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# Mobile Phones and Mobile Phone Masts

Mobile phones have become extremely widely used over the past few years. The paper describes that development, along with the prospects for the future. It also discusses health concerns and the planning issues related to mobile phone masts.

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## **Summary of main points**

- In the UK, 58% of the population have mobile phones. Leisure use by young people is an important part of the market.
- The auction of the radio spectrum for Third Generation (3G) phones raised a very large amount of money, £22.5bn in the UK alone, but it has had some serious consequences.
- 3G mobile phones have exciting potential, but several problems are unresolved, and there is uncertainty about their commercial importance.
- Mobile phone masts remain unpopular, and the Government has issued new planning guidance to increase the amount of consultation needed before approval.
- Health concerns have been raised for both phones and telecommunications masts. The Stewart Report argued that there was no evidence for health dangers from masts, but favoured a precautionary approach, particularly for the phones.



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# I The Mobile Phone Industry

## A. Overview

There are 35 million subscribers to mobile phones in the UK, 58% of the population. That is a higher penetration than France, Germany and the United States,<sup>1</sup> but there are even higher rates of ownership in Scandinavia.<sup>2</sup>

The mobile phone industry is in a strange position. At one level, it is extremely successful with massive sales across the world. The remarkable penetration levels for a product that did not exist a few years before have brought with them extensive changes in lifestyle. It seemed straightforward to move on from mass penetration to a vast new commercial market. The potential appeared to exceed anything related to normal telephone sets. Already a whole range of new internet companies was being established, with seemingly brilliant prospects. All that was needed was for mobile telephones to become more sophisticated, so as to enable connection to the internet. Share valuations of the successful internet companies soared. Vodafone, the most successful firm based on mobile phone services, reflected these expectations. At its peak, in March 2000, at its peak, Vodafone became by far the UK's largest company, measured by stock market value, at £240bn, yet its sales in 2001 were predicted to be less than £20bn, even after its merger with Mannesmann.<sup>3</sup>

However, concerns have been growing for some time. The move to the next generation of mobile phones has proved technically difficult and far more expensive than expected. The commercial boom on the internet has largely collapsed with the dot.com companies notorious for dramatic collapses.

Concerns about safety of mobile phones have been largely ignored by the public, but worries over the safety of mobile phone masts have been taken seriously, whether justifiably or not. That adds to the risk of further costs and delays in setting up the network needed for the new phones.

Vodafone's share price had fallen to £130bn by the middle of 2001. Many traditional telecommunications companies have also seen dramatic falls in share prices. They face problems because they share the risks and expense of the mobile phone companies but have the costs of the fixed network in addition.

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<sup>1</sup> DTI Press Notice P/2001/667, *Industry Challenged to Implement 10 Commandments for Mobile phone Masts with Vigour and Determination*, 28 November 2001

<sup>2</sup> "1/7/01 cellular in figures", *Public Networks*, September 2001 p 46,

<sup>3</sup> "Vodafone AirTouch's commercial status does not warrant the impact it has on the FTSE 100", *Financial Times*, 29 July 2000

## **B. What are Mobile Phones used for?**

Early use of mobile phones was associated with financiers and businessmen. However, the enormous growth of the industry came when usage spread to a far wider range of people, who often wanted their phones for leisure purposes. It is possible to use a mobile phone to access stock market prices or business information, but that does not account for the main use. Teenagers welcomed mobile phones, partly because the phones suited their mobile lifestyles, partly because it moved their private communications away from the bottleneck of the family telephone. They send text messages as much as they use the phones for conversation. Mobile phones became fashion accessories whose design and looks became as important as their functionality.

One of the major difficulties for the mobile phone industry is to predict what services will be demanded. Most people in the industry think that access to the internet will be the next major advance. That access could be used to enhance its entertainment and leisure facilities, or it could be used for business purposes. Business use would go well beyond accessing static sites for business purposes, to reach m-commerce, the next stage after e-commerce. E-commerce is electronic commerce based on the personal computer. M-commerce is mobile commerce based on the mobile phone or other mobile electronic device.

In December 2000 just one in ten users of wireless devices had shopped using their phones or personal digital assistants, according to a survey by Anderson Consulting. Many retailers have been reluctant to invest in m-commerce, given expectations that it will remain a relatively small part of the retail market for several years. Forrester Research predicts that m-commerce will account for \$3.4bn in retail sales worldwide by 2005 – just 0.1% of total revenues, or 1.3% of all online sales.<sup>4</sup>

The slow start of m-commerce has not just been due to handset limitations or conservative habits of potential users. For a start, many consumers have real fears about security of commercial transactions undertaken by mobile phone. In addition, the attraction of instant purchasing is diminished by the need to wait several days for delivery. Consumers have so far shown little interest in buying lifestyle products like clothes and groceries via a mobile phone. Instead, the limited uptake has focused on the purchase of smaller items like theatre tickets.<sup>5</sup>

A study in Sweden in October 2001 suggests that young women will be the main users of m-commerce. Girls aged 15-18, living at home, already spend considerable sums on mobile telephony and have expressed a willingness to pay for shopping services,

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<sup>4</sup> “Slow start to m-retail”, *Financial Times*, 10 December 2000

<sup>5</sup> “M-Commerce: A Hard Sell for Cellular Operators”, *Public Network*, May 2001 pp 44-45



entertainment and applications designed to improve contact with friends. A second mainly female group, aged 18-25, lives independently and enjoys a busy social life. Members of the group already use the internet for commerce and want to use mobile reminder services, information about their interests and wireless email services.<sup>6</sup>

Another idea for the use of mobile devices is l-commerce or location commerce. The idea is to send targeted messages to people via mobile phones, based on where they are. For example, information about traffic conditions could be sent to motorists in the relevant area. Advertisements for specialist shops could be targeted at those nearby if they requested the service.

Although the potential uses might seem rather frivolous, the interest of the telecommunications industry in them is very serious. Around £70bn has been invested in Europe in the licences for access to the radio spectrum for third generation mobile phones. If those phones appeal to consumers, for whatever reason, the industry will prosper. If they do not appeal, then there are almost bound to be extensive commercial failures, not just among start-up dot.com companies, but among the largest and best-known telecommunications companies in Europe.

### **C. Mobile Phone Standards**

In Europe the de facto wireless telephone standard is the Global System for Mobile communication (GSM). It uses a variation of time division multiple access (TDMA) and is the most widely used of the three digital wireless telephone technologies (TDMA, GSM and CDMA). GSM digitises and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. It has over 120 million users worldwide, and is available in 120 countries. Since many GSM network operators have roaming agreements with foreign operators, users can often continue to use their mobile phone when they travel to other countries.

GSM has been a successful standard for mobile phones, but the industry needs to transmit a much larger volume of information, so as to enable graphics and moving pictures to be accessed. General Packet Radio System (GPRS), which is based on GSM, is an intermediate technology to achieve higher transmission speeds. GPRS is a packet-based wireless communication service that sends information in packets, rather than in individual pieces, and promises data transmission rates from 56 to 114 kbps, along with continuous connection to the internet for mobile phone and computer use. The term “kbps” means “kilobits per second” or “thousands of bits per second”, where a bit is a digit or letter. The higher transmission speeds allow mobile phone users to take part in videoconferences and interact with multimedia web sites.

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<sup>6</sup> “Cyber chicks strike a blow at make myth”, *Guardian*, 11 October 2001

Third Generation mobile phones will have to offer yet faster transmission speeds, and the Japanese phones launched in October 2001 offer 384 kbps. The standard for 3G in Europe is Universal Mobile Telephone System (UMTS). This is a version of Collision Detection Multiple Access (CDMA) developed especially for the European market. UMTS was designed as an evolutionary step from GSM. Third Generation Phones are discussed in Section III of this paper.

This special development of a new standard increases the risks of the whole 3G development. Those operators hoping to launch services in 2002 are hoping that technical problems will be sorted out in time. The launch of a service with inadequate technology, of course, might deter customers from the new services for a long time.

In the USA Verizon and Sprint, the two companies nearest to offering 3G are using the CDMA technology.

#### **D. Price Regulation**

The Office of Telecommunications (OfTel) published a review of the mobile telecommunications market on 26 September 2001. The Director General of Telecommunications, David Edmonds, said:

The OfTel review of the mobile market found increasing competition. Since January 1999, the cost of mobile telephony has fallen by around 30%. Consumer satisfaction with mobile services remains high at over 90%. There are four major operators with more even market shares. A new operator is entering the market. On the other hand, our review found that Vodafone and BT Cellnet continue to price calls on average at levels higher than would be seen in a truly competitive marketplace. This means I cannot yet conclude that the mobile market is effectively competitive. Therefore the designation under EC Directives of Vodafone and BT Cellnet as operators with significant market power will remain in place. However, in the light of increasing competition, I have concluded that some existing regulation can be removed and there is no case for additional regulation.

