



Leicester Shire: Intelligent Landscape ICT Strategy

Guidance to Local Planning Authorities



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1. Introduction

- 1.1 This document provides information and advice to Local Planning Authorities in Leicester and Leicestershire regarding consideration of broadband access issues in planning policy and individual planning decisions.

CONTEXT

- 1.2 The Leicester Shire Economic Partnership (LSEP) has formulated an holistic ICT strategy for Leicestershire, that identifies inadequate broadband access infrastructure as a major obstacle that the sub region needs to tackle. This is adopted as one of four priority themes in the strategy and a range of 'action-types' are put forward to guide future projects and programmes.
- 1.3 Each local authority is expected to adopt the strategy and its priorities and will seek to implement the strategy wherever possible, through 'normal business' and through dedicated activities and projects.
- 1.4 The land use planning process, is a key example of 'normal local authority business' which can help support and implement the strategy and its objectives. The consultants who prepared the research supporting the strategy and drafted the strategy (DTZ Pieda Consulting), were also asked to prepare guidance and advice for the Leicestershire Local Planning Authorities, to help planning teams:
- understand the issues and objectives of broadband connectivity
 - to start to examine the policy issues and options
 - to be aware of the 'ideal' connectivity specifications different types of development should achieve
 - and to consider how these objectives might be supported and implemented through the planning process

STRUCTURE OF THIS REPORT

- 1.5 To achieve this:
- Section 2 sets out the 'ideal' connectivity specification for major sites/developments
 - Recognising that these are ideals, and cannot be achieve on every site, Section 3 sets out three broad levels of connectivity specification (representing a hierarchy), embracing flagship sites/ development; strategic sites/development; and thirdly, ordinary sites/ development
 - To describe where the help that the planning process can provide in achieving these 'connectivity targets', Section 4 sets out a full list of possible types of intervention to support ICTs (in the form of a matrix)
 - Section 5 defines at which points the planning process can contribute and then considers a range of issues and policy choices that each LPA will need

to consider – e.g. should the primary role of the LPA be an advisory and educational one to developers, or should it be more proactive; should the focus be on what is done within the boundary of each individual site or development, or should planners also be concerned with influencing what happens off-site regarding links from the site back to networks; what are the issues regarding alternative technologies and how much discretion should be left to individual developers/ property owners

- 1.6the remaining sections then provide further background information that will help inform the above considerations:
- Section 6 describes why ICTs are and will become increasingly important to Leicestershire's economic competitiveness;
 - Section 7 draws this discussion to a close by describing how the most important 'blockage' (or barrier) is inadequate connectivity – e.g. the topic of this paper
 - Section 8 provides a semi technical description of the principal broadband access technologies available and compares and contrasts key metrics
 - Section 9 briefly considers emerging technologies – particularly wireless
 - Section 10 concludes with a brief review of the overall current policy environment (EU and UK Government) regarding the telecoms/ broadband sector, which sets the framework determining what regional and sub regional authorities can do to enhance broadband connectivity in their areas
- 1.7 The reader should also refer to the Leicestershire ICT Strategy document itself, available from LSET and should discuss issues and/or need for further information with LSEP

2. The 'Ideal' Connectivity Specification

2.1 This section sets out 'the ideal' physical connectivity specification, in broad terms, for any given site, node, cluster or other defined location and demonstrates why the various elements are important and how they address the key end-user needs for choice and competition, enabling competitive pricing; unhindered access to any and all service providers; flexibility, quality and reliability service (characterised by capacity, performance, physical resilience and commercial resilience)

PRINCIPLE SERVICE LEVEL METRICS

- **Bandwidth** – indicating capacity measured in MB or GB per second
- **Access technology** – fibre, wireless, cable, copper ADSL, satellite, and other evolving access technologies
- **Physical resilience** – the need for alternative routing should the primary route be interrupted. To achieve physical resilience, one or more entirely physically separate links to separate points-of-presence (PoPs) on the backbone are required. One of the most common methods for achieving physical resilience is via provision of a loop, ring or circuit
- **Commercial Resilience** – requirement to be able to instantly switch suppliers should the quality of service falter¹.

FLAGSHIP SITE – IDEAL MINIMUM SPECIFICATION

Flagship Site – Ideal Minimum Specification	
Feature	Specification
Bandwidth	<ul style="list-style-type: none"> ■ 10 Megabits per second available to each occupier. ■ Capacity to scale up to 622 Megabits per second.
Resilience	<ul style="list-style-type: none"> ■ Physical resilience – BT plus a minimum of three other carriers offering physically separate links back to the core network. ■ Commercial resilience – BT plus a minimum of three other commercially separate carriers.
Quality of Service	<ul style="list-style-type: none"> ■ Availability Ability to provide up to 100% availability, if required. ■ Latency Ability to provide industry standard latency levels. These are approximately a round-trip latency of 60 ms within a country, 85 ms between Western European countries and 120 ms between Western Europe and the United States.

¹ Commercial resilience is a DTZ Piedad Consulting term which we now include to reflect the end-user's ability to easily and rapidly switch away from a primary supplier if their service level falters. This can be because of lack of competition or because of the impact of the technology crash on the supplier resulting in staff cut-backs, inappropriately qualified staff, high churn of staff or if the supplier runs into financial problems or goes into administration or receivership.

Flagship Site – Ideal Minimum Specification

Feature	Specification
	<ul style="list-style-type: none"> ■ Flexible bandwidth - scope to order very high bandwidth for short 'definable' periods (termed as spikes within the industry).
Certainty	<ul style="list-style-type: none"> ■ Minimum of ducting to the site and resilient on-site ducting.
Price	<ul style="list-style-type: none"> ■ Ability to achieve 20-30% cost savings in comparison with BT's standard tariffs. ■ Enabled by the ability to choose between four different telecommunications companies.

STRATEGIC SITE – IDEAL MINIMUM SPECIFICATION

Strategic Site – Ideal minimum specification

Feature	Specification
Bandwidth	<ul style="list-style-type: none"> ■ 10 Megabits per second available to each occupier. ■ Capacity to scale up to 155 Megabits per second.
Resilience	<ul style="list-style-type: none"> ■ Physical resilience – BT plus a minimum of two other carriers offering physically separate links back to the core network. ■ Commercial resilience – BT plus a minimum of two other commercially separate carriers.
Quality of Service	<ul style="list-style-type: none"> ■ Availability Ability to provide up to 99.9% availability, if required. ■ Latency Ability to provide industry standard latency levels. These are approximately a round-trip latency of 60 ms within a country, 85 ms between Western European countries and 120 ms between Western Europe and the United States.
Certainty	<ul style="list-style-type: none"> ■ Minimum of ducting to the site and resilient on-site ducting.
Price	<ul style="list-style-type: none"> ■ Ability to achieve 10-20% cost savings in comparison with BT's standard tariffs. ■ Enabled by the ability to choose between three different telecommunications companies.

