

SECTION C

Managing Public Resources

The expanding role of markets in telecom is made possible by a substantial commitment of public resources. Competition in telecom services markets is made possible because government is changing the way it manages valuable public resources. How it changes the management of these resources will significantly affect the structure of the competition in telecom markets and the efficiency of the allocation of the public resources. These resources generally are not sold or leased at market prices and confer very large economic benefits on the recipients.

This Section examines the issues associated with managing the essential public resources of rights of way, the radio spectrum and telephone numbers. William Melody and Dorte Møller analyze the significance of rights of way as a foundation for telecom infrastructure competition. Ironically most government policy decisions to foster infrastructure competition are made without much thought to its implications for access to, or management of rights of way. Jens Arnbak assesses developments with respect to the rights of way in the air, i.e., the radio spectrum. Although technological advance continues to expand the communication capacity of the spectrum, it makes possible new applications and very rapid growth in its use. This introduces a number of increasingly complex issues for spectrum management that will affect the future efficiency of spectrum allocation and use.

Until recently telephone numbers were considered to be a small scale technical issue for the PTOs to work out in a systematic way. Now it is recognized that telephone numbers are enormously valuable and a source of significant competitive advantage. Dialing parity and number portability are major issues in every competition policy. Claire Milne looks at the implications of numbering for market development and the important role of regulation in constructing forward looking numbering plans and managing them effectively.

Chapter 10

Rights of Way as a Foundation for Infrastructure Competition

William H. Melody and Dorte Møller

1.0 Introduction

Rights of way are the privileged uses of streets and other public and private property for particular purposes. They are normally granted by municipal, state or national governments to public utility (telecom, electricity, gas, water and more recently, cable television) and transport (railway, mass transit) operators to facilitate their provision of a public service. The rights are granted by a special contract, typically called a franchise, which defines the specific privileges and obligations. Rights of way privileges generally include the right to use whatever property is needed to provide the specified services. They often include the right of eminent domain. In most cases they are exclusive rights, so as to facilitate system-wide planning and construction, and to minimise disruptions to the public and incursions on public and private property.

Franchises frequently include obligations to serve all those who desire service in the franchise area on reasonable terms. Franchises are normally for a specified period, e.g. 20-30 years, but sometimes they are in perpetuity. In telecom, rights of way privileges principally include erecting poles, laying cable and wire and locating radio antennae at advantageous sites. They include continuing access to and protection of this property even though it is typically located on property (usually land or buildings) owned by others.

Governments have not sold rights of way to utility and transport operators. Rather they have preserved rights of way for essential public services and granted them at nominal cost, rather than at market value. The reasoning has been that the costs of the public services being provided by the utility or transport operator, and therefore the prices charged to the using public for essential public services, should be kept as low as possible. Franchise fees (or taxes) are sometimes charged, e.g. two percent of revenues, but these are seen as helping to cover the costs of administering the governments obligations under the franchise, not charging for the economic value of the right of way privileges. As a result, rights of way have not been a costly resource for utility and transport operators, and they do not figure as a significant item in their accounts. In the early days of railway development in the USA, Canada and some other countries, governments made outright land grants to railways to encourage extension of the railway network to unserved territories.

If a competitive market is to be pursued in telecom network services so as to achieve improved efficiency in the sector, a number of important issues are raised. Should the same rights of way privileges be granted to new competitive operators who may wish to create their own network infrastructure, or would this create inefficient and unnecessary duplications of rights of way franchises, disruptions to the public, incursions on public and private property, and administration and supervision costs for government? Would the fact that the rights of way resource can be obtained at a cost that is far below its economic value stimulate excessive demands for market entry that are really inefficient? Yet, if there is only a single local network infrastructure supplier with a direct connection to customers, how can it be said there is real competition in basic network services?