I propose to withdraw the market influence determinations that oblige Vodafone and BT Cellnet to supply airtime to independent service providers...I have also concluded that no controls on retail price on calls from mobile telephones are needed...<sup>7</sup>

However, he expressed concern at the price of roaming calls to other countries, and at the price of calls to mobile phones. He imposed a charge control of RPI-X for the next four years for all four mobile operators. It will not apply to 3G networks. It would mean that prices would be allowed to increase each year by a fixed amount less than the increase in

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<sup>7</sup> OfTel Press Release 64/01, *OfTel publishes outcome of mobile market review*, 26 September 2001

the retail price index. The mobile operators have rejected the price cap. The issue is likely to be referred to the Competition Commission in December 2001.<sup>8</sup>

## II Radio Spectrum Auctions

### A. The auctions for Third Generation Mobile Licences

The UK Government decided to auction the relevant parts of the radio spectrum, in order to allow telecommunications operators to launch a third generation (3G) mobile phone service. Section III of this paper discusses 3G mobile phones, which will be able to connect to the internet. The ability to operate such an auction dates back to the *Wireless Telegraphy Act 1998* (CAP 6). A consultation document, *Implementing Spectrum Pricing*, published in 1997 when the Bill was introduced, anticipated that increased licence fees would raise an additional £75m a year by the year 2000, although it anticipated that, periodically, some auctions might raise significantly greater sums.

In the event, the auction for 3G services soared to prices far beyond anything imagined at that stage. Indeed, within a year of the auction the whole picture had changed completely. It is hard to believe that prices anywhere near that level would have been paid if the companies had known then what they know now. The background was a belief that 3G would produce so many commercial opportunities that the successful bidders would be able to recoup their costs while the unsuccessful bidders would be virtually out of business. Five licences were on offer, and there were thirteen bidders, all of whom were reluctant to drop out after each round. The provisional licence winners, later confirmed, were announced on 27 April 2000:

A	TIW UMTS (UK)	£4,385m
B	Vodafone	£5,964m
C	BT(3G)	£4,030m
D	One2One Personal Communications	£4,004m
E	Orange 3G	£4,095m <sup>9</sup>

The spectacular prices in the auction had an immediate effect abroad. Several governments that had planned to give their spectrum away or charge a nominal amount, decided to adopt an auction. After a slow start and some withdrawals, the German auction raised even more than the UK one, eventually reaching a figure of £31bn. The German government decided to use DM 40bn or £12bn of this money on an ambitious plan for its crumbling rail network.<sup>10</sup>

<sup>8</sup> "Mobile Operators Reject OfTel's Price Cap", *Daily Telegraph*, 1 December 2001

<sup>9</sup> DTI Press Notice P/2000/296, *Byers announces 3G Mobile Licence Winners*, 27 April 2000

<sup>10</sup> "Germany to use 3G windfall", *Financial Times*, 22 September 2000

The Dutch auction only raised £1.65bn, rather than the £6bn expected by the Dutch Government. That apparently reflected the tactics of the Dutch government, offering only the same number of licences as incumbents, and allowing incumbents to raise bids if outbid in the early stages.<sup>11</sup> The Italian auction ended after only 10 rounds of bidding with the withdrawal of Bru, the consortium in which BT holds a 20% stake. BT's plans to develop a broad-based European mobile business were left in disarray. The Italian Government has only gained £7.5bn, instead of the £13bn they had expected.<sup>12</sup>

France decided to hold a "beauty contest" for 3G, rather than an auction. Candidates would be chosen according to the services that they planned to offer. The Government would seek to raise £12.2bn from the process, much less than the £22.5bn for the UK.<sup>13</sup> This strategy has also been problematic. The price chosen for the licences seemed reasonable, but then the shares of telecoms companies declined sharply, making it harder for them to raise finance. Three applicants withdrew, leaving only two companies for the licences and paying £6bn less than expected. There is a further round of sales to come:

Lowering the price enough to attract a fourth supplier will be a worry for Mr Fabius [the Minister]. If the price fell by more than half, a second round would not be worth the candle from a financial perspective. The first two operators would immediately demand the same terms, leaving the government worse off than now, with just two licences sold. However, Mr Hubert's [French Telecoms regulator] need to ensure a competitive market may demand just such a sacrifice from Mr Fabius. In turn, the government's need to save face will postpone any second round until after next spring's elections. As a result, France will be among Europe's laggards in rolling out 3G services, with Germany and the UK taking the lead as operators fight to earn a return on their mammoth investments.<sup>14</sup>

## **B. Some consequences of the auction**

Professor Negroponte, the US technology guru, criticised the British auction as early as June 2000:

"What happened in the UK was disastrous. It is the worst thing that could have happened to the consumer." The £22.5bn paid for the licences was unsustainable because it would translate into an extra cost of \$1,000 per subscriber on top of the cost of providing the service, said Prof Negroponte. "That \$1,000 has no research behind it, no new products behind it, no new infrastructure, no new handsets and no new potential for universal access or making this widely

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<sup>11</sup> "The flaws of a Dutch auction", *Financial Times*, 25 July 2000

<sup>12</sup> "BT's European mobile ambitions in disarray as Blu consortium collapses", *Independent*, 23 October 2000

<sup>13</sup> "France opts for 3G beauty contest over auction", *Financial Times*, 6 June 2000

<sup>14</sup> "Wrong call on France's 3G Auction", *Financial Times*, 30 May 2001

available". Prof Negroponete said the winners of the licences should have been chosen on the basis of which company would guarantee the lowest cost for consumers, which would install the most cellular infrastructure, which would put the most phones in schools and public places, and which would invest the most in creativity.<sup>15</sup>

However, the *Economist* dismissed such fears:

Yet the fears of Mr Negroponete and Mr Hellstrom are overblown. High licence prices will neither delay new mobile services nor make them unaffordable. Licences are a sunk cost; recipients have the strongest possible incentive to roll out new services to recoup their money as fast as they can. And the normal play of competitors and new entrants will discipline licence-holders long after the auctions are over. Auctions are a good way to ensure that licences go to those readiest to speed the development of new services, without affecting their price.<sup>16</sup>

During 2001, expectations and share prices in telecommunications declined, and companies began to look for ways to reduce their 3G commitments. In March 2001 the European Commission announced that it wanted EU governments to consider deferring payments for 3G mobile phone licences or allow operators to share infrastructure because of its worries about high debt levels in the telecoms sector.<sup>17</sup> However, the Belgian industry minister criticised the idea of relaxing the timescale of payments, on the grounds of unfairness between those who won auctions and the companies that did not. As well as the European Commission, German and UK regulators also considered the scope for co-operation between rival bidders in building the infrastructure.<sup>18</sup>

A robust comment in the *Financial Times* argued that softening the terms of the 3G licences would be a bad competition policy, amounting to a tax on 3G consumers, to be paid to the companies. It argued that regulators should hold the line:

First, any proposed mergers between telecoms companies that hold more than one licence in any European country should be viewed with deep suspicion. Companies should be forced to give up a duplicate licence without compensation (as under German rules) or sell it to a genuine competitor. Second, the licence terms should not be renegotiated. The European Commission is floating ideas such as extending the life of licences and rescheduling payments. These rightly got short shrift in Luxembourg on Wednesday. Third, plans to allow network sharing between licence holders should be resisted except in special circumstances. When competitors share a mobile phone mast of a given size,

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<sup>15</sup> "US tech guru condemns UK third generation auction", *Financial Times*, 7 June 2000

<sup>16</sup> "Mobile commerce and Europe's licence auctions", *Economist*, 8 July 2000

<sup>17</sup> "European Commission to tackle telcos' 3G debt", *Financial Times*, 20 March 2001

<sup>18</sup> "EU divided over 3G licences", *Financial Times*, 3 April 2001

there is no competition problem. Sharing the network is different...Network sharing would dilute competition on quality and standards would suffer.<sup>19</sup>

In June 2001 German regulators announced that 3G operators in Germany could share infrastructure costs. Deutsche Telekom and BT have announced that they are to join forces in building the 3G mobile networks in the UK and Germany, in a move they say will save up to \$2.5bn.<sup>20</sup> A further deal followed with KPN, the Dutch telecoms operator, announcing that it would share network costs with Group 3G.<sup>21</sup>

Perhaps the most important developments have been in France. On 30 September 2001, SFR, one of two groups awarded a 3G licence in France, announced it was withholding the £390m first tranche payment to the French government because of the onerous terms and deteriorating international business climate.<sup>22</sup> The company was compelled to pay up, but it had made its point. On 16 October 2001, the French Government reduced the upfront cost of 3G mobile phone licences from £3bn to £378m, and extended their life from 15 to 20 years.<sup>23</sup>

However, some companies that failed to gain a licence in the auction may feel that they have been treated unfairly if the winners end up paying far less than was promised.