3. Connectivity Hierarchy

- 3.1 This section provides a 'connectivity portfolio' specification. By this we mean, a hierarchy of connectivity specifications for different types of site, node, cluster or other defined location. This represents a practical interpretation and 'the ideal' specification, reflecting 'realism' e.g. not every household can ever be served by three independent fibre connections. There are some strategies that seek to ensure that every household is served by one direct fibre connection, but the capital cost of this alone, would be very substantial. **It is important to be realistic when setting out a menu of connectivity targets; and we have sought to be as realistic as possible, taking account of economics and cost and current technologies and their limitations.**
- 3.2 We have formulated a typology that identifies three different types of 'area/site/cluster/node)
- Flagship – e.g. flagship sites, such as the proposed science park in Leicester
 - Strategic – e.g. strategic employment sites; office clusters; complexes and other key nodes
 - Remainder – e.g. the remainder of the business and residential areas, both urban and rural
- 3.3 The following table sets out the basic minimum connectivity requirements/specifications for each of the three types of area, differentiating in terms of time between (a) now and the near future e.g. next two to three years, and (b) longer term e.g. 3 years plus. You will note therefore that the longer term column, in effect, also sets aspirational 'minimum' targets. These could certainly be varied in terms of time, say by changing the definition of what we mean by 'longer term' from 3 years down to 2 years
- 3.4 The technical specifications are presented in semi technical, but broadly lay terms and do not provide sufficient basis for formal technical specification. The specifications are instead intended as an 'in-principle' guide to the level of service and required supporting specification. The technical specifications are based on current 'known' feasible technologies. It is possible, given the rate of technology change in the telecoms arena, that by the time we reach the longer term (e.g. 3 years time), alternative connectivity technologies may be available. Notwithstanding this, the common view is that ground-based fibre will remain the 'bed-rock', the ideal and the benchmark form of high capacity connectivity access infrastructure. Given this, the aspiration in every case is to ensure 'fibre to the door' or if not, to the nearest feasible distribution point
- 3.5 The final column of the table lists the benefits provided by each level of connectivity, specified in the longer term column. These comments relate to the standard performance/ service level criteria we have established
- Connection enabling high capacity service and high quality (e.g. low latency and other standard performance spec features in the SLA)

- Choice enabling competitive pricing – ideally through separate alternative physical links or via competition over one link, enabled via telecoms market regulations
- Physical resilience – e.g. physically separate backup
- Commercial resilience – e.g. instant alternative routing if the primary route suffers quality or other problems due to the poor performance/ financial difficulties of the primary supplier

Leicestershire Broadband access Connectivity Specification Menu			
Types of location	Current/short term (to 3yrs) (entry-level broadband)	Longer term (3 yrs+) (higher capacity broadband)	What this provides
Flagship sites (e.g. a science park)	<ul style="list-style-type: none"> ■ Fibre to the door ■ BT eLocation + hopefully one additional physically independent service ■ Feeding MMR, feeding neutral distribution ring around site 	<p><u>Core connectivity</u></p> <ul style="list-style-type: none"> ■ Fibre to the door ■ 2 independent services + BT ■ from two physically separate PoPs ■ two physically separate entrance points to site ■ feeding MMR, enabling interconnection ■ distribution around the site via neutral resilient ring/loop <p><u>Back-up/alternatives</u></p> <ul style="list-style-type: none"> ■ high capacity point to point wireless service, feeding MMR ■ similar distribution via neutral loop ■ also distribution via point to multi point (MMR direct to end users) <p><u>Common areas</u></p> <ul style="list-style-type: none"> ■ wireless LAN 	<ul style="list-style-type: none"> ■ choice enabling competitive pricing (wholesale or retail) ■ high capacity ■ high quality ■ full physical resilience ■ full commercial resilience ■ coverage of common areas
Strategic sites, complexes, clusters and other key nodes	<ul style="list-style-type: none"> ■ ADSL or cable modem ■ Wireless or satellite (nearest equivalent) for areas beyond ADSL or cable modem service areas 	<p><u>Core connectivity</u></p> <ul style="list-style-type: none"> ■ Fibre to the door ■ 1 fibre service (BT or another) ■ high capacity wireless alternative ■ feeding MMR/cabinet/local distribution point ■ distribution around the site either via ground based (fibre or VDSL) or wireless (point to multi point) <p><u>Back-up/alternatives</u></p> <ul style="list-style-type: none"> ■ services generally available in the area (see last row) <p><u>Common areas</u></p> <ul style="list-style-type: none"> ■ wireless LAN 	<ul style="list-style-type: none"> ■ high capacity service ■ degree of competition ■ wireless alternative increases competitive choice and provides intermediate physical resilience ■ intermediate commercial resilience ■ coverage of common areas

Leicestershire Broadband access Connectivity Specification Menu			
Types of location	Current/short term (to 3yrs) (entry-level broadband)	Longer term (3 yrs+) (higher capacity broadband)	What this provides
<i>Remaining businesses and households</i>	<ul style="list-style-type: none"> ■ ADSL or cable modem ■ Wireless or satellite (nearest equivalent) for areas beyond ADSL or cable modem service areas 	<p><u>Core service</u></p> <ul style="list-style-type: none"> ■ Fibre to the street cabinet/ local distribution point ■ Ideally second independent fibre to the same cabinet; or two independent cabinets (could alternatively be a high capacity wireless feed) ■ Local distribution via VDSL (BT and competitors) ■ But also via wireless point to multi point <p><u>Back-up</u></p> <ul style="list-style-type: none"> ■ Wireless ■ Satellite 	<ul style="list-style-type: none"> ■ Ability to access high capacity services ■ Competition (enabled by telecoms market regulations, over BT fibre); and by 2nd fibre/ wireless link/ street cabinet (if available) ■ Physical resilience if premises served by ground-based and wireless backup

4. Broadband Access – Intervention Matrix

- 4.1 This section sets out, again in matrix form, generic intervention types regarding broadband access, across the intervention spectrum, both demand and supply side.
- 4.2 We have divided intervention options into two broad groups:
- **On-site** – this group of actions embraces those actions that can be undertaken at the level of an individual site (or cluster)
 - **Off-site** – this group of actions embraces those actions that can be taken at the level of the area, neighbourhood, district (e.g. the study area)
- 4.3 The principal reason for differentiating in this way is because of the different ‘actors’ involved. At the level of the site it tends to be the land owner, the developer, the site manager, the occupier; at the area level, intervention is more complex and involves a variety of parties

ON-SITE CONNECTIVITY INTERVENTIONS

- 4.4 The following table sets out possible on-site ‘demand-side’ and ‘supply-side’ interventions, from ‘least level of intervention’ (i.e. 1) to ‘highest level of intervention’ (i.e. 4), indicating priority.

On-Site Connectivity Interventions (e.g. actions at the level of an individual site or cluster)		
	Supply-side (e.g. advanced provision of network infrastructure on site)	Demand-side (awareness raising, aggregation and promotion of demand from site, to carriers/ services providers)
1. Awareness raising	<ul style="list-style-type: none"> • Communicate need for on-site network infrastructure; and advise on the specification of this, to site owners, developers, investors, occupiers (H) 	<ul style="list-style-type: none"> • Raise awareness of eBusiness and other broadband uses to occupiers, hence stimulating demand at the level of the site (H)
2. Facilitate negotiation	<ul style="list-style-type: none"> • Assist site owner/ manager to procure on-site infrastructure (H) 	<ul style="list-style-type: none"> • Facilitate aggregation of site occupier demand and package up and offer to carriers in return for competitive tariffs and advance connectivity (H)
3. Gap funding	<ul style="list-style-type: none"> • Gap fund site owner’s costs of providing on-site infrastructure (M for business sites; build in development costs for public sector and regeneration projects) (H) 	<ul style="list-style-type: none"> • Gap fund proportion of carriers’ capex regarding running circuits out to site (L)
4. Direct provision	<ul style="list-style-type: none"> • Full funding and direct build out of on-site infrastructure (L for business sites; M for clusters and urban centre; build in development costs for public sector and regeneration projects) 	<ul style="list-style-type: none"> • Fully fund build out to carriers’ PoPs (H for flagship sites, L for remainder) • Establish site-level reseller, to procure bandwidth in bulk and resell to occupiers at much more competitive tariffs and more flexible packages (e.g. Sheffield Wired Workplace model) (H for sites/ clusters with sufficient group of high bandwidth users)
Note: H = high priority; L = low priority		

OFF-SITE CONNECTIVITY INTERVENTIONS

4.5 The following table sets out possible off-site 'demand-side' and 'supply-side' interventions, from 'least level of intervention' (i.e. 1) to 'highest level of intervention' (i.e. 4), indicating priority.