If there is to be competition in the supply of local network infrastructure, should the rights of way privileges be sold in the marketplace like other economic resources? If they are sold to the highest bidder, the highest prices will be obtained if the franchise provides exclusive rights, thus ensuring a continuation of monopoly arrangements. Even with non-exclusive rights there may be only a single infrastructure supplier, as the market value of rights of way in many areas will be very high providing a significant barrier to entry for competitors, an increase in costs to telecom operators and an increase in prices to users. It is very unlikely that a workably competitive market in the essential rights of way resource could be established.

A more likely source of infrastructure competition in most countries is from the use of already established rights of way now held by other utility and transport operators. They are sitting on very valuable rights of way for their particular franchised areas and services. In many cases they provide the most efficient access to rights of way for the construction of competitive telecom infrastructure networks. This chapter examines the possibilities for using these existing rights of way as a foundation for telecom infrastructure competition that can, in turn provide for competition across the full range of public network services.

2.0 Experience and Plans

It is generally not recognised that use of the rights of way of other public utility and transport carriers has been an integral part of almost all new entry providing infrastructure competition in telecom. In the USA, Sprint has grown out of the communications division of the Southern Pacific Railway which initially used its own rights of way to build an extensive private microwave network for its own communication needs. It then became a specialised public common carrier providing long distance services when the FCC changed its policy in 1971 to permit competition in interstate long distance services. MCI has laid much of its fibre cable network along Amtrak railway lines, and is also using rights of way inherited from the former Western Union Telegraph Company. One of the more successful new long distance companies in the USA during the 1980s, Wiltel, leases fibre optic transmission capacity to other carriers using the rights of way of its parent company's oil and gas pipelines.

Similarly, in the UK, Mercury laid much of its fibre cable along British Rail lines, and railway rights of way will provide the foundation for future inter-city infrastructure competition. The Netherlands state railway already has laid 1,000 km of fibre cable along its tracks, and has joined forces with British Telecom in a proposal to be the second

Dutch operator. HIT Rail, a private telecom company owned by 14 European railways currently provides them with a high speed private communication data network and is planning the Hermes European Railtel project consisting of a USD 600m trans-European high capacity optical fibre network to span Europe, in association with Global Telesystems Group. Japan's regional railways are part owners of Japan Telecom, a new competitive carrier which has laid cable along their rights of way.

It would appear that rights of way have been, and are now, an essential resource for constructing an independent facilities network so as to enter long distance telecom markets. At the same time the absence of rights of way is likely to be an insurmountable barrier for entry to potential infrastructure competitors, given the costs and delays of obtaining grants of new rights of way franchises. Indeed, in many places, new rights of way franchises may not be obtainable at all. Thus the realistic possibilities for facilities-based new entry to telecom depend heavily on negotiations with the owners of existing rights of way.

At the level of local distribution, the rights of way issue is similar to long distance, but even more complex and ultimately more significant as it involves direct access to customers for all network services, including long distance service. The vast majority of telecom network infrastructure investment for all services is in the local distribution network. In the US, the major long distance companies, AT&T, MCI, and Sprint have been paying more than 40-60 percent of their revenues to the Region Bell Operating Companies (RBOCs) and other local telecom operators for use of local distribution facilities to obtain access to customers. Few, if any, of the alternative railway based infrastructure developments include plans to construct a comprehensive local infrastructure as well.

So far there has been very little infrastructure competition development for local networks anywhere. Rapidly growing cellular mobile services have proven to be more of a higher value and higher priced complement to, rather than a substitute for basic telecom services, except in countries with undeveloped local networks. Moreover most of the current value-added and predicted future broadband information superhighway services will require a fixed network with direct connections to residences. Thus, rights of way is an even more essential resource for the local network infrastructure than the inter-city infrastructure.