The effect of the high auction prices on the telecommunications manufacturing industry is another important issue. Andrew Rickman, founder and chairman of Bookham Technology, the maker of optical components, wants the Government to plough the £22.5bn raised from the mobile phone auction back into the telecommunications sector. He said:

“The government has raised billions. If it doesn’t allow that money to flow back to the construction of a better communications infrastructure, they will be party to snuffing out the main growth industry of the economy.” He added: “Some people might say the money should be spent on schools and hospitals, but in fact the infrastructure we are talking about will deliver things that are more fundamental to the economy.”<sup>24</sup>

The well-known problems of Marconi have been closely linked to the drop in orders from telecommunications operating companies, partly because they had spent so much on their 3G licences. The telecommunications problem goes far beyond 3G licences, however. There is now no doubt that far too much long-distance capacity in optical fibre, for example, was created. A company like Marconi, selling telecommunications equipment,

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<sup>19</sup> “Comment: 3G special pleas”, *Financial Times*, 4 April 2001

<sup>20</sup> “BT and Deutsche Telekom to share 3G Networks”, *Financial Times*, 12 June 2001

<sup>21</sup> “KPN seals Group 3G German network sharing deal”, *Financial Times*, 13 September 2001

<sup>22</sup> “French group SFR withholds part of 3G payment”, *Financial Times*, 30 September 2001

<sup>23</sup> “France cuts upfront cost of 3G mobile licences”, *Financial Times*, 16 October 2001

<sup>24</sup> “Bookham founder wants 3G funds ploughed into networks”, *Financial Times*, 16 July 2001

now faces a much smaller market than was expected until mid 2001. The great majority of it is likely to be left unused for several years. Telecommunications companies across the world are suffering losses and reducing their workforce as demand falls, for example Nortel of Canada. However, the cost of the 3G licences is a factor in the problems of the European telecommunications sector.

### **III Third Generation Mobile Phones (3 G)**

#### **A. What is 3G?**

Third generation mobile telephones will be able to access the internet and consequently to provide a wide range of services to people away from computer terminals. Stephen Byers, then Secretary of State for Trade and Industry, was enthusiastic in April 2000:

3G has the potential to transform everyday life, opening up full scale, multi-media access to millions of people. 3G users will be able to surf the net, download e-mails, music and high quality pictures and hold video conferences all on the move.<sup>25</sup>

The prospects seemed so exciting that telecom companies in Europe paid large sums for rights to the necessary part of the radio spectrum for the operation. However, the technical side is difficult and, partly as a consequence, the range of services that will be available is also unclear.

#### **B. 3G in Europe**

The telecommunications companies that agreed to pay enormous amounts for access to the radio spectrum for 3G face problems on all fronts. First, there are technical problems in developing the handsets. Second, nobody really knows how much consumers will be prepared to pay for the new services. Third, the construction of the network of masts will be a considerable further expense, and masts are increasingly unpopular with the public. The costs in constructing the infrastructure for a 3G network in Britain are believed to be slightly more than the cost of the licences.<sup>26</sup>

Some people argue that the EU decision to develop its own technology may be a serious mistake:

Third-generation services, which will bring colour, full-motion video and the internet to mobile phones, were due to be launched in Europe next year [2002]. But all the 3G base-stations and telephone handsets have had to be created from

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<sup>25</sup> DTI Press Notice P/2000/296, *The result of the UK auction for 3G mobile licences*, 27 April 2000

scratch because of Europe's insistence on following its own version of the CDMA (collision detection multiple access) technology on which 3G services will be based...The European specification, called UMTS or Universal Mobile Telephone System, is still undergoing radical revision. Only this week is a definitive version expected. There are already worries that handsets will be delivered late and will perform worse than the GSM phones they are to replace. Critics say a complex development such as UMTS requires much more time to be completed and tested than the Europeans have allowed.<sup>27</sup>

However, the same author argued more recently that the European standard will probably be accepted in the end:

UMTS was designed as an evolutionary step from GSM. There are upwards of 500m GSM subscribers worldwide. By comparison, there were only 80m CDMA subscribers at the end of last year [2000].<sup>28</sup>

In September 2001, Vodafone admitted that its 3G network will not be fast enough to offer full multimedia services. Transmitting live music and video clips remains slow and expensive. Therefore its technology will fall below the internationally-accepted standard for 3G mobile services.<sup>29</sup>

In September 2001, a draft copy of the listing particulars for the BT wireless division (mmO2) reveals further concerns about GPRS and 3G:

- The development costs of our UMTS mobile networks will be substantial, the demand for UMTS services is uncertain and we may not make an economic return on our investment.
- We are dependent upon suppliers of GPRS and UMTS handsets, network equipment and software being able to meet our requirements and on applications developers to develop new products that will increase demand and generate revenues.

The technology for new GPRS and UMTS services is not yet fully developed by the suppliers of the handsets, network equipment and software to be used by us and our competitors in providing GPRS and UMTS services. We are reliant upon certain suppliers, of which there are a limited number, to supply functional network equipment as well as handset devices...Some of our suppliers are facing difficulties of their own...

- Our business is highly dependent on technology and new technologies may develop that could reduce the marketability of our services and products.
- We will require additional sites for the roll-out of our UMTS networks. Planning controls and other factors affecting the siting of masts may slow down the development of our UMTS networks.

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<sup>26</sup> P.Collier, "The Astronomical Debt", *Connectis*, August 2001 p 14 quoting Durlacher Research

<sup>27</sup> Alan Cane, "Winding road to a 3G solution", *Financial Times*, 29 March 2001

<sup>28</sup> Alan Cane, "Delays send shivers", *Financial Times*, 16 May 2001

<sup>29</sup> "Vodafone fails its 3G Test", *BBCNews Online*, 7 September 2001



- Regulations and other factors may not permit us to share UMTS networks with other operators. If we are permitted to share UMTS networks with other operators, it is uncertain what terms we will be able to agree with them.<sup>30</sup>

Despite fears over delays and uncertainties, a report suggests that the enormous amounts paid to acquire licences for 3G networks have not been wasted:

The annual Technology Forecast from PriceWaterhouseCoopers predicts that 3G networks will turn out to be money-earners for mobile phone companies. But the bad news is that no-one seems to know what exactly people or businesses will be using the networks for, nor what will prove most popular.<sup>31</sup>

Attempts to produce intermediate technology handsets with some of the facilities of 3G have not worked well. The move towards 3G in Europe began with the development of Wireless Application Protocol (WAP) a set of standards to which the phones would conform.<sup>32</sup> Phones launched as WAP phones were seen as an intermediate stage towards 3G. Unfortunately, since they were not based on sufficiently high data transmission speeds, they were unable to meet expectations and contributed to disillusionment.

General Packet Radio Service (GPRS) has been widely seen as a stepping-stone to 3G, and is sometimes called 2.5G. The launch of such phones in the UK in 2001 has been plagued by setbacks. BT and Vodafone claim to have overcome the initial problems and have launched a commercial service. One2One has said it will delay its launch, probably till after Christmas 2001:

In an even more worrying sign for the industry, One2One compared the response to GPRS phones to the reaction to an earlier range of phones using widely ridiculed Wap (Wireless Application Protocol) technology. “Our feedback is that the GPRS offerings launched to date have not delivered a customer experience that gives people confidence in the future potential of this technology,” said Harris Jones, Chief Executive.<sup>33</sup>

However, there are increasing doubts about the level of demand for 3G, particularly since other intermediate technologies can satisfy many of the more important needs – for example better access to financial information in a limited area. Entertainment applications may be popular, but it is notoriously difficult to predict what will catch on in this area.

The *New Scientist* commented that the mobile internet and video on the move will be delayed by public opposition to mobile telephone masts.