Off-Site Connectivity Interventions (e.g. actions at the level of the area)		
	Supply-side (e.g. advanced provision of resilient MAN rings/ hub and spoke + tails to key sites/ nodes)	Demand-side (e.g. stimulating, communicating and boosting end-user demand)
1. Awareness raising	<ul style="list-style-type: none"> Communicate demand to carriers and service providers (H) 	<ul style="list-style-type: none"> Raise awareness of all end-users (H) Programmes to support and advise on take up of eBusiness and other broadband applications (H) Programmes to assist in skills creation (H) Possibly create locally-specific 'killer application' (e.g. must have application that high proportion of end users can see the direct advantages of and seek to take up) (L)
2. Facilitate negotiations	<ul style="list-style-type: none"> Assist carriers to assess demand and prepare business cases for their investment boards (M) Assist carriers to package up demand and secure contracts (L) Independent body/advisory services (H) 	<ul style="list-style-type: none"> Package up and aggregate end user demand (H) Aggregate by end-user type – e.g. public sector, communities, business clusters/ groupings, clusters of sites (H) Or by area, ideally in conjunction with sub region or even at regional level if framework and structure is put forward by DTI/YF (H)
3. Gap fund	<ul style="list-style-type: none"> Provide contribution towards the capex (ducts-transmission equipment) for the required MAN infrastructure and local circuits (M) And/or provide contributions towards opex – e.g. subsidising tariffs to the carriers/ service providers, rather than subsidising end-users to pay these (L) 	<ul style="list-style-type: none"> Establish a fund to contribute to the cost of purchasing hardware and software (H for disadvantaged groups; L for rest) And/or tariffs (as above) And/or training (H)
4. Direct provision	<ul style="list-style-type: none"> Public sector or intermediary creates technical specification, commissions construction and then operates (design, build, operate) (L) Or puts a service level requirement out to tender – this is technology and design neutral, and the provider will probably operate in return for a long term annual lease or operational fee (L) 	<ul style="list-style-type: none"> Create special projects that generate significant demand (H) Create an area-based reseller, similar to site level Sheffield Wired Workplace model (H)
Note: H = high priority; L = low priority		

5. Issues for the Planning Process

- 5.1 This section considers the role of 'planning guidance' as one action within this matrix and sets out some of the issues and potential principles.
- 5.2 The intervention matrix identified earlier on identifies two sets of actions (of interventions): those that related to on-site issues and those that relate to 'off-site' issues. Planning guidance is one of the intervention tools available to help tackle on-site issues.
- 5.3 In essence broadband planning guidance can involve the inclusion of advice, information, awareness raising and perhaps regulatory requirements in the land use planning process for those implementing new development and refurbishment. The objective is to encourage (and perhaps require) those involved to pre-plan and build-in the necessary access infrastructure, thus making it as easy as possible for new occupiers to secure a full choice of any combination of telecoms services.
- 5.4 How does this help the delivery of broadband?
- Raises the awareness, knowledge and ability of developers to tackle the broadband issue
 - Helps them select the right approach rather than a site ICT strategy that is prohibitive
 - Removes delays
 - Avoids remedial costs
 - Places the cost of on site common infrastructure on the developer and development rather than the end user

Extension into the off-site arena

- 5.5 Broadband planning guidance may also utilise the planning gain process, requiring developers to fund some off-site network infrastructure, connecting the site to the nearest local PoPs for example

HOW TO FORMULATE BROADBAND PLANNING GUIDANCE

- 5.6 Formulating appropriate broadband planning guidance is a complex process, needing to reflect and respond to a number of complex issues/ objectives. Some of the main considerations will be
- Determine whether the guidance is to be advisory, or if any requirements are to be imposed
 - This will be closely linked to the overall intervention approach adopted in the ICT strategy
 - Determine if it is to focus on on-site matters, or to include certain off-site investment as part of a planning gain discussion

- It needs to embrace both physical specification and procurement methods
- Different specifications need to be articulated for different types of site reflecting the connectivity hierarchy
- The specifications need to allow for alternative access technologies and needs to evolve as technology evolves
- Decide which particular planning media/ processes the guidance should be included in and what the processes and timetables are
- All of the above needs to be set within the confines of planning law

LOOKING AT SOME OF THE ISSUES AND CHOICES FOR POLICY

Horses for Courses

- 5.7 The starting point ought to be the connectivity hierarchy, established earlier on, that sets out the target connectivity requirements of different types of site/ building/ cluster or node. The table which sets this out potentially provides a sufficient level of detail for planning guidance, leaving it to individual developers to articulate the requirements in terms of their own designs

Wireless or fibre – a major issue for policy

- 5.8 The ultimate form of specification for any business park, industrial estate or other group of buildings (including new housing) is to provide fibre to the door. Part of encouraging this is to ensure that suitable multiple ducting and interconnection space is built into the scheme at the outset (saving time, and additional disruption costs and embodying the cost in the development)
- 5.9 However, building in multiple fibre ducts in the form of a neutral ring and linking individual buildings will impose additional development costs (not insignificant)
- 5.10 An issue for policy is how many sites should this be applied to, especially when there are cheaper alternatives e.g. wireless. Wireless, certainly from the PoP or MMR (meet me room) to the end user is becoming more and more feasible, although it is not entirely problem free and some end users are not happy with wireless.
- 5.11 Policy could for example encourage/ require provision of a common MMR/ cabinet/ onsite PoP to be made with resilient ducting from the edge of the site to the facility and then leave it to the developer to design in one or more options. Policy could require a primary and then reserve access architecture to be provided, to ensure back up.

Ducting only, or fibre and cabling also?

- 5.12 Another choice will be whether to encourage/ required provision of space (ducts) only, leaving carriers to install their own media, or whether to build in a pre-installed dark fibre/ duct option also.

In-building

- 5.13 Should planning guidance include building design, or leave this to the individual developer? The principle current in-building connectivity options include:
- cable flood wiring – CAT 5 or above
 - fibre to the floor or door
 - and wireless, both backhaul and wireless LAN
- 5.14 Similar policy issues apply regarding promoting the most expensive but best infrastructure (fibre) or leaving the choice to individuals.

