and £33,851,698 (where VoIP reaches 40% of all UK households by 2011/12).

Table 13: Gross benefits (in NPV monetary value terms) (2007/08 prices) (2007/08 - 2011/12)

	Assume 25% VoIP growth	Assume 40% VoIP growth
NPV of monetary value of gross benefits (£)	23,833,805	33,851,698

Source: Ofcom

Further benefit considerations

A5.188 Additional complexity arises because a VoIP service might not be as reliable as a PSTN service. For example, a PSTN line is line-powered so that in the event of a power-cut it is still possible to make calls; however, VOIP services typically depend on equipment in the end-user’s premises that is mains-powered and would not work during a power-cut. Additionally, VOIP equipment (e.g. broadband modem, router, PC, etc.) is more complex than a standard fixed telephone handset and therefore more prone to failure. However, in both cases the difference is less marked when compared to a cordless DECT PSTN phone. The risk to life may not be completely eradicated by Option 2, therefore, and indeed there may be an offsetting increase to

¹¹⁵ HM Treasury Green Book, http://www.hm-treasury.gov.uk/media/05553/Green_Book_03.pdf

the extent that more people are encouraged to take up VoIP as a substitute for PSTN services.

A5.189 Ofcom has considered the risk of a free riding problem developing (see from paragraph A5.13). It should be noted that free riding could occur under Option 1 (e.g. more consumers and citizens use VoIP services without 999 access, placing a greater burden on PSTN providers to recover the costs of providing 999 access). Any assessment of free riding under Option 2 would have to be made in comparison with a counterfactual market where free riding might also be present.

A5.190 We have taken the view that although VoIP penetration may have reached up to 40% by the end of the period of this CBA (2011/2012) (see paragraph A5.159), substitution from PSTN to VoIP services would not be high enough for there to be a free riding problem in the counterfactual (Option 1). It is less likely that there would be free riding under Option 2 because, if all providers were required to offer 999, consumers would not depend on others for 999 access.

Qualitative assessment

Benefits to householders making 999 calls to non-ambulance emergency services

A5.191 Ofcom has also considered the potential benefits that could arise from mandating 999 access for calls to other emergency services including fire, police and coast guard services. Ofcom notes that calls to other emergency services represent (in aggregate) 65% of all remaining 999 calls (see Table 14 below).

Table 14: Calls to 999/112 handled by BT and Cable and Wireless in June 2006

Emergency service	Number of calls	% of calls ¹¹⁶
Coastguard	1,088	0.1%
Ambulance	531,620	35.7%
Police	835,969	56.2%
Fire	120,020	8.1%
Total	1,488,697	100%

Source: 999/112 Liaison Committee

A5.192 The difficulty with quantifying the impact of the proposal for other emergency services is that there are no equivalent statistics about life-threatening calls made from domestic residences (as is the case for 999 calls to ambulance services). That statistic is relevant to our calculation of benefits, since calls to 999 made from households where VoIP is available represent the base of households where confusion in a life-threatening situation could lead to delays in contacting the emergency services. In the case of ambulance services, records are kept about the number of life-threatening calls both at the time of the call and on an ex post basis.

A5.193 Ofcom considers it is likely that many 999 calls to other emergency services relate to injury or damage to property in addition to life-threatening situations. In those cases, the benefit would not be a life saved, but an improvement in the quality of life

¹¹⁶ Rounded to one decimal place.

(e.g. fewer burns from a fire, police intervention preventing further violence, or minimising property damage or loss).

A5.194 We have chosen not to incorporate the additional benefits for 999 calls to non-ambulance emergency services in our quantitative analysis, given the difficulty in estimating the reduction in harm for non life-threatening calls. However, the benefits from those calls are no less important and they are relevant to the impact assessment and to the decision of whether to require type 2 and type 4 VoIP services to provide 999 access.

A5.195 Table 15 below illustrates that Ofcom has only quantified benefits in relation to 4.3% of all 999 calls made from VoIP households in the UK (i.e. 12% of all life-threatening calls to ambulance services multiplied by 35%, which is the number of life-threatening calls to ambulance services as a proportion of all 999 calls). Ofcom considers the benefits are likely to be materially higher than those reported using the quantitative analysis.