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<sup>30</sup> *Listing Particulars of mmO2*, pp 86-7

<sup>31</sup> “Mobiles mean money, probably”, *BBCNews Online*, 14 May 2001

<sup>32</sup> Wap is thus an acronym and not rhyming slang

<sup>33</sup> “Mobile operator attacks ‘unreliable’ technology”, *Financial Times*, 14/15 July 2001

The news follows the revelation by telecoms analyst Ovum that Britain's 3G operators are going to need at least 100,000 new antenna masts, a number that dwarfs the 40,000 used for today's GSM network....The networks do not publish the number of masts they use or are planning to build. But Ovum says that each of the four British networks has around 10,000 masts. The 3G system uses higher frequencies than GSM, which do not travel so well, so it will need three times as many antennas in urban areas and twice as many in the country. This means Britain's five 3G operators will need at least 100,000 new antennas between them to match GSM coverage.<sup>34</sup>

That figure is strongly contested by others. In a Standing Committee Debate, the Parliamentary Under Secretary for Transport, Local Government and the regions, Sally Keeble gave a completely different view of the number of new masts to be expected:

The hon. Member for Cotswold raised some points about new masts. The 10th report of the Select Committee on Trade and Industry on mobile phone masts, which was published in March, states that operators have reported that 80 per cent of existing sites could serve as base stations for third-generation mobile phones. There are about 22,500 sites and a net total of some 27,000 installations, which include all the varying types that are said to be required. Many additional sites will not be ground-based but will be positioned on existing structures or buildings. New ground-based masts will often be shared, and I shall deal with the questions that were asked about mast sharing in a moment. Working from a current total of some 6,000 ground-based masts, the Select Committee's best estimate was an extra 3,000 ground-based masts over the next three years. There has been extensive discussion on mast sharing. The Government's policy is firmly to encourage mast sharing where that is the best solution in a given circumstance. The conditions attached to individual operating licences granted by the Secretary of State for Trade and Industry include a requirement to investigate mast sharing before seeking to put up any new masts.<sup>35</sup>

### **C. 3G in Japan and Korea**

NTT DoCoMo launched its 3G service, the first in the world using wide-band CDMA technology, on 1 October 2001. DoCoMo admit that they do not know how much demand there will be for the service, called Foma. European operators, hoping to launch similar services, are eagerly watching results.<sup>36</sup>

One feature of the 3G is that it can transmit a moving picture of the sender on a 2.2 inch screen on the handset, which costs between £400 and £600.

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<sup>34</sup> "Not in my backyard", *New Scientist*, 10 February 2001 p 6

<sup>35</sup> Standing Committee on Statutory Instruments, SC Deb 21 November 2001 c 14

<sup>36</sup> "Industry awaits DoCoMo 3G launch with apprehension", *Financial Times*, 30 September 2001

[The handsets] offer impressively fast connection speed of 384 kbps. At 40 times faster than i-mode, this means quicker downloads of email and smoother web browsing. The extra speed allows voice and data to be transmitted at the same time so it is no longer necessary to interrupt a conversation to receive an email. Best of all, it means the quality of mobile phone voice calls is now on a par with landlines.<sup>37</sup>

Monthly charges for 3G are 20% more expensive than for Japan's i-mode, which is perhaps 2+G. It was launched in February 1999, but by August 2000 had signed up 10 million people, with DoCoMo still signing up a million a month. Teenagers find i-mode particularly attractive, because they are mobile, and because it is the easiest way to access entertainment sites. It was also their first opportunity to send text messages. DoCoMo offers a proprietary technology, rather than an open standard like WAP. It does not want to convert the rest of the world to its system, but to secure "roaming" agreements so people can use DoCoMo handsets anywhere in the world. Apparently firms are lining up to court DoCoMo because they want its experience with packet-switching technology and with marketing and handling content and content providers.<sup>38</sup>

Keniichi Enoki, who runs DoCoMo's i-mode has said that telecom operators will struggle to justify the £60bn+ they have spent on 3G licences in Europe. DoCoMo says it will be too costly to download large files, such as pop videos, to handsets.<sup>39</sup>

There has been much discussion of why i-Mode succeeded while WAP failed.

"Wap failed [in Europe] because operators concentrated too much on the technology rather than the content," says i-mode's Mr Enoki. "It is like worrying about the quality of TV sets before you have any programmes." By contrast, content has been central to DoCoMo's success. It discovered that the growth of the mobile web is being driven by entertainment and pop culture not weighty financial information sites or technological one-upmanship. The secret lies, above anything, in the variety of what is on offer.<sup>40</sup>

Korea has launched a 2.5G service on the IS95 network, which can be accessed via new mobile phones launched by the electronics division of Samsung. The service was the most advanced in the world in the summer of 2001, being equipped with video-on-demand and audio-on-demand functions. Samsung has only around 5% of the world market for handsets.<sup>41</sup>

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<sup>37</sup> "Japan's Quantum Leap", *Guardian*, 11 October 2001 Online p 9

<sup>38</sup> P.Hadfield, "Sayonara Wap", *New Scientist*, 21 October 2000 pp 39-41

<sup>39</sup> "DoCoMo sounds alarm on 3G", *Financial Times*, 22 November 2000

<sup>40</sup> "Myths of i-mode's success", *Financial Times*, 5 December 2000

<sup>41</sup> "Samsung puts 3G in the picture", *The Scotsman*, 4 June 2001

## D. 3G in the USA

US mobile communications companies are edging towards building high-speed third generation wireless networks. The cautious moves and continuing disagreement over wireless technology standards highlight the problems US companies have had in matching the rapid growth by the wireless industry in large parts of Europe and Asia. However, American companies have avoided the high costs and uncertainty that now surrounds 3G in Europe.<sup>42</sup> They now seem well placed to develop the technology.

One article suggests that the 3G industry is financially unsound:

Publicly, operators point to GSM penetration levels of more than 50% in order to justify the required investments in licences, network construction and service development. If only increases in subscriber numbers carried with them proportionate increases in revenue. Instead, new users are attracted to cellular at the expense of growing acquisition costs while yielding lower than average revenues in all but the longest of terms. This is bad news for two reasons:

- predictions of the take-up of 3G are postulated on the basis of 2G penetration levels, ignoring the varying “value” of an individual subscriber;
- 2G revenues are required to fund the development of 3G networks and services, so that any decline in per-subscriber revenue will hit both current profit expectations and future investment planning.<sup>43</sup>

Another article, however, argued that [US Telecom operator] Sprint’s plans to launch 3G in 2001 are well ahead of those of European operators:

This ambitious plan...is thanks to forward thinking when the Sprint PCS network was designed in the mid-1990s. “The design of our digital network, which was planned with 3G in mind, meant we only had to spend \$280 million in the FCC wireless auctions for digital spectrum,” explained Dan Wilinsky, a spokesman for the carrier...The reason why Sprint PCS seems to be sitting pretty with its 3G plans is that CDMA2000 is evolutionary, rather than revolutionary, as Europe’s 3G network plans are. This pragmatic approach will see Sprint PCS users having access to a relatively modest 144 kilobits per second (kbps) – 10 times the speed US cellular users already have access to – in “selected markets” across the US by the end of the year.<sup>44</sup>

## E. Fourth Generation

Ericsson of Sweden is planning its 4G mobile telephones, which will be less dependent on menus and scrolling. The phone – or “virtual reality device” – will be able to

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<sup>42</sup> “US mobile groups edge towards 3G networks”, *Financial Times*, 20 March 2001

<sup>43</sup> “Wireless: riding its luck into 3G”, *Public Network*, February 2001

<sup>44</sup> “Sprint outruns 3G limp”, *Guardian*, 5 April 2001

recognise whether you are standing in front of your garage door and want to open it, or standing in a supermarket aisle wanting to buy something. 3G networks may offer internet connection speeds of 2 megabits per second, some 20 times faster than is possible today, making it possible to see live video clips, for example. Fourth generation speeds could be as high as 100 megabits.<sup>45</sup>

To some extent, the mobile phone industry needs to increase its data transmission speeds to keep up with developments elsewhere in the telecommunications industry. Broadband services called ADSL (asymmetrical digital subscriber line) are currently being rolled out. A new development, VDSL (Very high bit-rate DSL), based on optical fibre, will soon be available, perhaps by the end of 2002:

The new systems may also be bad news for the mobile phone industry, which has invested heavily in 3G networks as a way of delivering high-speed data. Just as today's mobile phones are horribly slow compared with ordinary modems, tomorrow's 3G phones may seem horribly slow compared with VDSL and wireless networks.<sup>46</sup>

## **IV Mobile Phone Masts and Planning**

### **A. Planning requirements for telecommunication masts in England**

The erection of a mast counts as development, and would therefore normally require planning permission. However, licensed telecommunications operators, like other operators of utilities, have certain permitted development rights, which means that they can carry out certain activities without having to apply for planning permission.