6. The evolution of ICTs and their importance to a sub regional economy

- 6.1 This section provides a high level think piece regarding the evolution of ICTs, and their importance to the sub regional economy (any sub regional economy); the principal developments, potential, barriers and hence key issues. In 'high level' easily digestible terms, this piece demonstrates why a sub region needs an ICT strategy, providing an additional justification for the Leicestershire Intelligent Landscape (ICT) strategy
- 6.2 We briefly define what ICTs are, and in particular what communications aspects are that are so important) and in so doing, we set out the chief technologies; we look back to see how the technologies have evolved and what the adoption and impact has been. We look at current 'technology shifts' and potential near-future developments; and consider the issues around adoption. The section concludes with a discussion of the potential broad impacts, on business, transport, living, learning and health; and derived from this, the headline implications for the Leicestershire economy.

ICTs (INFORMATION AND COMMUNICATION TECHNOLOGY)

- 6.3 Information and Communication Technologies (ICTs) concern the manipulation and communication of information (data) digitally (mainly so far on the PC, but also of recent by mobile phones and other interfaces.
- 6.4 ICTs can be defined in many ways and one of the most useful we have identified for economic strategy work is to separate the IT from the C:
- IT (information technology) - broadly refers to the manipulation of data and human interface with this e.g. manipulating data on the PC, with the interface being inputting data and reading/ printing out the results. This requires hardware (e.g. the computer) and software (e.g. programmes/ digital content)
 - Communications (the C part of ICTs) refers to the ability for PCs and other interfaces to communicate with each other e.g. for computers to send information to other computers. This is often termed digital communication as opposed to voice communication
- 6.5 Most people understand what computers (and other IT interfaces are); but less so what digital communications are. Moreover, digital communications are a more recent phenomena and are likely to evidence the most change and have the most impact in the short to medium term, and hence are worth special reference. But we will come to this further on. First, lets briefly consider the history and evolution of ICTs.

BRIEF HISTORY

It all started with the telephone

- 6.6 It all started with Graham Bell and the telephone, which enable sound (voice) to be transmitted (point to point) along a copper wire, using analogue encoding/ decoding technology (*define analogue)
- 6.7 In the 60s, came the computer – initially large ‘mainframe computers’. The very first of which filled entire rooms and had less processing power than today’s mobile phones.

The Personal Computer (PC)

- 6.8 The 80s saw the advent of the personal computer (PC) enabled by a massive revolution in processing technology (the micro chip) and associated storage technologies, hand in hand with falling cost, ***Some of us will remember the pioneering Amstrad from entrepreneur Clive Sinclair; but global corporations quickly moved into this space, dominating and leading development in the PC market place***
- 6.9 The 90s saw rapid increases in processing power which enabled development of data rich content and applications – *remember the first word processing packages and compare these with current Microsoft Word. Remember too the first computer games (e.g. black and white ‘tennis’) and compare this with the graphics and complexity of current games. It would not be wrong to describe the change as ‘awesome’.*

NEXT CAME COMMUNICATION BETWEEN COMPUTERS

- 6.10 Communication between computers is, by definition, digital communication, because it involves the sending and receiving of digital information (information that has been digitally encoded):
- Initially, communication between computers was literally physical, via the physical carriage of data on a floppy disc, or tape
 - Some computers, were networked, most commonly within a building, but sometimes between buildings and sites. This was enabled by BT or another telecoms carrier interconnecting your site with another site or sites (the industry termed this a leased line connection because the user literally ‘leased a data link’). Leased lines are expensive and tend to be limited to major companies, organisations and sites

The rise of the Internet

- 6.11 The tail end of the 90s also saw the growth of a radically new form of communication between computers in different buildings, sites, towns, cities and countries – via the ‘internet’.

- 6.12 The internet is kind of the equivalent of the telephone system for computers (for data). The phone system sends voice messages from one address to another; the internet sends packets of data from one IP address to another; but more than this, the internet allows point to multi point communications (e.g. one person can communicate with many), most notably via the concept of the 'website'.
- 6.13 The internet enables individuals via the PCs (and of recent, other devices including handhelds)
- to send information to a particular address or addresses; and to receive it (termed point to point(s) communications)
 - to view information – placed on a website; and to have information viewed by placing it on a website (sometimes termed virtual broadcast)
 - And of recent, to 'interact' with websites – enabling actions/ processes/ transactions to be undertake on the internet
- 6.14 Adoption of the internet has followed the 'standard adoption' curve and we are probably moving towards the final third, with the internet being used by the majority of businesses and a high proportion of people to communicate.
- 6.15 The internet has created mass digital communications, heralding a true communications revolution.

Clever routing

- 6.16 The early years of the internet were plagued by problems – by capacity problems, but routing problems, and by security and reliability problems. The advent of the 'router' heralded solutions to many of these problems; to the point where it is now possible for a telecoms carrier to emulate the equivalent of the traditional lease line (an expensive point to point connection leased to the end user) using VPN technology. VPN stands for 'virtual private network' and describes the ability to create a virtual private (lease line) network using the internet, avoiding the need to use dedicated and expensive lease lines.
- 6.17 This but one major technological enhancement impacting the internet. Others, on the horizon are likely to be:
- The Grid – next generation internet
 - Voice over the internet (voice over IP or VoIP) enabling voice to be transmitted via the internet, replacing the telephone system
 - And not lease, wireless technologies enabling cheaper, faster, easier and mobile access

Full circle – voice via the internet!

- 6.18 We still (apart from mobiles) tend to talk to each other via the old telephone system (much of which is analogue). Hence voice communications are largely separate from data communications. This will change as 'Voice over IP' (VoIP) is taken up.
- 6.19 So the process is coming full circle in that analogue voice communications (which is where it all started), will increasingly transfer to digital voice, over data communication networks.

HOW ICTs HAVE IMPACTED SO FAR

- 6.20 Information technology and more recently digital communications (ICTs when combined) have had tremendous impact:
- Information technology has had the most impact to date (e.g. advent of the PC) – the PC has revolutionised much of business, many aspects of living, education, science, health and other walks of life (can include selected diagrams/ charts **)
 - Digital communication has had some impact, which of recent is escalating – e.g. the internet and mobile phone, but the extent of digital communications and its application is in its infancy

FUTURE DIRECTION

- 6.21 No doubt there will be future innovations on the IT side (particularly miniaturisation enabling embedding of IT devices in machines and people – also termed micro electronics and nano technology); but these impacts lay more in the future. The most significant immediate impacts are likely to derive from provision and exploitation of high capacity high quality data communications, between PCs, but and particularly so, between mobile devices.
- 6.22 So we should look a little more closely at the opportunities and issues around digital communications (the C part of ITC)

Focussing on the C of ITC (digital communications)

- 6.23 To send and receive data (e.g. digital encoded information representing a document, spreadsheet, slide presentation, diagrams, pictures (still or moving); an sound (voice and music in particular)), the two (or more) IT devices **must be interconnected by an appropriate digital communications network.**
- 6.24 The problem is that the electronic communication networks we have in place are very largely built for voice (for analogue voice transmission e.g. the telephone system). Although the phone system can be adapted to send data, it is not ideal and does have limitations. Hence, as the demand for data communications has grown, these limitations have been hit. One of the principle issues for any town, city or sub region is the absence of sufficient electronic communication systems that are better suited to high volume, high capacity data communications.