In some countries cable television (CATV) operators have developed reasonably comprehensive local infrastructure coverage, with a higher capacity cable connection to households than provided by telecom operators. Thus CATV operators might be seen as the most likely source of local infrastructure competition. But CATV infrastructure networks are based on a simple one-way delivery of television signals, not an interactive switched telecom network capable of supplying a variety of services. In only a very few relatively small locations in the UK and other places are CATV companies offering local telephone service. It is still very much in the experimental stage as significant additional investment and expertise is required, and CATV operators are moving slowly and cautiously even in countries like the USA and Canada, where new government policy allows them to enter the telecom business. Nevertheless, where CATV has developed significant coverage of its geographical areas and is independent of the public telecom operators (PTO), it has an alternative right of way resource that could be used by itself, or an independent entrant, as a foundation for a second telecom infrastructure. However, the

probability of independent entry is quite low when one considers that CATV companies would view new independent infrastructure network operators as just as much a competitive threat to their services as PTO services. Moreover, CATV operators normally could not lease rights of way at market value that they were granted by government at nominal cost.

At the present time, electricity, energy and water operators, and even municipal governments are assessing how their rights of way might be used as a very valuable resource in the rapidly expanding and newly competitive telecom sector. Some have only rights of way. Others have some telecom facilities, e.g., installed cables, on their rights of way. Others see economies in piggybacking a telecom network on top of their existing networks, especially electricity operators. A number of municipalities have installed a fibre ring network in recent years as part of their ongoing utility service development programs. However, none of these utilities or municipal governments has any significant expertise in telecom technologies, management, market or service development.

Some electric utilities are testing their potential for becoming public service telecom operators taking advantage of their direct connections to virtually every residence. Fibre cables can be strung through power lines and can be used to read electricity meters, as well as control appliances for most efficient energy use. Electric utilities have expertise in billing very large numbers of public users, as well as information databases on customers. They have some significant potential advantages for entry into the telecom market as an alternative infrastructure provider to the PTOs.

In the UK, Energis (owned by the regional electric companies) began offering national telephone service to business customers in September 1994. In Japan Tokyo Electric Power and its partially owned telecom operator are providing telecom services to local businesses. But entry into telecom requires a major investment by the utilities. After studying the possibilities, half the UK's 12 regional electric companies decided against getting into telecom, at least under present conditions. Nevertheless, an increasing number of utility and transport operators are either entering telecom markets or studying the possibilities. Table 1 provides a list of some of them as of early 1995.

Providing Some Commercial Service	
<i>Railway</i>	
British Rail	Britain
Deutsche Bundesbahn	Germany
Nederlandse Spoorwogen	Holland
Banverket	Sweden
<i>Water Supply</i>	
Générale des Eaux	France
<i>Electricity/Energy</i>	
Energis	Britain
Norweb	Britain
Scottish Power	Britain
Yorkshire Electricity	Britain
RWE Energie	Germany
Veba	Germany
Tokyo Electric Power	Japan
Planning to Enter Commercial Markets	
<i>Electricity/Energy</i>	
South Wales Electricity	Britain
South Western Electricity	Britain
VIAG	Germany
GEB Rotterdam	Holland
In Trials	
<i>Electricity/Energy</i>	
Duke Power	United States
Entergy	United States
Pacific Gas and Electric	United States
The Southern Company	United States

Table 1– **Right of Way Utilities Entering Telecoms Markets,
January 1995**

Source: The Economist, 28 January 1995, p. 75.

3.0 Potential Roles for Utility and Transport Operators

If the rights of way of established utility and transport operators are an essential resource for promoting infrastructure competition in telecom, it is important to examine the most

appropriate role these companies can, or might play in the new environment. The minimal role is to make their rights of way available on reasonable terms to new operators. The maximal role would be to become a telecom operator and service supplier, i.e., to become the competitive infrastructure operator to the PTOs.

But can stodgy monopoly utilities and railways that have little or no expertise in telecom be expected to be efficient and customer-responsive competitors to telecom monopolies that have been unable to keep up with the dynamic market changes in their industry? Is the best source of infrastructure competition in Europe and other regions a consortium of railways, municipal governments, electric/energy and water companies, most of which are government owned monopolies?