Table 15: Quantifiable benefits (Table 1 Reproduced)

	Ambulance service (35.7% of 999 calls)	Police, Fire, Coastguard (64.3% of 999 calls)
Life-threatening 999 calls	4.3%	X%
Non-life-threatening 999 calls	31.4%	(64.3%-X%)

Source: 999/112 Liaison Committee

A5.196 For the purposes of illustration, Ofcom has considered what the quantified benefits would look like if we assumed that for all 999 calls to the coast guard, police and fire brigade, the percentage that was life-threatening was the same as for the ambulance services, i.e. 12% (or $X = 7.7\%$, i.e. $12\% \times 64.3\%$).

A5.197 To gross up the benefits in relation to life-threatening 999 calls to all remaining emergency services, we need to consider all life-threatening 999 calls. To do this we apply a multiplicative factor of $100/35.7 = 2.8$ which allows for the same proportion of life-threatening calls across the emergency services to be represented (see Sensitivity 3, Table 17).

A5.198 Again, this illustration still underestimates the extent of benefits because:

- i. it ignores all potential benefits attached to preventing or reducing injury or personal loss or loss or damage to property from fire or theft when making a non-life-threatening call to 999 for any emergency service;
- ii. it ignores instances where life-threatening calls do not result in the loss of life but result in permanent injury. For instance, benefits are estimated based on the proportion of lives that are at risk (i.e. 1/10,000). That proportion would be higher, leading to higher benefits, if we included those who made life-threatening 999 calls and were saved but faced personal injury or another condition that reduced their quality of life over time.

A5.199 In summary, the following factors underestimate the extent of the likely benefits of mandating 999 for some VoIP providers:

- i. benefits restricted to only 4.3% of all 999 calls (see from paragraphs A5.46, A5.135);
- ii. VoIP growth of 25% as a conservative estimate of growth (see from paragraphs A5.159, A5.169, A5.187);
- iii. not including 22% of the 1,526,400 households without 999 access that are aware they had no access (because that does not take into account the possibility that visitors might need to make a 999 call or that the householder will nonetheless attempt a 999 call from their VoIP service under stress) (see from paragraph A5.144); and
- iv. the probability that a critical delay from using a VoIP service to access 999 could result in a loss of life out of 1/10,000 life-threatening 999 calls to ambulance services (see from paragraph A5.167).

Net Benefit

A5.200 Ofcom has taken a conservative approach to estimating the benefits, wherever possible, so that they can be interpreted as the minimum possible benefits from implementing the proposal. Ofcom estimates that, taking into consideration quantitative and qualitative costs and benefits, there would be a significant net benefit from implementing Option 2 (ranging between approximately £14 million and £24 million, based on the low and high VoIP growth estimates, respectively).

Table 16: Option 2: Costs, benefits and net benefits, 25% and 40% VoIP take-up by 2011/12

	Growth of VoIP	
	25%	40%
Costs (£)	10,204,664	10,204,664
Benefits (£)	23,838,805	33,851,698
Net Benefits (£)	13,634,141	23,647,034

Source: Ofcom

A5.201 The results demonstrate that Ofcom's Option 2 base case generates a positive net benefit from mandating 999 access, where the benefits are approximately double the costs for Ofcom's low VoIP growth assumption and triple the costs where the high VoIP growth estimate is taken.

A5.202 Ofcom has also undertaken a number of explicit calculations to apply sensitivities to both costs and benefits:

- i. costs that are reported in ranges are assumed to be at the maximum of that range for the on-net and Internet-based VoIP provider groups (i.e. sensitivity 1) (see from paragraph A5.115);

- ii. we take account of 2 Internet-based VoIP entrants each year between 2007/08 and 2011/12 (i.e. sensitivity 2(a)) (see from paragraph A5.123);
- iii. in addition to (ii) above, we then assume one on-net entrant per year (sensitivity 2(b)) (see from paragraph A5.125); and
- iv. we assume that the proportion of lives that can be saved in respect of life-threatening calls to non-ambulance emergency services is the same that can be saved in respect of similar calls to ambulance services (i.e. 12% of 999 calls) (sensitivity 3) (see paragraph A5.196).