- 6.25 ***Unlock this, and many argue that you unlock significant economic potential in the locality.***

Digital Communications Technologies at a glance

- 6.26 This is not the place for a technical discussion, so in brief, the principal alternative digital communication systems are:
- Cable (coaxial cable networks) laid by the Cable TV franchises in the 80s to bring cable TV to households, now being adapted to provide data services
 - Fibre optic networks – usually the preserve of the trunk network and large companies, organisations and sites
 - Fixed Wireless – point to point and point to multi point – used for filling gaps in the trunk network where fibre optic links are not available or require backup; and also used to link end-users with local distribution points
 - Mobile Wireless – communication between mobile devices and between mobiles and fixed devices, via the mobile phone networks (that are part wireless and part fixed) and via wireless LANs
- 6.27 Probably one of the biggest issues under the ICT banner for Leicestershire is the extent to which it can provide high capacity high volume data links between its citizens and the outside world; and the extent to which it can do this before others do, thus gaining a head start. Much of the evidence suggests that this will not happen on its own and that a public sector strategy and action plan is required to ‘fill the gaps’, to facilitate the process. Many areas are preparing such strategies.

Digital communications – the barriers

- 6.28 The key dynamic concerning digital communication networks and interconnection is the volume of data (measured in bytes) that can be sent and received per second e.g. 1 KBPS; 1Mbps.
- 6.29 Almost everyone can send and receive around 56 KBPS via the telephone network. This is termed narrow band because this is not a huge capacity and many data products and services take a long time to download, or send, or the system just crashes, hence failing all together
- 6.30 More and more people are therefore seeking high capacity links – around 2 MBPS and the requirement is expected to gradually rise to 5 MBPS, then to 10 MBPS and so on, as broadband access becomes more and more common place; as it becomes a ubiquitous utility, available at commodity prices
- 6.31 The problem is that most people cannot access this level of connectivity, unless they pay a high price, both for the capital set up cost and then for the service. So how can the digital communication revolution ever take place.
- 6.32 Essentially, digital connectivity is a utility, like a gas supply – and one person in the street placing an order will not justify a commercial decision to invest in a gas main – the entire street, or neighbourhood will need to decide it wants gas for this to happen.

Pre privatisation, BT was required to provide a telephone connection to anyone who wanted one and still is, but data services are not covered by this arrangement, and BT, as all other telecoms carriers, will make a commercial decision. Often the answer is not, because the price is too high, because the scale of network upgrade and build is too great for one small order to support. It helps if you are a large organisation or company, placing a large order for data services; but for medium and small companies and individuals, unless their immediate area is 'enabled', they will not be able to secure higher capacity data connections either at all, or at a feasible cost.

- 6.33 Economists and policy makers see this as a temporary (or transitional problem) requiring some help. There is a range of actions that can be taken, but the process will also be helped, potentially considerably, by developments in wireless technology

Wireless to the rescue

- 6.34 The principal barrier is the cost of laying or upgrading ground based communications systems. On the other hand, wireless systems require not digging or way-leaves and the transmission and receiving equipment can be cheaper and far easier to install.
- 6.35 Wireless communications, due to the laws of physics, is subject to a number of drawbacks –e.g. needing line of site; atmospheric conditions and other factors effecting the reliability, quality and capacity
- 6.36 However, recent innovations are solving some of these problems, and as technology marches forward, we can expect to see wireless technologies solving more and more of the cost problems;

Mobile communications

- 6.37 Moreover, these technologies will be applied to mobile communications, enabling increases in capacity and miniaturisation (so that mobile devices can be placed in moving parts, and in humans) to monitor and potentially control/ intervene).

LEICESTERSHIRE – THE ICT VISION

- Leicestershire will implement an ICT strategy that ensures that leading edge digital communications (fixed and mobile) are available to all residents, businesses, and organisations – both in their place of work and residence, but also on the move and in public places
- Building on Leicestershire' reputation for and image of being a leading technology city, the strategy will ensure that Leicestershire is an 'early adopter' playing a lead role in the provision and exploitation of high capacity, high quality digital communications
- The strategy will enable the telecoms industry to provide digital communications and services that meet next generation expectations
- And at the same time, will ensure that local people, as residents, as employees, managers and entrepreneurs, as learners and as public services

consumers, are fully aware of, and have the know-how, knowledge and confidence to exploit digital communications

- As a by-product, Leicestershire will foster the growth of a specialist ICT services cluster and expert skills pool, not only serving the needs of its own residents and businesses, but creating a competitive cluster that plays a key part in the wider regional and national economy

LEICESTERSHIRE – IMPACT OF THE ICT VISION

6.38 The impacts will be wide ranging, impinging on every walk and aspect of economic and social life. Examples of known impacts include:

- Increased competitiveness of indigenous businesses
- Increased market reach for indigenous businesses
- Increased attraction to inward investors
- Accelerated ITC awareness and knowledge amongst residents and the labour market
- Better operation of the labour market and access to training
- Increase efficiency, quality and range of public services – increased ease of and flexibility of accessing these
- Improved education and learning
- Improved delivery of health and other critical local services
- Improved ranges of services that can be accessed from the home – entertainment, knowledge and information, learning
- Significant impact on location and location options – working from home, flexible working; working on the move

7. Broadband Access is the most difficult issue for the strategy

- 7.1 This section cuts to the quick, identifying one of the most difficult challenges faced by the strategy – namely tackling clear market failure in broadband access; and as part of this, finding appropriate ways to ensure that the sub region not only stays level with competitor regions in terms of broadband access rollout and utilisation; but that it finds ways of securing ‘early mover’ advantage; of generating both competitive advantage and higher visibility, particularly on the international inward investment stage, through provision of advanced ‘flagship’ ICTs.
- 7.2 This is not to say that the other themes in the strategy will be ‘easy to tackle’ and drive forward, but comparatively, addressing broadband access is the most difficult.
- 7.3 Why?
- 7.4 Because of the
- complex and evolving technologies
 - because of the high capital cost of some access infrastructures
 - because of the complex market competition, state aide and operational regulatory environment
 - because of the complexities around identifying the precise causes of market failure and particularly the extent to which barriers are demand-side or supply-side
 - the complex ‘tiering’ of the telecoms carrier market place (e.g. whole-sale, intermediate retail, and final retail)
 - and not least because of difficulties associated with any kind of ‘supply-side’ intervention that involves public sector in any form of ‘direct provision’, even if on a temporary ‘pump priming basis’.
- 7.5 In short, it is a lot easier to assemble a complex site and put up an advanced factory or workshop unit that it is for public sector to become a temporary intermediary telco.

8. Defining Broadband Access – the technologies available

- 8.1 Section 5 defines what we mean by ‘broadband access’ and specifies the principal features, elements and issues associated with current access technologies. This is presented in lay terms, avoiding technical specifications and ‘jargon’ as far as possible, but we cannot entirely avoid this given the nature of the topic.