There are a variety of potential roles that such organisations can play depending on their particular organisational structures and circumstances. Parallel to the deregulation of telecom, other utilities and railways are also being liberalised in their own right, and some of their financial and competitive restraints are being removed. Different types of operators either already possess or have the possibility of installing extended telecom networks over a wide geographical area. Thus existing utilities, whose main business purpose is not the provision of telecom services, will face both opportunities and problems of an economic, organisational and technical character.

Denmark, for example, is a fairly typical case. Both the Danish State Railways and the power utilities own extended networks of optical fibre cable. Most of the installed base of communication lines in Denmark that is not owned by the PTO (Tele Danmark) was created for the internal communication needs of the other utilities. Most of these utilities are wholly or partly owned by the government and have therefore not had the opportunity to initiate long-range investments in telecom infrastructure, the policy being that investments are made only when immediate needs can justify them. The power utilities in Denmark are privately owned, but are forbidden by law to accumulate capital for future investments and are in this respect in the same situation as public companies. Not all such companies are purely public or purely private, as the direct and indirect influence of government in utilities often is limited to of specific functional activity. For example, the following range of activities can be under either public or private control:

- Ownership;
- Control over investment;
- Use of Rights of way;
- Goals and Selection of Management;
- Operational Accountability; and
- Scope of Public Service Obligations.

The Danish State Railways are totally publicly owned, and all the activities listed above are politically controlled. The power utilities, although privately owned, have most of the other activities subject to government control. They are obliged to develop annual network expansion plans with scopes of five and ten years. These plans are subject to approval by the Ministry of Energy, the Ministry of Environmental Affairs, preservation commissions, and, if relevant, air traffic and military authorities. The power utilities have

two associations which co-ordinate the network plans nationally and internationally. These plans are developed based on the development plans of municipalities.

In Denmark rights of way are granted both by municipalities, concerning their own property (streets and other public areas), and by the state (by expropriation in whole or in part of private or public property). The rights of way owned by municipalities are used simultaneously for gas, water, electricity, and telecom, whereas state-awarded rights of way are granted to specific companies such as railways, power and telecom utilities.

The power utilities do not pay the state for rights of way. Rather, the necessary land ducts are partly expropriated from the private site owner. If the property is owned by the state or county, the public authority will have the same status as a private owner, i.e., it cannot resist expropriation on other terms than can a private owner. The owner will still own the property, but the rights of usage are restricted (e.g., no tall farming machines allowed under airborne wires). The property owners are reimbursed directly by the power utilities. The rates of compensation, however, are fixed by law, not market value.

The railways acquire property in a similar manner. The duct itself will be wholly expropriated, while surrounding areas are partly expropriated and may even impose obligations on the property owner. For example, the owner may have to cut down or trim trees near electric railway sections.

The issues of which regulation in telecom would be applied with respect to the entry of a new rights of way-based operator can be divided roughly into three areas: allocation of public resources, market regulation, and consumer-oriented regulation. The regulation of resources includes rights of way and the terms and conditions on which they are awarded. This is familiar territory for other utilities. The market structure will be influenced by telecom licensing policies relating to specific service types such as Plain Old Telephone Service (POTS) and value-added network services (VAS). This would affect the market and the customers for the new telecom capacity that is established. Telecom pricing and tariff regulation will influence the market structure as will regulation of interconnection between different operators, and must be addressed if the new carrier wishes to provide telecom services. Finally, consumer protection may require regulation of tariffs and service obligations, if the new carrier chooses to offer services to the public. These conditions collectively will determine the opportunities for telecom market entry by utilities and railways and the directions they will take.

4.0 Technology Issues

Entry by utilities and railways which already have their own internal telecom networks raises some important technological issues. An important problem for inter-networking and multi-provider networks is the standardisation of signalling systems and network management systems. It is essential that end-users be shielded from the heterogeneity of the underlying networks and perceive the service as simple and seamless. This is much more complex for public networks than internal networks.

The independence of functional layers of capabilities is vital to the effective operation of multi-provider networks. It is not likely that users will accept widely different tele-applications and interfaces depending on which telecom provider is delivering the service they want to use. Therefore, the work of standardisation becomes increasingly important (see Hawkins, this volume).