The *Town and Country Planning (General Permitted Development) Order 1995* (Part 24 of Schedule 2) granted a general planning permission for certain telecommunications masts providing:

- the mast is erected by a telecommunications code system operator licensed by the Secretary of State for Trade and Industry under the Telecommunications Act 1984;
- the mast does not exceed 15 metres in height;<sup>47</sup>
- the mast is not erected in a National Park, area of outstanding natural beauty, conservation area, or the Broads; and

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<sup>45</sup> "Ericsson starts planning for 4G mobile technology", *Financial Times*, 2 October 2000

<sup>46</sup> "How to stay above the rest", *Guardian Online*, 6 December 2001

<sup>47</sup> The height limit does not include an antenna installed on top of the mast

- the mast is not refused prior approval (explained in the following section) by the local planning authority within the period allowed under the Order.

A full application for planning permission is normally required for any mast that does not meet these criteria.

In those circumstances where the exercise of a permitted development could have a serious impact on amenity, the local planning authority may serve a direction under Article 4 of the Order. It is for the local planning authority to determine whether the siting or appearance of the development would pose a serious threat to amenity on a case by case basis. Guidance on factors the authority may take into consideration when determining whether to give or refuse such approval is contained in Planning Policy Guidance Note 8.<sup>48</sup>

Where permitted development rights do not exist for a particular mast, because it is higher than 15 metres for example, then the operator can apply to the local authority for planning permission in the normal way. If a local authority refuses planning permission, then the operator can appeal to the Secretary of State and this is dealt with under the usual planning appeal system.

## **B. The 1999 prior approval procedure**

In 1999, after a review of telecommunications permitted development rights, the Government decided to proceed with a new single-stage prior approval period of 42 days for ground based masts. The legislation was *The Town and Country Planning (General Permitted Development) (Amendment) Order 1999* (SI 1661). The explanatory memorandum summarised the changes:

Article 3 amends Part 24 of Schedule 2 to the 1995 Order, which confers permitted development rights in respect of development by telecommunications code system operators. The principal change is the introduction of new conditions, where the proposed development consists of or includes the construction, installation, alteration or replacement of a ground-based mast, requiring a developer to apply to the local planning authority for a determination as to whether the prior approval of the authority will be required to the siting and appearance of the development. Provision is made for a site notice to be displayed informing the public of the application and providing for representations to be made to the local planning authority.

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<sup>48</sup> DTLR, *Planning Policy Guidance Note 8: Telecommunications*, August 2001, <http://www.databases.dtlr.gov.uk/planning/npp/PubDetail.asp?thisPub=PPG08>

Some other telecommunications developments, including masts installed on buildings or structures, are covered by a 28-day procedure to decide whether approval is needed for siting and appearance. The same criteria for refusal exist as for the 42-day procedure.

If approval is refused, then the applicant can appeal. After refusal, or after confirmation of refusal on appeal, the applicant may make a fresh application for prior approval determination to the local planning authority. Any fresh application may include details of different sitings and/or appearance at the same or a different location. The system of prior approval has been retained in the revision of telecommunications planning in 2001.

### **C. Policy after the Stewart Report**

In May 2000, an expert committee appointed by the Public Health Minister, chaired by Sir William Stewart, published a report on Mobile Phones. The report found no evidence of harm from emissions from mobile phones or base stations, but it called for a precautionary approach. The report is described in more detail in section V of this paper, but the following conclusions are relevant to planning:

- For base station emissions, exposures of the general population will be to the whole body but normally at levels of intensity many times less than those from handsets.
- Some people's well-being may be adversely affected by the environmental impact of mobile phone base stations sited next to houses, schools or other buildings, as well as by fear of perceived direct effects.
- For all base stations, including those with masts under 15m, permitted development rights should be revoked and the siting of all new base stations should be subject to the normal planning process.

The report also drew attention to the particularly contentious issue of base stations near or within school grounds, recommending that radiation levels be checked for conformity with guidelines. In July 2000, the Government sent advice to local education authorities, with the following passage on base stations and schools:

#### **Base Stations on or near schools**

The [Stewart] report does not suggest that existing base stations should be taken down from schools, or that no new base stations should be erected on school premises. However, under its precautionary approach, the report recommends that the "beam of greatest intensity" from a base station's antenna should not fall on any part of the school grounds or buildings without agreement from the school and parents. Where parents and/or schools wish to know whether the beam of intensity falls on school grounds or buildings, the school should contact the base station's operator. The operators have agreed to provide schools with information on the level of intensity of radio frequency radiation. This should include an explanation of the way in which the intensity of radiation falls off with distance from the antenna. If there is major concern from the school or parents, they could ask the network operator to adjust the antenna.

### **Audit of base stations**

The Government has asked the Radiocommunications Agency to carry out the report's recommendation for an independent random audit of base stations. The Radiocommunications Agency has agreed to audit base stations in and around schools first.<sup>49</sup>

An action group, Mast Action UK (MAUK) has been formed to oppose the siting of mobile phone masts close to schools. It is a coalition of community groups from across the UK who are concerned about the possible health risks of radiation generated by the masts. Backed by former Conservative health minister Marian Roe, the group is calling for children and other vulnerable groups to be protected against potential radiation risks.<sup>50</sup>

The Stewart Report left the Government with a difficult balance. On the one hand, it found no evidence that telephone masts caused health problems. On the other hand, it called for increased consultation before the granting of planning permission and an extension of the scope of planning permission to cover masts that were previously approved by permitted development rights. In view of the popular hostility towards telephone masts, any increase in the scope of planning permission was bound to lead to greater pressure on the local planning authority to reject the application for permission. The Government was also committed to encouraging the development of new technologies like mobile telephones, and sold the licences for radio spectrum for third generation (3G) mobile phones for £22.5bn.

The new policy was announced, after consultation, on 16 March 2001, although it did not come into force until August 2001.

The Government today announced a series of important changes to the planning system on the siting of mobile phone masts. Following public consultation on planning rules for telecommunications mast development last year, the Government is to:

- \* strengthen public consultation requirements on mast proposals of 15 metres and below so that they are exactly the same as applications for planning permission
- \* increase the time for authorities to deal with prior approval applications to 56 days
- \* underline that school governors must be consulted on all proposals for new masts on or near a school or college.
- \* increase fees to enable authorities to carry out full public consultation.
- \* maintain in full an authority's ability to reject applications on amenity grounds.

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<sup>49</sup> DFEE Guidance, *Mobile phones and base stations*, July 2000

<sup>50</sup> "Site mobile phone masts away from schools", *BBCNews Online*, 13 December 2000



Announcing the changes, Planning Minister, Nick Raynsford, said:

"These changes represent a considerable strengthening of the current planning arrangements. We shall introduce them, and revised planning policy guidance at the earliest opportunity. A modern communications system brings massive benefits to people and businesses. But it is vital that the masts which enable the service to be delivered are designed and sited sensitively so that their environmental impact is kept to a minimum and that local people have a better chance to have their say."<sup>51</sup>

## D. The Planning Policy Guidance of August 2001

The new planning guidance opens with a statement of general policy sympathetic to telecom masts:

- The Government's policy is to facilitate the growth of new and existing telecommunications systems whilst keeping the environmental impact to a minimum. The Government also has responsibility for protecting public health.
- The aim of telecommunications policy is to ensure that people have a wider range of services from which to choose and equitable access to the latest technologies as they become available.
- The Government places great emphasis on its well established national policies for the protection of the countryside and urban areas – in particular the National Parks (including the Broads and the New Forest), Areas of Outstanding Natural Beauty, Sites of Special Scientific Interest, the Green Belts, the Heritage Coast and areas and buildings of architectural or historic importance.
- Whilst local planning authorities are encouraged to respond positively to telecommunications development proposals, they should take account of the advice on the protection of urban and rural areas in other planning policy guidance notes.
- Material considerations include the significance of the proposed development as part of a national network. In making an application for planning permission or prior approval, operators may be expected to provide evidence regarding the need for the proposed development.
- Authorities should not seek to prevent competition between different operators and should not question the need for the telecommunications system which the proposed development is to support.<sup>52</sup>

The need for “protection from visual intrusion” is stressed. Mast sharing is encouraged:

- In order to limit visual intrusion, the Government attaches considerable importance to keeping the numbers of radio and telecommunications masts, and of the sites for such installations, to the minimum consistent with the efficient operations of the network.