MAIN TYPES OF ACCESS TECHNOLOGY

- 8.2 Broadband (data) access technologies (network technologies) can be divided into several main categories:
- Ground-based – these include copper (twin pair), cable and fibre
 - Air-based (e.g. wireless) – these can be fixed and mobile; utilise ground stations and satellite (and potentially balloon platforms); and can be point to point or point to multi point or broadcast

DIFFERENCES

- 8.3 There are very significant differences. The key metrics to consider when comparing access technologies are:
- Capacity (bits per second) Kbps/Mbps/Gbps/Tbps
 - Reliability and resilience
 - Form of transmission technology supported
 - Cost

LOOKING AT SOME OF THE KEY METRICS

Capacity and Transmission Technology

Copper

- **Integrated Services Digital Network 2e (ISDN2e)** ISDN 2e, also known as Basic Rate Interface (BRI), provides two digital 64 Kilobits per second channels to give a maximum **bandwidth of 128 Kilobits per second**.
- **Integrated Services Digital Network 30 (ISDN 30)** ISDN 30, also known as Primary Rate Interface (PRI), provides up to 30 digital 64 Kilobits per second channels to give a maximum **bandwidth of 2 Megabits per second**.
- **Asymmetric Digital Subscriber Line (ADSL)** ADSL allows broadband to be delivered down an upgraded copper telephone line. ADSL can only be delivered from local telephone exchanges that have been ADSL-enabled by locating a Digital Subscriber Line Access Multiplexer (DSLAM) equipment in the exchange. Due to signal degradation over distance, ADSL can only be

offered to businesses and households that are within approximately 3.5 Kilometres of an ADSL-enabled local exchange. In the UK, ADSL currently **offers data rates of 512 Kilobits per second downstream and 128 Kilobits per second upstream.**

Cable

- **Cable Modem:** cable modem systems utilise cable television company's coaxial cable networks to supply broadband connectivity at **data rates of approximately 500 Kilobits per second both downstream and upstream.**

Fibre

- **Fibre-Based Systems:** A number of telecommunications companies are offering broadband telecommunications services direct to users over fibre optic cables. The main advantage of fibre based systems is that the bandwidth can be scaled immediately.

Wireless

- **Satellite Internet Systems:** Satellite Internet systems offer broadband Internet connectivity via satellite. The main advantage of satellite Internet systems is that they work in parts of the country that do not have access to fixed broadband copper or cable networks.
- **Broadband Fixed Wireless Access:** Broadband fixed wireless access offers customers broadband services through radio links at **data rates of approximately 512 Kilobits per second both downstream and upstream.** The main advantage of broadband radio links is that the technology is flexible because fixed infrastructure (such as copper, coaxial cable, or fibre) does not need to be installed between the customer's premises and the service provider. However, there are a number of limitations to the technology which include concerns over radio wave safety, susceptibility to interference and very limited availability.

WIDEBAND

- 8.4 Wideband refers to applications that deliver telecommunications services at data rates in excess of 2 Megabits per second. Wideband services are typically delivered over fibre optic networks due to the capacity that the transmission medium offers. Specialist wideband services are also delivered over point-to-point radio, although there are a number of limitations with this technology including capacity - radio can only deliver services up to 155 Megabits per second - and reliability - radio systems often fail in adverse weather conditions such as heavy rain or snow and the technology is not suited to developing networks.
- 8.5 There are a number of transmission technologies that are used to deliver wideband services and some of these are detailed below:

- 8.6 **Synchronous Digital Hierarchy** (SDH) is the most commonly used wideband technology. It is based upon internationally agreed transmission standards and enables inter-working of all operator networks and manufacturers' equipment. Bandwidths range from 2 Megabits per second to 2.4 Gigabits per second and above. SDH is delivered on self healing electronics supported by fibre optic networks configured in rings to give maximum resilience and service reliability.
- 8.7 **Asynchronous Transfer Mode** (ATM) is a network technology that allows the transmission of video, audio, and computer data over the same network without any single type of data monopolising the line, by splitting data into small packets. It is used as a means for forming Wide Area Networks (WANs) and supports data transfer rates from 2 Mb/s to 622 Mb/s. When purchasing an ATM service, occupiers will tend to have a choice between four different types of service:
- **Constant Bit Rate** (CBR) specifies a fixed bit rate so that data is sent in a steady stream.
 - **Variable Bit Rate** (VBR) provides a specified throughput capacity but data is not sent evenly. This is used for applications such as voice and videoconferencing.
 - **Unspecified Bit Rate** (UBR) does not guarantee any throughput levels and is used for applications that can tolerate delay, such as large file transfer.
 - **Available Bit Rate** (ABR) provides a guaranteed minimum capacity but allows data to be busted at higher capacities at times when the network is free.

RELIABILITY (RESILIENCE)

Resilience (physical)

- 8.8 Resilience is the term given to the ability of a network and its transmission equipment to minimise service disruption in the event of a failure in any network element. Resilience needs to be taken into account because networks can and do fail from a number of occurrences such as physical damage to fibre optic cables, optic line systems, microwave systems and multiplexer equipment. Lucent Technologies (who manufacture network equipment) estimate that on average, a piece of fibre optic cable is cut per annum for every 100 km of fibre optic cable laid.

There are two practical ways of achieving physical resilience:

- 8.9 The **first option** is to divide traffic proportionally between two separate transmission routes. Under this option, 50% of the traffic load is delivered over each route, although variations on this are often used. For a single building, this would involve a traffic sharing agreement, but for a multi occupancy business park, could more easily be facilitated through a resilience on-site ducting strategy with competing carriers serving different occupiers and able to provide back-up to others should their primary supplier fail

- 8.10 The **second option** is to provide redundancy in the form of back-up transmission paths and electronics. The provision of redundancy requires that back-up equipment be installed that may never be used. This form of resilience is usually in the form of two transmission routes: a primary route that is permanently live, carrying 100% of traffic; and a secondary route, which remains inactive until the event of a network element failure.
- 8.11 In either case, a single carrier can provide the resilience, but a more common strategy is for two carriers to create physical resilience through option 1 (e.g. BT and one other carrier). It is critical that 'the other carrier' is not using any part of BT's physical network to serve the site or runs its network next to BT's. Classic examples of 'false physical resilience' occur when two supposedly separate fibre optic links share the same duct, or run in parallel to cross a railway for example, or connect into the same PoP.

Resilience (commercial)

- 8.12 Reliability can also be impacted, particularly in the current economic climate, by the financial performance of individual carriers. A growing number are converging or going into receivership, which at the very least, raises concerns about their network's ability to sustainably deliver high quality services.
- 8.13 Such concerns have even been raised with respect to BT data services, which do not currently fall within the USO. Speculation that BT's data network or entire network will be subject to hostile take over raises concerns about BT's ability to continue to deliver quality data services in the future. The protection against commercial risks to resilience is to ensure that the site is served by at the minimum of two and ideally three entirely independent carriers – independent in a financial sense, but also using entirely physically separate metropolitan and local access fibre optic networks and transmission equipment to serve the site. In this way, if one network falls into receivership or is subject to take over activity, what ever the impact of this on service, there are two others to continue to provide viable and competitive quality services.
- 8.14 Major sites, such as eCampuses and Knowledge Campuses, ideally ought to aim for circa five to six independent carriers because three might become two should two of them merge - as may be the case with Cable & Wireless and NTL (this would have direct implications for employment sites as C&W is the only carrier other than BT serving the site at present and the nearest alternative carrier is ntl).

PERFORMANCE/ QUALITY

Availability

- 8.15 The availability rate of a telecommunications application represents the amount of downtime that the service provider expects to occur in any given period. It is usually expressed in uptime percentage terms, for example a 90% availability rate indicates that the application will be available for 90% of the time. Availability is usually grouped into what are referred to in the industry as the five nines - 90%, 99%, 99.9%, 99.99%, and 99.999%. Some telecommunications companies are now offering 100% service availability guarantees.

Latency

- 8.16 Latency measures the speed of a network, usually the time it takes a packet of data to make a round-trip from one hub router to another hub router and back again, and is measured in milliseconds (ms). It is particularly important to take latency into account when using real time applications such as videoconferencing and collaborative working.