A number of technical interconnection problems must be addressed when these quite different telecom networks are connected. Physical interfaces must be provided, but this situation has been solved for many network types and solutions are in operation in heterogeneous networks owned by single users and different telecom operators. More difficult problems are those concerning the integration of synchronisation, signalling, and network management. These cannot easily be controlled from both sides at once, implying that either one network must partly give over control to the other network, or a new joint operations centre must control both networks. The last solution was chosen for instance for the Hit Rail pan-European railway network.

Separating networks from services is technically difficult and becomes increasingly so as more intelligence is built into the networks. The responsibilities and rights of transmission providers, service providers and customers therefore must be carefully considered before internal utility and railway networks are expanded to provide public telecom network services.

5.0 Options for Rights of Way Entry into Telecom

There are several avenues open to utilities and railways that wish to take advantage of the opportunities provided by liberalisation. One end of the scale is the leasing of rights of way or physical transmission lines, most probably optical fibres, either to new telecom operators or directly to large customers who will then install their own terminal equipment, provide their own network management, etc. The other end of the scale is to offer network services to the public and thus to function as a telecom operator. Both approaches offer advantages and complications.

In each case new requirements are posed for the new entrant in the form of manpower, equipment resources and service support skills and organisation. There are also potential disadvantages to the internal telecom operations of the right of way carrier for its own basic services. Furthermore, it must consider under what terms contracts must be made with external customers, including quality of service requirements, as normally utility and railway telecom networks require significantly higher quality standards than public telecom networks. Indeed, that is a major reason they were constructed in the first place, i.e., to maintain a higher quality of service for their utility or transport services than the PTOs would otherwise provide to them.

A variety of different activities can be adopted by the would-be new provider, for instance:

- Simply obtaining additional income from the lease of rights of way or spare capacity in the existing network;
- Providing communication facilities to meet the future telecom needs of the utility or railway at minimum costs by including additional capacity to lease or sell in the telecom market;
- Providing contract telecom services to large users, but avoiding too large a demand on resources for expansion or its telecom services support organisation;
- Providing public telecom services, either independently or in association with a new telecom operator.

These goals could conflict with those of the primary utility operator. It is therefore very important for the potential new entrant to formulate the goals of the company explicitly before deciding on the manner in which the telecom market is entered.

The vital problem of determining what telecom services customers want – or more specifically, what they are willing to pay for – is no longer a question of consulting the statistics of telephone subscriptions for recent years and making an extrapolation. A more detailed understanding of consumer demand is needed in a market environment where raw transmission capacity is rapidly becoming an ever cheaper commodity. It is commonly agreed that the larger part of telecom revenues in the future will come from services offering more than the mere transmission of bits, i.e., value-added services, especially for new entrants. The more complex the service, the larger the potential revenue, but also the larger new investments, operating and marketing costs that are required and the greater risks assumed as the new right of way carrier moves further away from the source of its initial competitive advantage.

5.1 Leasing Rights of Way

In this scenario, the provider will simply allow other operators to utilise existing cable ducts for their own cables. The customers will provide cables and terminal equipment and will operate the network. The only cost for the provider is the work and inconveniences related to installation of the cables and considerations of space limitations. There will be some administration costs related to coordination of the work with other installations and the updating of cable plans. Furthermore, terminal equipment will probably have to be located on the premises of the provider. An additional consideration is the potential problem of housing cables owned by an external customer in areas with restricted access, for instance because of security considerations. In this case, the cable owner may not be allowed free access to its cables.

5.2 Leasing Optical Fibre Pairs

In this scenario, optical fibre pairs are leased out over long periods of time. Customers provide their own terminal equipment, which will probably be located on the premises of the provider. This option requires investment in optical cables with capacity exceeding the internal needs of the provider. In many cases excess capacity will already exist. This approach will be relatively cheap in investment, since the marginal cost of extra fibre pairs is relatively small, given that cables have to be installed for internal needs. On the other hand, it will be relatively costly to establish new optical cables with the sole purpose of leasing. There should be little additional maintenance cost compared to the existing situation.