A5.203 The following table illustrates the costs, benefits and net benefits after applying the explicitly calculated sensitivities.

Table 17: Net benefit of mandating 999 access: Sensitivity results

	Sensitivity 1 - Maximum possible compliance costs		Sensitivity 2(a) - Assume 2 retail VoIP entrants per year		Sensitivity 2(b) Assume 2 retail and 1 on-net entrants per year		Sensitivity 3 - all (including non- ambulance) life- threatening 999 calls	
	low growth	high growth	low growth	high growth	low growth	high growth	low growth	high growth
Costs (£)	22,743,956	22,743,956	11,534,098	11,534,098	19,338,600	19,338,600	10,204,664	10,204,664
Benefits (£)	23,838,805	33,851,698	23,838,805	33,851,698	23,838,805	33,851,698	66,775,364	94,822,684
Net benefits (£)	1,094,849	11,107,742	12,304,706	22,317,600	4,500,205	14,513,098	56,570,700	84,618,020

Source: Ofcom, Intercai

A5.204 Ofcom considers the results from Method A support the proposal to mandate 999 access.

A5.205 In two of the eight sensitivities applied in Table 17 above (sensitivity 1 low growth scenario and sensitivity 2(b) low growth scenario), the net benefits are arguably small. Ofcom considers a small net benefit does not in itself mean those sensitivities do not support Option 2 because the result is contingent on a key assumption about the probability of the number of lives that can be saved. Ofcom argues in the following section that it can be demonstrated that there is a positive minimum probability of a life at risk at which benefits can at least cover the costs for Option 2 (and each sensitivity within that Option) (see from paragraph A5.211).

Other sensitivity analyses for Option 2

A5.206 Ofcom has considered an additional sensitivity: the benefits of Option 2 regarding life-threatening calls to the ambulance services about Serious Cardiac Arrest (SCA) only.

A5.207 This sensitivity estimates benefits for SCA calls and compares those to the total estimated costs. The purpose of this estimate is to determine the net benefits of Option 2 for a narrow group of consumers.

A5.208 Ofcom's methodology for estimating the benefits of Option 2 regarding life-threatening calls about SCA to the ambulance service relies on the following key alternative assumptions:

- i. 100,000 fatalities from SCA per year in the UK¹¹⁷ when there is a 5% survival rate (see point iv below) implies there is a total of 105,000 SCA cases per year in the UK. 30% of SCAs take place in hospitals so we can assume the remaining 70% relate to SCAs at a location where there may be a VoIP service (so there could be a maximum of 74,000 calls to 999 about SCAs per year);
- ii. the probability of an SCA-related 999 call being made to the ambulance services from a UK household is 74,000 calls/24m households = 0.3% (or 0.003);
- iii. using data from Ofcom's October 2006 research, this is multiplied by the proportion of UK households with a VoIP service that doesn't offer 999 access where consumers don't know this to be the case (i.e. 78% of 64% of all UK VoIP households);
- iv. 65% of VoIP households have a type 2 or type 4 VoIP service so we assume 65% of calls are made from those services;
- v. we then assume 1% of people reach for the wrong phone (i.e. confusion) and this results in a ½ minute delay (those are average probabilities); and
- vi. a half minute delay lowers life chances 5% points (that is an average probability)¹¹⁸.

A5.209 In estimating the NPV monetary value of lives saved, Ofcom undertook the same steps as set out earlier in paragraph A5.171. Note that the cost analysis does not change relative to the base case in Option 2 (see from paragraph A5.113). The results are as follows:

Table 18: Option 2 (SCA benefits only). Costs, benefits and net benefits: 25% and 40% VoIP take-up by 2011/12

	Growth of VoIP	
	25%	40%
Costs (£)	10,204,664	10,204,664
Benefits (£)	13,458,985	17,227,649
Net Benefits (£)	3,254,320	7,022,985

Source: Ofcom

¹¹⁷Source: <http://www.thecormactrust.com/medical-information/>

¹¹⁸http://www.azshare.gov/cardiac_arrest_faq.pdf.

A5.210 The results indicate that, even taking into account the benefits from saving lives in relation to life-threatening calls about SCA only, the net benefit of Option 2 remains positive.