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<sup>51</sup> DETR Press Notice 142, *Better Public Consultation on Mobile Phone Masts*, 16 March 2001

<sup>52</sup> DTLR, *Planning Policy Guidance Note 8: Telecommunications*, August 2001, <http://www.databases.dtlr.gov.uk/planning/npp/PubDetail.asp?thisPub=PPG08>

- The sharing of masts and sites is strongly encouraged where that represents the optimum environmental solution in a particular case. Authorities will need to consider the cumulative impact upon the environment of additional antennas sharing a mast or masts sharing a site.
- Use should also be made of existing buildings and other structures, such as electricity pylons, to site new antennas. Local planning authorities may reasonably expect applicants for new masts to show evidence that they have explored the possibility of erecting antennas on an existing building, mast or other structure.
- Authorities are encouraged to help applicants identify existing and potential sites by making suitable local authority owned property available to users and by encouraging others to do the same with their property.
- With the closure of the analogue mobile phone network, the re-use of the existing sites is encouraged to minimise the need for new second and third generation base station sites.

The importance of design is emphasised, and lower emission guidelines, recommended by the International Commission on Non-Ionizing Radiation Protection (ICNIRP), are introduced. The planning policy guidance states plainly that health considerations should not be grounds for rejection of applications:

- Health considerations and public concern can in principle be material considerations in determining applications for planning permission and prior approval. Whether such matters are material in a particular case is ultimately a matter for the courts. It is for the decision-maker (usually the local planning authority) to determine what weight to attach to such considerations in any particular case.
- However, it is the Government's firm view that the planning system is not the place for determining health safeguards. It remains central Government's responsibility to decide what measures are necessary to protect public health. In the Government's view, if a proposed mobile phone base station meets the ICNIRP guidelines for public exposure it should not be necessary for a local planning authority, in processing an application for planning permission or prior approval, to consider further the health aspects and concerns about them.
- The Government's acceptance of the precautionary approach recommended by the Stewart Group's report "mobile phones and health" is limited to the specific recommendations in the Group's report and the Government's response to them. The report does not provide any basis for precautionary actions beyond those already proposed. In the Government's view, local planning authorities should not implement their own precautionary policies e.g. by way of imposing a ban or moratorium on new telecommunications development or insisting on minimum distances between new telecommunications development and existing development.

The Planning Policy Guidance also includes the following passage relating to the siting of masts near schools:

62 Where the operator submits an application to the local planning authority for planning permission or prior approval for the installation, alteration or replacement of a mobile phone base station wither at or near a school or college, it is important that operators discuss the proposed development with the relevant

body of the school or further education (FE) college concerned *before* submitting any such application to the local planning authority. When making the application the operator should provide evidence to the local planning authority that they have consulted the relevant body of the school or college (e.g. the school's governing body or the corporation of the FE college).

63 When an application has been submitted to the local planning authority for planning permission or prior approval for the installation, alteration or replacement of a mobile phone base station either on or near a school or college, the local planning authority should consult the relevant bodies, and should take into account any relevant views expressed. Consultation should be in the form of written notification to the school's governing body or the corporation of the FE college, inviting their comments by a specified date.

The new Planning Policy Guidance was accompanied by two statutory instruments, both now in force:

- 1 *The Town and Country Planning (General Permitted Development) (Amendment) (England) Order 2001* (SI 2718)<sup>53</sup>
- 2 *The Town and Country Planning (Fees for Applications and Deemed Applications) (Amendment) (England) Regulations 2001* (SI 2719).<sup>54</sup>

The first Order amended the permitted development rights to bring in the extended prior application procedure for items such as telecommunications masts under 15 metres. The second Order allowed local planning authorities to increase charges, so as to enable them to devote more resources to investigating the applications.

There is some difference in policies within the UK, although the practical effect of these differences is not yet clear. In Wales, the Administration has said that in 2001/2002 it will "introduce policy and new procedures for the siting of new Telecommunications masts."<sup>55</sup> That follows consultation from December 2000 after a decision by the Assembly Environment Secretary to make all masts subject to full planning control.<sup>56</sup> The *Town and Country Planning Act 1990* applies to Wales, and there have not yet been any notable changes in planning statutory instruments, although the statutory instruments introduced in July 2001 to implement English policy do not apply in Wales. In addition, planning guidance in Wales already differed from that in England since before devolution. In Scotland, where planning law is different from that in England, although organised similarly, the executive has already placed all masts under full planning control. The Northern Ireland executive has announced its intention to remove permitted

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<sup>53</sup> <http://www.legislation.hmso.gov.uk/si/si2001/20012718.htm>

<sup>54</sup> <http://www.legislation.hmso.gov.uk/si/si2001/20012719.htm>

<sup>55</sup> Welsh Assembly Website,

[http://www.wales.gov.uk/subiassemblybusiness/content/assembly\\_business\\_prog\\_2001-e.htm](http://www.wales.gov.uk/subiassemblybusiness/content/assembly_business_prog_2001-e.htm)

<sup>56</sup> Welsh Assembly Consultation Paper on Telecommunications Mast Development,

[http://www.wales.gov.uk/subiplanning/content/consultationpapers/telecomms\\_letter\\_e.htm](http://www.wales.gov.uk/subiplanning/content/consultationpapers/telecomms_letter_e.htm)

development rights, after an Executive Committee decision of 14 June 2001. Legislation is expected in the winter of 2000/2001.<sup>57</sup>

## **E. The Telecommunication Operators' Ten Commitments**

All five operators of mobile telecommunications services have signed up to “ten best practice commitments” to:

- develop, with other stakeholders, clear standards and procedures to deliver significantly improved consultation with local communities
- participate in obligatory pre-rollout and pre-application consultation with local planning authorities
- publish clear, transparent and accountable criteria and cross-industry agreement on site sharing, against which progress will be published regularly
- establish professional development workshops on technological developments within telecommunications for local authority officers and elected members
- deliver, with the Government, a database of information available to the public on radio base stations
- assess all radio base stations for international (ICNIRP) compliance for public exposure, and produce a programme for ICNIRP compliance for all radio base stations as recommended by the Independent Expert Group on Mobile Phones
- provide, as part of planning applications for radio base stations, a certification of compliance with ICNIRP public exposure guidelines
- provide specific staff resources to respond to complaints and enquiries about radio base stations, within ten working days
- begin financially supporting the Government's independent scientific research programme on mobile communications health issues
- develop standard supporting documentation for all planning submissions whether full planning or prior approval.<sup>58</sup>

## **V Health Effects of Mobile Phones and Masts**

### **A. Mobile Phones**

Mobile telephones emit radio waves that can penetrate human tissue, producing a heating effect. Safety guidelines produced by the National Radiological Protection Board are based solely on avoiding the known biological consequences of excess heating. The intensity of radiation from mobile phones is too low to produce significant heating; most health concerns surround possible athermal effects, arising from interference with the body's natural electrical activity for example. In particular there have been suggestions that mobile phone use could be associated with brain cancers, though the evidence that

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<sup>57</sup> <http://www.northernireland.gov.uk/>

<sup>58</sup> <http://www.fei.org.uk/fei/feiweb.nsf/framesetter/MGIO4FREFN?OpenDocument>

exists is patchy at best. A World Health Organisation factsheet (May 1998) summarised the evidence in the following terms:

Exposure to Radiofrequency (RF) Fields and Cancer: Current scientific evidence indicates that exposure to low levels of RF fields, including those emitted by mobile phones and their base stations, is unlikely to induce or promote cancers.

Cancer studies using animals have not provided convincing evidence for an effect on tumour incidence. However, a recent study found that RF fields, similar to those used in mobile telecommunications, increased the incidence of cancer among genetically engineered mice that were exposed near (0.65m) an RF transmitting antenna. Further studies will be carried out to determine the relevance of these results to cancer in human beings.

To date, epidemiological (population health) studies do not provide adequate information to allow a proper evaluation of human cancer risk from RF exposure because the results of these studies are inconsistent. This can be explained, in part, by differences in the design, execution and interpretation of these studies, including the identification of populations with substantial RF exposure and retrospective assessment of such exposure.<sup>59</sup>

The World Health Organisation is co-ordinating an international research effort, the results of which are expected around 2003. In 1999 the House of Commons Science and Technology Committee reported on mobile phones and health. It pointed out that scientific evidence supported the view that mobile phones were not a health hazard. However, the report noted some uncertainties, and called for further research.<sup>60</sup>

One response to uncertainty over the health effects, if any, of mobile phones was the establishment of the Independent Expert Group on Mobile Phones, chaired by Sir William Stewart. This reported on 11 May 2000, having reviewed the literature and conducted a number of public hearings around the UK.<sup>61</sup> The main conclusions, summarised in an accompanying press release were:

- The use of mobile phones and related technologies will continue to increase for the foreseeable future.
- The balance of evidence to date does not suggest that emissions from mobile phones and base stations put the health of the UK population at risk.
- There is now some preliminary scientific evidence that exposures to radio frequency (RF) radiation may cause subtle effects on biological functions, including those of the brain. This does not necessarily mean that health is affected but it is not possible to say that exposure to

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<sup>59</sup> <http://www.who.int/inf-fs/en/fact193.html>

<sup>60</sup> Science and Technology Committee, *Scientific Advisory System: Mobile Phones and Health*, 2 September 1999, HC 489 1998-99

<sup>61</sup> <http://www.iegmp.org.uk/>

RF radiation, even at levels below national guidelines, is totally without potential adverse health effects.