5.3 Providing Fixed-Capacity Channels

In this scenario, the commodity sold is fixed-capacity channels between designated end-points. The provider must supply both cables and terminal equipment. A typical example would be the leasing of 2 Mbit/s channels. The provider must meet requirements concerning availability of the channel and error rates on the channel and must provide end-to-end connections possibly spanning several nodes in the corporate network. In this case, proper synchronisation must be ensured. Multiplexing of channels must be

performed in a manner that guarantees that the full transmission capacity will be available to the customer at all times.

Additional security issues may arise here. It must be assumed that customers will want the ability to transmit sensitive data over the leased channels. The provider must be able to guarantee that communication cannot be disrupted by an unauthorised access to cables or terminal equipment. Furthermore, customer information must be secured against unauthorised access or tampering

This approach requires long-range capacity planning in the corporate network. When a channel is leased from a public provider today, it is understood that the customer will be able to retain the channel as long as desired. Similar conditions must be offered when a utility or railway leases out excess capacity. Thus the leased channels cannot be reclaimed on short notice if they are suddenly needed for internal uses.

5.4 Acting as Public Provider

If a utility or railway wishes to take the full step and act as a public communication provider, a number of complications arise. Which services to provide depends on a number of considerations including investment, operating cost, profitability, and available resources. Packet switched data communication would probably be the simplest choice in most situations. Providing POTS requires cooperation with existing network operators, as a closed telephone network without access to the rest of the world is of little value. Bulk transmission of video signals between a few points (where customers could for instance be broadcasters) could be relatively easy to implement.

In general, operational costs will increase with the number of customers to be served. A few large customers are much easier to connect and support than a multitude of small customers. Network management must be integrated and well-functioning in order to guarantee the grade of service agreed upon. It is necessary to employ staff possessing adequate skills and experience; as well, a detailed understanding of communication demands – both internal and external – is needed.

This also raises an important issue of management. What is the appropriate treatment for internal corporate users in relation to external customers? There are two distinct approaches. One is to let users inside the corporation buy the communication services on an equal basis with external customers. In this case, the justification for the utility to maintain an independent physical telecom network could be jeopardised. The other possibility is to provide the core utility users with a privileged status in which they are provided with communication capacity for free or at favourable rates. In this case, the department financially responsible for the operation of the network will find itself in a very peculiar situation. It will have a large incentive to withhold available capacity from internal corporate users in order to get an income from selling the capacity to external customers who pay higher prices. This will also make it more difficult for the telecom operation to compete most effectively in the liberalised telecom services market. Moreover, to avoid regulatory difficulties, it may be necessary to establish a structural separation between the new telecom operations and the established utility operations. These issues will need to be resolved before a utility or railway enters the telecom services market.

A major potential problem is connecting the geographical sites on utility company premises, where switching and termination equipment are located, to the access points of

customers. A customer which is a public telecom service provider with an existing access network can easily establish connection to customer end-points. But small customers will not find it economical to establish a direct connection to the corporate network end-point. As the telecom access network can account for up to 80 percent of the cost of operating a network, it is extremely expensive for a new telecom service provider to create an access network of its own. Even established public utilities, such as electricity and water operations, which have complete local right of way networks, would have to undertake very large investments to establish new local telecom access networks.

Additionally, in a competitive market environment, telecom tariffing systems are likely to become more complex than they have been traditionally. The advent of intelligent networks and more complex value-added services, and the entry of new operators providing a multitude of national and international services will require increased levels of expertise in demand analysis and tariff management in a large multi-provider network.

In most cases, potential new right of way providers will benefit greatly from co-operation with other companies that can provide competitive advantages of their own. Partners in such ventures may include rights of way holders, telecom equipment manufacturers, established telecom operators, capital providers, or experts in new services development.