Method B

A5.211 A key assumption underpinning the results in Table 18 is a conservative, arbitrary estimate of the chance of confusion leading to a delay that reduces life chances of 1/10,000. Ofcom has taken that approach because there is a large degree of uncertainty surrounding the true percentage.

A5.212 Another way of expressing this result is to estimate the probability that the benefits exceed the costs. This is done by identifying the known costs and then identifying the probability of lives at risk/being saved for the case where:

$$B - C \geq 0 \text{ or } B \geq C.$$

A5.213 That is, Ofcom asks the question:

“What is the minimum probability that confusion would result in loss of life in the absence of mandated 999 access, which is consistent with the benefits of mandating 999 access at least equalling the cost (reproduced from paragraph A5.49)”

A5.214 Ofcom estimates that if VoIP take-up is in the range of 25% - 40%, the implied probability of lives at risk (at which benefits are equal to or higher than the costs) is between $\geq 1/23,361$ and $\geq 1/33,173$. That is, the benefits at least cover the costs where at least one life for every 23,361 life-threatening 999 call is at risk/saved (low VoIP growth) or one life in every 33,173 life-threatening 999 call is at risk/saved (high VoIP growth). Ofcom must then consider whether those probabilities are plausible and would justify adopting Option 2.

A5.215 Under Method A, we derived benefits by assuming that one life in every 10,000 life-threatening 999 call was at risk and could be saved by mandating 999 over type 2 and type 4 VoIP. Under Method B, we are interested in the minimum probability that a life is at risk and can therefore be saved. We then ask whether this minimum probability appears plausible, and whether it justifies intervention through adopting Option 2.

A5.216 To illustrate this point further, consider the two sensitivities (out of 8 sensitivities) applied in Table 17 above, where a small net benefit was the result.

A5.217 For the sensitivity that applies a high end estimate of possible costs for the costs reported in the medium and high cost compliance ranges (sensitivity 1, low VoIP growth), Ofcom has estimated that for the benefits to at least cover the costs, the minimum probability of a life at risk and that can be saved by Option 2 is 1 in every 10,481 life-threatening 999 calls to the ambulance services. Ofcom considers this probability is likely to represent a minimum probability of life at risk that is plausible (i.e. sufficiently low) to justify intervention by mandating 999 access.

A5.218 In respect of the sensitivity that applies an entry assumption of two Internet-based VoIP providers and one on-net entrant per year (sensitivity 2(b), low VoIP growth), Ofcom has estimated that for the benefits to at least cover costs, the minimum probability of a life at risk and that can be saved by mandating 999 over VoIP is 1 in every 12,327 life-threatening 999 calls to the ambulance services. Again, Ofcom

considers this probability represents a minimum probability of life at risk that is sufficiently low to justify intervention by adopting Option 2.

- A5.219 The above probabilities multiplied by the number of life-threatening 999 calls made from VoIP households can be used to estimate the number of lives that would need to be at risk/saved to make the benefits at least cover costs. This suggests that in the Option 2 base case, if at least 8 lives were saved between 2007/08 and 20011/2012 the costs would be covered (for both low and high growth scenarios).
- A5.220 Ofcom has also considered implicitly two sensitivities within Method B.
- A5.221 First, Ofcom has considered the possibility that by mandating 999, compliance costs will be raised for type 2 and type 4 VoIP services. Depending on the degree to which those compliance costs are passed on to consumers and consumers' sensitivity to that increase in price, there could be substitution to type 1 services without 999 access or to PSTN services. If switching was material, it could reduce the incremental benefits to consumers of Option 2.
- A5.222 It is difficult to precisely estimate the extent of substitution without detailed information on the price responsiveness of consumers. That said, Ofcom considers that any substitution effect is likely to be small because we estimate the per-household cost for each type 2 and type 4 VoIP provider that currently doesn't provide 999 access to comply with the proposed modification to GC 4 and any other relevant GCs is approximately £4.11 in NPV terms spread over 5 years (i.e. an annuity cost of £0.91 per year¹¹⁹). For anything other than a change to a previously free VoIP calls package, Ofcom considers the increased compliance cost is unlikely to be material for most VoIP users.
- A5.223 Ofcom considers the substitution effect would not raise the minimum probability that a life is at risk sufficiently high to suggest Ofcom should not adopt Option 2.
- A5.224 Ofcom has also considered the impact of mandating the provision of consumer information about 999 access over VoIP as required under the new Code of Practice set out in GC 14. In principle, any benefits from Option 2 should be estimated incrementally to the net benefits of the proposal to mandate information provision on 999 access.
- A5.225 As discussed earlier (see paragraphs A5.9 and A5.25) it has been mandatory since the end of May 2007 for VoIP providers that are PECS (i.e. types 2, 3 and 4) to provide information about the availability and standard of 999 access over their service.
- A5.226 Fieldwork was carried out in April/May 2007 as part of a quantitative face-to-face survey examining consumer awareness of 999 access from VoIP services.¹²⁰ The Code of Practice was not obligatory at that time but the main VoIP providers already provided some form of consumer information on 999 access.
- A5.227 The survey results suggest low consumer awareness about 999 access over VoIP. One question asked VoIP users:

¹¹⁹ Ofcom derived a cost per household by dividing the NPV industry cost of compliance over 5 years by the number of households that by 2011/12 (a) would use a VoIP service that does not have 999 access and (b) would use a type 2 or type 4 VoIP service (i.e. £10,204,664/2,480,400 households).

¹²⁰ The survey was conducted by Jigsaw Research, from a representative sample of 1050 telephone consumers in the UK (unpublished).

“Are there any calls that you are unable to make using VoIP/Internet calling?”

A5.228 65% said they were able to make all calls using VoIP and 21% said they “don’t know”.¹²¹

A5.229 Ofcom considers there are difficulties in estimating the impact of mandating consumer information. But Ofcom does not consider the incremental net benefits of Option 2 would be low enough (taking into account the Code of Practice) to suggest that Ofcom should not mandate 999 access in addition. As explained in paragraph A5.214, the probability of a life being saved falls from 1/10,000 to 1/23,361 where we assume the benefits just cover the costs (i.e. the benefits are roughly halved). Even if the effect of requiring VoIP providers to provide information increased consumer awareness by approximately 50% (which would be optimistic given the evidence to date) and resulted in 50% less delays and possible loss of life, there would still be a sufficiently low minimum probability of lives saved to justify adopting Option 2.

Conclusion

A5.230 Ofcom’s IA considered the impact on different stakeholders of requiring 999 access to be provided for type 2 and type 4 VoIP services. Both costs and benefits are taken into account and quantified where possible. The assessment takes account of the effect of market failures such as imperfect information, externalities and the possible “merit good” nature of 999 access.

A5.231 Ofcom’s approach was to consider two possible options:

- “do not mandate 999 access” (Option 1), and
- “mandate 999 access for type 2 and type 4 VoIP” (Option 2)

A5.232 Ofcom’s analysis assessed the costs and benefits of Option 2 relative to Option 1. This means that there were zero net benefits for undertaking Option 1 by definition.

A5.233 The key benefits identified in the IA for Option 2 were:

- Eliminating critical delays resulting from confusion (on the part of consumers unaware that their VoIP provider does not offer 999 access) when dialling 999, thereby potentially saving lives

A5.234 Ofcom estimates that expected benefits range between £24 - £34 million in NPV terms.

- The estimated benefits related only to potential lives saved in relation to life-threatening 999 calls to ambulance services (i.e. only 4.3% of all 999 calls). They did not include estimates of benefits from life-threatening 999 calls to other emergency services (e.g. fire, police or coastguard) or in relation to potentially preventing personal injury or loss or damage to property (e.g. through fire or theft).

A5.235 The key costs identified in the IA for Option 2 were:

¹²¹ Base: all making some calls using VoIP (83). Findings are indicative because answers are from a small base of respondents.

- The costs to VoIP providers of enabling 999 access, and
- Compliance costs of meeting additional General Conditions for some operators at PATS standard.

A5.236 Ofcom estimates that expected industry costs would be approximately £10 million in NPV terms over the next 5 years.

A5.237 Ofcom estimates an expected net benefit of Option 2 between £14 - £24 million in NPV terms.