- The Expert Group has recommended that a precautionary approach to the use of mobile phone technologies be adopted until more detailed and scientifically robust information becomes available.
- The use of mobile phones whilst driving can have a detrimental effect on the quality of driving. Drivers should be discouraged from using mobile phones whilst on the move.
- The widespread use of mobile phones by children for non-essential calls should be discouraged.

Sir William Stewart amplified his warnings to the British Association in September 2001:

Sir William Stewart...called for the cost of handsets to be increased to restrict their use by children. Sir William...said he would not allow his grandchildren to use a mobile phone...<sup>62</sup>

Concern over children relates partly to the thinness of their skulls. Professor Om Ghandi, of the University of Utah, has carried out further research, not yet published. However, he was quoted in newspapers:

“Up to 50% more radiation is absorbed in children as compared to the adults. More radiation can go through since the child’s ear is thinner, the telephone is closer to the head and this thinner ear doesn’t absorb so much power. Therefore more is able to go past the ear into the head. All it takes is two millimetres difference.”<sup>63</sup>

The *British Medical Journal* reported in January 2001 on studies suggesting that mobile phones did not cause cancer:

The studies, which together involved more than 1250 patients with brain tumours and an equal number of healthy individuals, found no increased risk of cancers among those who used the devices more frequently. The results are not likely to put the issue of potential harm completely to rest, but they join a growing body of evidence suggesting that the only important risk associated with the handheld devices is a higher likelihood of traffic accidents. “In all of the available scientific literature, there is nothing that indicates any adverse health effects from using cell phones,” said Russell Owen, chief of the Food and Drug Administration’s radiation biology branch. The two studies leave open the question of whether longer uses of the devices could pose a problem. That issue is being addressed in a still larger European trial now under way, but results are not expected until 2003 at the earliest.<sup>64</sup>

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<sup>62</sup> “Mobile telephones in new brain tumour alert”, *Daily Telegraph*, 5 September 2001

<sup>63</sup> “Young Child’s Brain Absorbs 50% More Radiation than an Adult”, *The Express*, 8 November 2001

<sup>64</sup> S.Gottlieb, “Evidence grows for safety of mobile phones” *BMJ*, 20 January 2001

Mobile phone makers started displaying radiation emission levels on handsets from October 2001 following agreement on a European Union-wide harmonised test method. The EU's standards committee adopted an industry-wide testing system to measure specific energy absorption rates (SARs). By 31 March 2002 all phones on sale will have to display their values.<sup>65</sup>

## B. Base Stations

Base stations associated with masts send and receive microwaves from mobile telephones within their range of coverage (or cell). The established health effects associated with exposure to microwaves come, in most cases, from their heating effect on body tissue. In cases of extreme exposure this can cause cataracts, skin burns, heat exhaustion or heat stroke.<sup>66</sup> Since heat is a teratogen (i.e. capable of inducing fetal abnormalities) the embryo and fetus may be particularly sensitive. However, the magnitude of these effects will be insignificant at the very low exposure levels experienced by the majority of the population.<sup>67</sup>

In view of the above heating effects, the National Radiological Protection Board has recommended restrictions on human exposure given in terms of the specific energy absorption rate (SAR). For base stations, the whole body SAR of 0.4 watts per kilogram (of tissue) is applicable.

In connection with base stations, the Parliamentary Office of Science and Technology notes the following:

...antennas operating at 800-900 MHz or at ~1800 MHz will both produce power densities in excess of guidelines, but only in the immediate vicinity. Power densities decline very rapidly and since both types of transmitters are usually mounted on rooftops or on towers, people at ground level (at least 15m from the antennae) typically receive exposures that are hundreds or thousands of times lower than the limits recommended by NRPB or ICNIRP.<sup>68</sup>

It is worth noting that the limits for the relevant frequencies recommended by the International Commission on Non-Ionizing Radiation Protection are five times lower (for the general public) than those of the NRPB. The ICNIRP limits on whole body average SAR are endorsed in European Council Recommendation 99/519/EC of 12 July 1999. This aims to protect the public from the established (non-cancer) health effects of electromagnetic fields and radiation.<sup>69</sup>

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<sup>65</sup> "Mobile Phones to show Radiation Emissions", *Financial Times*, 24 September 2001

<sup>66</sup> <http://www.mcw.edu/gcrc/cop/cell-phone-health-FAQ/toc.html#1>

<sup>67</sup> *Radiological Protection Bulletin* December 1997

<sup>68</sup> *Health Risks and Mobile Phones* POST Note 109, January 1998

<sup>69</sup> Commission document COM(1999) 247 final 98/0166 (COD), 27 May 1999

There has been some publicity concerning possible *athermal* effects of microwaves, such as cancer. Since microwaves do not possess nearly enough energy to break chemical bonds, it is not immediately apparent how they could initiate damage to DNA and thence cause cancer.

The current consensus is that radiofrequency radiation (including microwaves) does not act as an initiator of carcinogenesis. This does not eliminate the possibility that microwave radiation could influence tumour promotion, though there is as yet no firm, reproducible, evidence for any such effect.<sup>70</sup> Research is continuing, including that being co-ordinated by the World Health Organisation.<sup>71</sup>

The House of Commons Science and Technology Committee has concluded an inquiry into mobile phones and health. Their report focused more on mobile phone use, but included the following paragraph on transmitter base stations:

In the main, public anxiety has centred on transmitter base stations, particularly those sited in residential areas and on school buildings but there is little evidence to support claims that these have any adverse health impacts. Either because of the height of the masts on the roofs of buildings or because at ground level they are fenced off, the attenuated radiation to anyone passing would be well within safety limits.<sup>72</sup>

The Stewart Report produced the following main conclusions on the health effects of mobile phone masts:

- The balance of evidence to date does not suggest that emissions from mobile phones and base stations put the health of the UK population at risk.
- For base station emissions, exposures of the general population will be to the whole body but normally at levels of intensity many times less than those from handsets.
- Some people's well-being may be adversely affected by the environmental impact of mobile phone base stations sited next to houses, schools or other buildings, as well as by fear of perceived direct effects.
- For all base stations, including those with masts under 15m, permitted development rights should be revoked and the siting of all new base stations should be subject to the normal planning process.

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<sup>70</sup> *Radiological Protection Bulletin* December 1997

<sup>71</sup> The International Electromagnetic Fields (EMF) Project, <http://www.who.ch/emf/>

<sup>72</sup> Science and Technology Committee, *Scientific Advisory System: Mobile Phones and Health*, 2 September 1999, HC 489-I 1998-99, xiii, para 30.



One recommendation of the Stewart Report is the adoption of the more stringent International Commission on Non-Ionizing Radiation Protection (ICNIRP) guidelines for public exposure; in their response to the report, the Government accepted this.<sup>73</sup> The report also draws attention to the particularly contentious issue of base stations near or within school grounds, recommending that radiation levels be checked for conformity with guidelines. In July 2000, the Government sent advice to local education authorities, with the following passage on base stations and schools:

**Base Stations on or near schools**

The [Stewart] report does not suggest that existing base stations should be taken down from schools, or that no new base stations should be erected on school premises. However, under its precautionary approach, the report recommends that the “beam of greatest intensity” from a base station’s antenna should not fall on any part of the school grounds or buildings without agreement from the school and parents. Where parents and/or schools wish to know whether the beam of intensity falls on school grounds or buildings, the school should contact the base station’s operator. The operators have agreed to provide schools with information on the level of intensity of radio frequency radiation. This should include an explanation of the way in which the intensity of radiation falls off with distance from the antenna. If there is major concern from the school or parents, they could ask the network operator to adjust the antenna.

**Audit of base stations**

The Government has asked the Radiocommunications Agency to carry out the report’s recommendation for an independent random audit of base stations. The Radiocommunications Agency has agreed to audit base stations in and around schools first.<sup>74</sup>

As the Expert Group notes, the use of mobile phones contributes far more to microwave exposure than the presence of base stations. Despite the absence of a clear health risk in either case, there is clearly a need for further research into the biological effects of microwaves at the frequencies and intensities relevant to mobile phone applications.