The matter of what the purpose is of owning a separate utility or railway telecom network will have to be reconsidered in a liberalised environment. If this incentive is mainly economic, it is not certain that the original utility network will continue to be the best solution to the communication needs of the provider. If, on the other hand, other factors such as security or quality of service considerations, or access to sites where public connections are not available are the main reasons, then there would be a justification for the utility network to be maintained. In the new liberalised environment, some utilities and railways may wish to expand their internal telecom networks, while others may wish to contract, or even eliminate them.

6.0 Conclusions

The rights of way resource has been, and will continue to be fundamental to the implementation of telecom reform in all countries and regions. Given its importance to efficient and effective entry into telecom markets, it is surprising that policies on the use of established rights of way for introducing competition have not been addressed as a fundamental part of national telecom reform programs. This undoubtedly has kept barriers to entry higher than necessary, especially with respect to establishing competitive access network infrastructures.

To date the rights of way of railways have received most attention from new entrants to long distance communication markets. Railways have until now seen their role primarily as a limited one of leasing rights of way, or telecom transmission capacity along their rights of way to telecom operators and service providers. The European Hit Rail consortium plan for a trans-European telecom network is in association with an experienced telecom operator and is targeted to be a wholesale supplier of telecom transmission capacity – a carrier’s carrier – principally to the European PTOs, not a direct competitor or retail service supplier. Jan Loeber, Managing Director of the railway initiative, stated in 1995 that it would be “strategically unwise” to attempt to sell to end-

users. This Hit Rail initiative also will almost certainly remove the rights of way of the participating railways from use by a direct competitor to the PTOs.

Ironically, although the European Union has adopted a policy of competition in telecom across all services, effective January 1st, 1998, it is moving extremely slowly in making it possible for existing rights of way resources to be used in developing alternative telecom infrastructures. Only CATV infrastructure networks (which in a number of countries are provided by the national telecom operators for CATV program distributors) may be used as alternative infrastructure for already liberalised telecom services. Railways and utilities have been left out of EU rulings and are not expected to be allowed to offer their infrastructure to third parties before 1998. Thus even the HIT Rail initiative will have to seek approval on a country by country basis – a time consuming and costly process.

For the future, there will be increased attention paid to the rights of way of other local utilities, particularly electricity and energy networks, which have advantages in addition to rights of way (customer connections, billing capabilities), and potential benefits in their core business (load management). Although this improves the opportunities for entry by established electricity/energy operators, it may restrict the opportunities of other potential entrants to joint initiatives with local monopoly electricity/energy operators. However, as local utilities (and railways) have little or no special qualifications for acting as public telecom service operators, they are likely to find benefits from joining forces with other companies having experience and expertise in telecom networks and services.

This future infrastructure competition, especially at the local level, will be highly constrained by the barriers to access to the rights of way resource. At the level of access to customers, duopoly may be the only realistic competition that can develop, at least until the longer-term future when continuing improvements in radio-based technologies may provide a comprehensive competitive alternative that does not require extensive land-based rights of way.

These developments also will ensure that telecom regulators will be kept busy attempting to ensure that the very limited extent of infrastructure competition develops fairly and efficiently, and residential consumers with limited or no competitive options are protected. Cross-subsidy and anti-competitive issues will arise not only with respect to monopoly and competitive services, but also between telecom and utility services, and between private and public services. Service expansion may introduce strategic behaviour to capture the best rights of way and restrict the sharing opportunities of competitors. For example, the Norwegian PTO, TeleNor, has entered a long term leasing arrangement for all the unused capacity of the Norwegian railway.

In addition, determining the costs, and therefore the reasonableness of prices charged for access to basic network services, will become more complex and require regulators to gather more detailed information from operators to assess the claims of different groups. In the absence of government policy on the treatment of local rights of way in a competitive telecom environment, telecom regulators ultimately may be forced to establish a common set of rules of the road to ensure this valuable public resource is used in the best interest of the consuming public and not used to frustrate implementation of telecom reform objectives.