Table 19: Option 2: Costs, benefits and net benefits, 25% and 40% VoIP take-up by 2011/12 (Table 16 reproduced)

	Growth of VoIP	
	25%	40%
Costs (£)	10,204,664	10,204,664
Benefits (£)	23,838,805	33,851,698
Net Benefits (£)	13,634,141	23,647,034

Source: Ofcom

A5.238 The IA concludes that, by conservatively estimating benefits (i.e. quantifying benefits in relation to only 4.3% of all 999 calls made), and by making reasonable allowances for compliance costs, the benefits for consumers and citizens of Option 2, if implemented, would significantly exceed the costs for type 2 and type 4 VoIP providers.

Annex 6

Proposed Modification to General Condition 4

This section shows the proposed modification to General Condition 4. Proposed additions are in bold. Proposed deletions are struck through.

GENERAL CONDITION 4: EMERGENCY CALL NUMBERS

- 4.1 The Communications Provider shall ensure that any End-User can access Emergency Organisations by using the emergency call numbers “112” and “999” at no charge and, in the case of a Pay Telephone, without having to use coins or cards.
- 4.2 The Communications Provider shall, to the extent technically feasible, make Caller Location Information for all calls to the emergency call numbers “112” and “999” available to the Emergency Organisations handling those calls.
- 4.3 For the purposes of this Condition,
- (a) “Caller Location Information” means any data or information processed in an Electronic Communications Network indicating the geographic position of the terminal equipment of a person initiating a call;
 - (b) “Communications Provider” means:
 - (i) in paragraph 4.1, a person who provides **a Service or provides access to such Service** ~~Publicly Available Telephone Services, or provides access to such Publicly Available Telephone Services~~ by means of a Pay Telephone;
 - (ii) in paragraph 4.2, a person who provides a Public Telephone Network;
 - (c) “Pay Telephone” means a telephone for the use of which the means of payment may include coins and/or credit/debit cards and/or pre-payment cards, including cards for use with dialling codes. For the avoidance of any doubt, references to a Pay Telephone include references to a Public Pay Telephone.
 - (d) **“Service” means a Public Electronic Communications Service enabling origination of national and international calls to numbers in a national or international telephone numbering plan.**

Annex 7

Notification of the Proposed Modification to General Condition 4

Notification of a proposed modification under Section 48(2) of the Communications Act 2003

Proposal for modification of General Condition 4 of Part 2 of the General Condition Notification regarding Emergency Call Numbers under Section 48(2) of the Act for the purpose of requiring access to Emergency Call Numbers.

1. OFCOM, in accordance with Section 48(2) of the Act, hereby make the following proposal for the modification of General Condition 4 of Part 2 of the General Condition Notification regarding Emergency Call Numbers.
2. The draft modification is set out in the Schedule to this Notification.
3. The effect of, and OFCOM's reasons for making, the proposals referred to in paragraph 1 above is set out in the accompanying explanatory statement.
4. OFCOM consider that the proposed modification referred to in paragraph 1 above complies with the requirements of Sections 45 to 50 of the Act, as appropriate and relevant to their proposal.
5. In making the proposal set out in this Notification, OFCOM have considered and acted in accordance with their general duties in Section 3 of the Act and the six Community requirements in Section 4 of the Act.
6. Representations may be made to OFCOM about their proposal set out in this Notification and the accompanying statement by 5pm on 20 September 2007.
7. Copies of this Notification and the accompanying statement have been sent to the Secretary of State in accordance with Section 50(1)(a) of the Act, and to the European Commission in accordance with Section 50(6) of the Act.
8. In this Notification:
 - (i) 'the Act' means the Communications Act 2003;
 - (ii) 'General Condition Notification' means as set out in the Schedule to the Notification under Section 48(1) of the Act published by the Director General of Telecommunications on 22 July 2003; and
 - (iii) 'OFCOM' means the Office of Communications.
9. Except insofar as the context otherwise requires, words or expressions shall have the meaning assigned to them in this Notification (including the Schedule) and otherwise words or expression shall have the same meaning as it has in General Condition Notification and, subject to such meanings, otherwise any word or expression shall have the same meaning as it has in the Act.

10. For the purpose of interpreting this Notification:
 - (i) headings and titles shall be disregarded; and
 - (ii) the Interpretation Act 1978 shall apply as if this Notification were an Act of Parliament.
11. The Schedule to this Notification shall form part of this Notification.