Service Level Agreements (SLAs)

- 8.17 Service Level Agreements (SLAs) are documents that constitute a contractual agreement between the service provider and the end-user on the quality, availability, reliability, delivery and price of the service being offered. SLAs also detail the financial penalties that will be incurred on the service provider if it fails to deliver the service as specified in the SLA.

Certainty

- 8.18 Given the multiplicity of factors (commercial, physical, landlord and tenant, planning, telecoms regulatory and other) that can delay or prevent the availability of the required service level, the only effective way of guaranteeing certainty is to provide the physical services 'in advance of demand'. Or at the very least, to have undertaken all the major physical works to the point of laying ducting to the site, and within the site and upgrading/ providing all the necessary transmission equipment and making all off-site connections.

FIBRE REMAINS THE 'MEDIUM OF CHOICE' BUT IT IS EXPENSIVE

- 8.19 Having established that more and more ordinary firms, and especially typical target occupiers of blue chip business parks, will require high capacity data links (particularly wideband links offering between 5 and 35 Mbps), it is important to establish the different ways in which these levels of bandwidth can be delivered to a site or building.

PRICE OF BANDWIDTH

- 8.20 The final important dimension of a telecommunications service is price – price principally in terms of tariff, but sometimes, also regarding the contribution the customer (occupier) could be required to pay towards instillation (e.g. a one-off capital contribution).

Capital cost contribution

- 8.21 Whether a capital contribution is required depends on:
- The distance of the customer from the nearest point of connection to the carrier's network
 - The carrier's charging strategy – some prefer to bundle-up a proportion of the capital cost in the form of a higher tariff, others adopt a more overt approach

- Current 'state of the market' and negotiation – whatever the carrier's preferred approach, much will also depend on the current state of the telecoms market place and on the customer's negotiation approach

Annual Tariff

- 8.22 Probably of more importance to an occupier is the on-going annual tariff. Tariffs are a function of distance, bandwidth, quality of service (set out in the SLA along with penalties) and specialist services.

9. Wireless and other ‘breaking technologies’

9.1 This section looks a little more closely at some of the ‘breaking’ access technologies and particularly wireless.

Next Generation Broadband Services in Leicestershire – Current Position		
Technology	Summary	Relative Position of Leicestershire
Higher Bandwidth Cable Modem	NTL’s existing coaxial cable infrastructure has the potential to deliver up to 20 Mbps+ synchronous connectivity but this is predicated on the switch from analogue to digital TV signals, which is expected to occur in the next 2-3 years.	<ul style="list-style-type: none"> Although the company has yet to confirm this, NTL will be capable of delivering next generation (20 Mbps+) broadband services to all end-users in Leicestershire with access to their network by the end of 2005; This will require investment at the digital head end and in customer premises equipment (CPE).
Fibre-to-the-Door	Fibre optic cabling is a technology that uses bundles of glass or plastic threads to transmit messages modulated onto light waves. It has a number of advantages over other broadband media including virtually unlimited bandwidth, low susceptibility to interference and very low latency ² levels but is expensive to deploy - as such fibre-to-the-door is only viable for large volume sites.	<ul style="list-style-type: none"> There are a significant number of under-used fibre-optic networks in Leicester city – offering potential for intermediaries to aggregate demand for lower volume end-users in the city; Outside Leicester city, fibre coverage is limited to trunk routes that could not be used to offer services to end-users in the sub-region without significant capital investment.
Broadband Fixed Wireless Access (BFWA)	Broadband Fixed Wireless Access (BFWA) is a radio technology that operates within the microwave region of 1-40 GHz and systems operate within either the licensed or unlicensed parts of the microwave spectrum. Licensed BFWA spectrum is in the 3.4, 3.6 and 28 GHz bands.	<ul style="list-style-type: none"> The 28 GHz licensed spectrum for the East Midlands has not been bid for since its release in 2000 and therefore no services are offered under this spectrum in Leicestershire; If taken up, the 28 GHz licensed spectrum could be used to offer 2 Mbps+ broadband services to end-users in the sub-region; Pipemedia offers services over the 3.4 GHz licensed spectrum, equivalent to ADSL service-level offering, in the Market Bosworth area but take up to date has been very low.
Wireless Fidelity (WiFi)	Wireless Fidelity (WiFi) is a wireless local area network that uses high frequency radio signals to transmit and receive data over distances of a few hundred metres, using the Ethernet protocol. WiFi operates in unlicensed spectrum, predominantly using the 802.11 family of standards.	<ul style="list-style-type: none"> A number of WiFi hotspots have been developed in Leicestershire that allow very localised broadband Internet access. As with the rest of the UK, we consider that this coverage will become near universal in the urban areas of the sub-region in the next few years; Wireless Rural BroadBand (WRBB) states that its Sunshine product will offer broadband services up to 24 Mbps in the east of the sub-region in 2004. However, it must be noted that Sunshine will operate in the unlicensed spectrum and may be prone to service issues with regard to interference and security.

² Latency refers to the amount of time it takes data to travel from destination to source on a network.

10. Broadband Access – Current Intervention Policy Environment

- 10.1 This section sets out the current policy environment regarding the telecommunications markets – European Commission policy and UK Government policy. It is important to consider the European and UK Governmental intervention policy context, as it provides clear guidance on the types and extent of intervention in the telecommunications market that are generally acceptable.
- 10.2 The reader should note that policy is evolving at present.

MARKET FAILURE HAS INSPIRED RADICAL ACTION

- 10.3 A number of agencies have considered the market failure to be of such concern that they are considering direct and substantive intervention in the telecomm network infrastructure marketplace. To illustrate this, case study work we have undertaken of interventions across the UK and wider Europe include a number of examples where public sector agencies or partnerships are proposing to direct build and then operate independent networks. One of the most often quoted examples is Stockab from Stockholm, but there are others in Holland, France, and in the UK including in Wales and Scotland. Scottish Enterprise's Project Atlas (for which we helped SE prepare a business case for and economic impact assessment of) is one of the most high profile of such proposed interventions in the sector in the UK.
- 10.4 The European Commission, the UK Government and the Regional Development Agencies are concerned however, that direct development is approached very much as the last resort. This is because direct intervention, if inappropriately configured, can and will distort future competition and investment, which are the very things that deregulation policy is designed to foster.
- 10.5 In summary, those proposing intervention are being encouraged to have considered and tested other (lesser intervention) options before direct build should be contemplated.

TELECOMS INTERVENTION – DIRECTIVES AND REGULATIONS

- 10.6 You will be aware that there are European directives, regulations and guidance that are highly relevant to proposed intervention in, and operation of, telecoms networks. These fall within three broad headings:
- EU Regulatory framework
 - State aid guidance spectre to telecoms
 - Telecoms operational license requirements
- 10.7 We briefly consider each in turn below.

EU regulatory framework - Deregulation

- 10.8 A new package of Directives will establish a framework for the regulation of electronic communications networks, services and associated facilities throughout the EU has been agreed between the Council of Ministers and the European Parliament. The Directives entered into force on 24 April 2002 upon publication in the Official Journal of the European Community.
- 10.9 The new package of directives consists of:
- a) Directive 2002/21/EC - a common regulatory framework for electronic communications networks and services.
 - b) Directive 2002/20/EC - on the authorisation of electronic communications networks and services.
 - c) Directive 2002/22/EC - on universal service and users' rights relating to electronic communications networks and services.
 - d) Directive 2002/19/EC - on access to, and interconnection of, electronic communications networks and services.
 - e) Directive 2002/58/EC - concerning the processing of personal data and the protection of privacy in the electronic communications sector.
 - The Directives are expected to be implemented in all member states on 25 July 2003. The provisions of these Directives will be transposed into national legislation. Individual national regulations will be brought into line with the new Directives.
- 10.10 Deregulation is the underlying theme and the above directives are designed to help open up and ensure fair competition.