## VI Parliamentary Comment

The location of mobile phone masts is clearly of interest to many MPs. There have been several early day motions and some short debates. Some were pressing the Government to implement its policy during the period between publication of the Stewart Report in May 2000 and the main announcement of policy in March 2001. In addition, Debra Shipley introduced the *Siting of Telecommunications Masts Bill* (2000-2001 Bill 53) as a

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<sup>73</sup> Department of Health, *Mobile Phones and Health - Government Response to the report from the Independent Expert Group on Mobile Phones. (Stewart Group)*, 11 May 2000  
<http://www.doh.gov.uk/mobile.htm>

<sup>74</sup> DFEE Guidance, *Mobile phones and base stations*, July 2000

Ten Minute Rule Bill, also before the policy announcement. She complained that a mast was to be erected in her constituency 150 metres from a school and a day nursery. She continued:

My constituents are not alone. Since my decision to present a Bill to the House on this issue, many colleagues have contacted me and offered support. In addition, I have received representations from across Britain. It is no exaggeration to say that thousands and thousands of people want much stronger legislation regarding mobile phone masts. I know of opposition to them in areas including Luton, Brighton, Forest of Dean, Conwy, Dartford, Hendon, Harrow and many more. Overwhelmingly, people want to know that they will be fully consulted, that their views will be listened to and that local decisions will be valued. They do not want local decisions that are supported by their democratically elected representatives to be overturned...

When the Minister for Public Health, responded to the recent debate on the Phillips inquiry into BSE, she acknowledged that the report stated that the other casualty of the BSE story had been the destruction of the credibility of pronouncements. My hon. Friend said:

"That is extremely serious; it is about not only BSE, but trust in Government across the board and in pronouncements on health and safety."--[*Official Report*, 15 February 2001; Vol. 363, c. 554.]

She then specifically mentioned mobile phones. Public opinion about the possible health risks of mobile phones is such that there is urgent need for changes to planning legislation.

I have shown today that the Stewart report was used to dismiss an appeal on health grounds in one part of the country, but that such grounds were not used in my Stourbridge constituency. I have demonstrated that consultation is being driven by the fear of adverse publicity rather than by a genuine commitment to community consultation. I have shown that public opinion is overwhelmingly fearful for children's health; rightly so. In the view of expert opinion, the case for the safety of mobile phone masts in regard to children's health is at best unproven.

I have made the case for an urgent change in legislation to allow for planning controls on mobile phone masts. I make that case on behalf of thousands of parents across Britain. I commend the Bill to the House.<sup>75</sup>

Michael Fabricant opposed the measure:

I oppose the Bill, however, because the hon. Lady tried to imply that there is a real health danger from mobile phone masts. She referred to extracts from the Stewart report, especially on localised heating of tissues. If the hon. Lady had read the report--as I have--she would see that those points apply specifically to the use of a mobile phone where the antenna is close to the cranium, when there is indeed a possibility of localised heating. In such cases, a health problem may arise--but no one is sure about that.

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<sup>75</sup> HC Deb 28 February 2001 cc 909-910

This morning, I found out from the BBC engineering information department that the Crystal Palace television transmitter gives out 1,000 kW of power--1 MW or 1 million watts--on its analogue television transmissions. In addition, for each of its digital services, it gives off a further 10,000 watts.

Those frequencies are similar to those used by Vodafone and Orange, to which the hon. Lady referred. However, neither at Crystal Palace, where such transmissions have been going on for more than 50 years, nor, indeed, at Sutton Coldfield, which serves my area and where similar power transmissions are used--I repeat that the power is more than 1 million watts--is there any evidence of health problems. There is no clustering of leukaemia; nor are there other carcinogenic dysfunctions in the area.

Does the hon. Lady know the power of an average mobile phone mast? It is not 1 million watts or 1,000 watts--it is between 50 and 100 watts. That is the same power as an average light bulb. The hon. Lady has raised important and interesting points. Unfortunately, I fear that she may have increased the fears--unwitting, unrealised and perhaps unnecessary--of parents. For that reason only, I oppose the Bill.<sup>76</sup>

The revised planning policy guidance for telecommunications (PPG8) did not require any parliamentary procedure for approval. The *Town and Country Planning (General Permitted Development) (Amendment) (England) Order 2001*, which implemented the changes in permitted development rights for telecommunications masts at the same time, was debated in House of Commons Standing Committee on 21 November 2001. Geoffrey Clifton-Brown opened the debate for the Opposition, calling for tighter regulation and summed up:

Mast development should not be automatic. Planning policy on telecommunications—PPG 8—which the statutory instrument strengthens, states that to encourage telecommunications development the presumption should be in favour of development, such that the technological constraints may outweigh the environmental concerns...

Planning guidance should now be redrafted to provide a better balance between the environment and commercial concerns. Operators should have to justify the need for a new mast when environmental, health or safety concerns are raised. We advocate consulting local authorities, environmental groups and the telecommunications industry about the revised guidelines.

We welcome the increased protection for sensitive areas. Masts are now erected in national parks and areas of outstanding natural beauty. Under the statutory instrument, sites of special scientific interest are to be included in areas requiring full planning permission. We welcome that, but full planning should also be required in other areas, such as on sensitive greenbelt land.

Public health should be protected further. Local communities should be allowed to question mast developments near schools, hospitals and residential buildings...

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<sup>76</sup> HC Deb 28 February 2001 c 910

Proper consultation with local communities is crucial. Local authorities must be better informed about future mast sitings in order to encourage more co-ordinated developments. Operators should have to prove to local authorities that they have explored mast-sharing options before being allowed to erect a new mast.<sup>77</sup>

The Parliamentary Under-Secretary, Sally Keeble stressed the need to balance costs and benefits:

The Government's general policy on development is to encourage and facilitate the provision of a modern national telecommunications network while providing environmental protection. The hon. Member for Cotswold (Mr. Clifton-Brown) made half the case when he talked about the inconvenience that he experienced when he found that his mobile phone did not have reception. People are concerned about mobile phone masts, and that is the other half of the equation.

We want to ensure that the public are able to enjoy the benefits that come from a greater choice of service providers and a broader range of services. The drive to develop the telecommunications network and its attendant base stations, masts and antennae must, however, be balanced by the Government's commitment to achieving environmental objectives. The Government attach great importance to keeping to a minimum the level of intrusion caused by the development of the telecommunications network. The land-use planning system provides the tool for striking the necessary balance.

The general planning arrangements mean that an application for planning permission is required for larger telecommunications developments, such as masts more than 15 m high, and for any mast development in key environmentally sensitive areas, such as national parks, areas of outstanding natural beauty, conservation areas and sites of special scientific interest.<sup>78</sup>

On 14 November 2001, Janet Anderson introduced a ten-minute rule Bill called *Motor Vehicles (Prohibition of the use of Hand-Held mobile Telephones) Bill* (2001-2002 Bill 50). The main part of her argument came in the following passage:

There can be no hon. Member who has not at some time witnessed someone at the wheel of a motor vehicle who is at the same time conducting a conversation on a hand-held mobile telephone. Indeed, there may be hon. Members who have committed what is already technically an offence under sections 2 and 3 of the Road Traffic Act 1988. I am pretty sure that I am one of them. Historically, the Government have argued that the legislation is wide-ranging enough to include mobile phones as the highway code already contains in paragraph 127 advice on driving and using the phone. It states:

"you must exercise proper control of your vehicle at all times. Never use a hand held mobile phone or microphone while driving."

I believe that in the long term it is right to consider a generic offence to cover the use of mobile phones while driving and any other technologies that may emerge

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<sup>77</sup> SC Deb 21 November 2001 cc 5-6

<sup>78</sup> SC Deb 21 november 2001 c 9

in the not-too-distant future. That view is supported by the Royal Society for the Prevention of Accidents and the parliamentary advisory council for transport safety. Indeed, a similar law was enacted in the state of New York as recently as 1 November this year. New York is the first US state to enact such legislation, but more than 30 other states are reported to have introduced similar legislation during this year. There are also moves in the United States to introduce a Bill to impose a national ban on the use of mobile phones while driving...

Some may argue that our present laws are sufficient to deal with this problem, but I believe that we know from our daily experiences that they are not. As recently as July this year the Royal Society for the Prevention of Accidents called for a specific offence to ban the use of mobile phones while driving. It called for new legislation to make it crystal clear that mobile phones should be switched off while drivers are at the wheel.<sup>79</sup>

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<sup>79</sup> HC Deb 14 November 2001 cc 881