Neil Buckley
Competition Policy Director

A person authorised by Ofcom under paragraph 18 of the Schedule to the Office of Communications Act 2002

26 July 2007

Schedule

Proposal for modification to General Condition 4 of Part 2 of the General Condition Notification regarding Emergency Call Numbers, which is set out in the Schedule to the Notification under Section 48(1) of the Communications Act 2003 published by the Director General of Telecommunications on 22 July 2003

General Condition 4 on Emergency Call Numbers shall be modified as set out below:

1. The text of General Condition 4.3(b)(i) shall be substituted for the following -
 - (i) in paragraph 4.1, a person who provides a Service or provides access to such Service by means of a Pay Telephone;
2. The following definition is inserted in alphabetical order in Condition 4.3 -

“Service” means a Public Electronic Communications Service enabling origination of national and international calls to numbers in a national or international telephone numbering plan.

Annex 8

Glossary

3G: the third generation of mobile phone technology, which allows wireless broadband connection

Broadband: A service or connection that is generally defined as 'always-on' and provides a bandwidth greater than 128kbit/s

Core network: The centralised part of a network, characterised by a high level of traffic aggregation, high capacity links and a relatively small number of nodes

CBS: Cost-Benefit Assessment

CPS: Carrier Pre-selection. The facility that allows customers to opt for certain defined classes of call to be carried by a communications provider that they select in advance (and with which they have a contract) without having to dial a routing prefix, use a dialler box, or follow any other procedure

DECT: Digital European Cordless Telephony. A DECT phone is a cordless fixed phone

EC: European Commission

ECN: Electronic Communications Network

ECS: Electronic Communications Service

ERG: European Regulators Group

EU: European Union

GC: General Condition

IA: Impact Assessment

Interconnection: Where one Public Electronic Communications Network is linked to another to enable users of one of them (a) to communicate with users of the other one; (b) to make use of services provided by means of the other one (whether by the provider of that network or by another person)

Interoperability: The technical features of a group of interconnected systems that ensure end-to-end provision of a given service in a consistent and predictable way

IP: Internet Protocol. The packet data protocol used for routing and carriage of messages across the Internet and similar networks

ISP: Internet Service Provider. A company that provides access to the Internet

LLU: Local Loop Unbundling. A process by which BT's exchange lines are physically disconnected from BT's network and connected to other operators' networks. This enables operators other than BT to use the BT local loop to provide services to customers

MPF: Metallic Path Facilities. These are the pair of copper wires that run from a Main Distribution Frame at a telephone company local exchange to the end user's home or business premises

Naked DSL: A DSL service (e.g. broadband) provided without existing PSTN line voice services

NGN: Next generation network

NP: Number Portability, which allows consumers to keep their phone number when they change provider

NVS: New Voice Services. A term used by Ofcom in a previous consultation to describe new VoIP services

Ofcom: Office of Communications. The regulator for the communications industries, created by the Communications Act 2003

Oftel: Office of Telecommunications, whose functions transferred to Ofcom on 29 December 2003

PATS: Publicly Available Telephony Service, a category of ECS

PC: Personal Computer

PDA: Personal Digital Assistant (a handheld computer)

PECN: Public Electronic Communications Network

PECS: Public Electronic Communications Service

PSTN: Public Switched Telephony Network

PTN: Public Telephone Network. A network over which PATS is provided

QoS: Quality of Service

Service provider: A provider of electronic communication services to third parties. Some Service Providers have their own network

SLA: Service Level Agreement

Vertical integration: Mergers, or co-ownership between, producers that are active in different stages in the value chain for a particular good or service

VoIP: Voice over Internet Protocol. A technology that allows users to send calls using Internet Protocol, using either the public internet or private IP networks

Voice over Broadband: A Voice over Internet Protocol service provided over a broadband Connection

Wi-Fi: Wireless Fidelity based on IEEE 802.11x standards

WiMax: Worldwide Interoperability for Microwave Access – Broadband wireless based on IEEE 802.16 & ETSI HiperMAN standards

WLR: Wholesale Line Rental. A regulatory instrument requiring the operator of local access lines to make this service available to competing providers at a wholesale price