State aids DTI advice

- 10.11 The EC Treaty prohibits Member State authorities from granting state aid that distorts competition and trade in the EU. Articles 87 to 89 give the European Commission wide-ranging powers to investigate illegally paid subsidies and to order their repayment.

The terms of article 87 (1) of the relevant European Commission treaty states that: "Any aid granted by a member state through state' measures in any form whatsoever which distorts or threatens competition by favouring certain undertakings or the production of goods, shall, in so far as it affects trade between member states, be incompatible with the common market

- 10.12 The EC Treaty itself does not define state aid. However, both the Commission and the European Court of Justice have interpreted the term very widely to include many different forms of state financial assistance or economic advantage. Clearly, the rules apply to direct state grants (for example, a capital injection to bail out a firm), but the rules also apply to other less obvious types of aid:- tax exemptions, loans at reduced rates of interest, guarantees or indemnities on favourable terms, sale of land below market value, writing off debts.
- 10.13 Potential cases of state aid should be notified to the Commission for clearance,
- 10.14 Companies have the right to challenge unlawful subsidies paid to foreign competitors before the European Court of Justice. A number of companies in the UK, where aid to industry is generally lower than elsewhere, have exercised this right.
- 10.15 The Commission has adopted a number of "guidelines" or "frameworks" to clarify its State aid policy in a number of areas, listed below.
- Regions lagging behind in terms of development;
 - Research & development;
 - Employment;
 - Protection of the environment; and
 - Rescue and restructuring of firms in difficulty.
- 10.16 The Commission has also adopted a number of "block exemption" regulations for state aid to:
- Small and medium-sized enterprises;
 - Aid for training; and
 - Aid for employment

State Aides and Telecommunications

- 10.17 There is no specific guidance related to telecommunications. Most cases considered by the Commission and the Court have been concerned with the rescue funding of national incumbent suppliers.
- 10.18 Thus, there is a general requirement to ensure intervention does not do more than the minimum necessary to correct market failure.

UK Telecoms - Licensing Legislation

- 10.19 Any interventions in broadband infrastructure and communications services provision must take account of the prevailing licensing requirements, set out in prevailing legislation.
- 10.20 On 25 July 2003, the UK implemented a new EU framework for the regulation of

electronic communications networks and service providers.

- 10.21 The **framework sets out a harmonised and technology neutral** regime for the regulation of communications companies across the EU, which will provide industry with greater certainty and a transparent, more uniform approach across the member states. The regime is based on five EU Directives that cover interconnection and access, data protection, universal service, authorisation of electronic communications networks and services and a common regulatory framework.
- 10.22 The requirements of four of the Directives have been taken forward in the Communications Act 2003, and following the enactment of the Communications Act and the change in regulatory regime, certain parts of the Telecommunications Act 1984 have been repealed.

What does this mean for the industry?

- 10.23 For communications networks and service providers, the most significant operational change is the ending of the licensing regime and the withdrawal and revocation of Telecommunication Act licences.
- 10.24 Prior to 25 July, any company operating in the UK had to do so under the appropriate telecommunications licence. The process required most companies to apply to the Department of Trade and Industry (DTI) for a licence before being able to operate and supply services to consumers.
- 10.25 The licensing regime has now been replaced by a general authorisation regime with the General Conditions of entitlement (that is, conditions which apply to all) and specific conditions (that is, conditions which apply to individuals).

The General Conditions

- The difference between the Licensing Regime and the Authorisation regime is that all communications providers will only need to look to one set of general conditions to ensure they are complying with the law.
- There will not be different 'licences' containing different conditions any longer.
- This also means that communications providers are responsible for ascertaining which of the general conditions applies to them and their operations - they will not be issued with a personal licence, which sets out their obligations.

The obligations themselves are similar to those contained in current licences, although they have been redrafted in line with the new EC Communications Directives and the Communications Act.

TO CONCLUDE

- 10.26 The principal points of relevance for you regarding intended future intervention in the telecoms arena are:
- Deregulation is the underlying theme. A new suite of EU directives comes into force after this year. These are standardising regimes across the EU and are not expected to have a big impact in this country.

- Given the underlying objective of deregulation, intervention is therefore to be seen as a last resort.
- State aids limitations apply to intervention in the telecoms arena, although there are no telecoms-specific state aids regulations. There is no succinct statement on state aid rules for telecommunication projects. It is not a special sector such as shipbuilding or textiles. Justifications have to be made on a case by case basis, ensuring they hit 'buttons' such as regional development or support for SMEs. The high profile cases are those where governments have been bailing out incumbents.
- Market failure must be proven and any intervention must not go above and beyond that needed to correct market failure, otherwise it may lead to market distortion.
- Moreover, any intended intervention must not benefit one or a limited range of companies, except exempted companies.

- Regarding operation of any possible future public sector network or public sector supported network, the operator will require an appropriate license.
- However, licensing is relatively straightforward. The defining issue is whether a network is wholly private (no license needed), or connects with other parties.

UK GOVERNMENT'S (DTI'S) INTERPRETATION

- 10.27 The DTI endorses this approach, as does EMDA
- 10.28 What this has translated into in practice has been the requirement that public sector and partnerships formulate and test at least one 'least intervention/ least cost option'; and only resort to gap funding or direct development where this is the only solution to market failure.
- 10.29 In parallel, national research has been commissioned examining the roll of 'demand aggregation' and how best to use this tool, because this is thought by many to be one of the most effective and helpful methods of intervention. The Government and Yorkshire Forward favours this approach. We have been informed by the DTI that this principle has been cleared with all appropriate departments of state, The DTI plans to set up regional organisations to aggregate and purchase bandwidth on behalf of all public bodies in each region. The Yorkshire company will be operational by October 1, 2003.

IMPLICATION FOR LEICESTERSHIRE

Case for Intervention

- 10.30 This report clearly identifies the need/ aspirations for high capacity digital connectivity infrastructure to serve the area.
- 10.31 The analysis suggests that the required infrastructure has not and may not be provided without intervention, hence suggesting evidence of market failure. Thus, we conclude that there is a case for you to consider a variety of 'intervention' options designed to address these gaps in provision. But we advise that the form and extent of intervention should not produce outcomes beyond those needed to correct market failure and enable the full and effective operation of a competitive market.
- 10.32 This is particularly important given that the European Commission is currently critically examining a number of intervention programmes and funds in the UK. Those telecoms intervention proposals in other regions/ countries that appear to 'be excessive' or to 'over step the mark', are prone to high profile criticism in the press and to legal challenges by carriers.
- 10.33 In light of the above, the principal course of action for you to consider is:
- Consider demand aggregation combined with demand stimulation options as a priority.

- Consider how to do this at the local level, but also explore scope to do this at the sub regional/ regional level. The logic of demand aggregation is that the wider the scale, the more effective it will be.
- Treat direct development as a last resort, but pre-plan this as a fall-back and as a benchmarking option.