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NEW MOBILE SOLUTIONS IN THE UTILITY SECTORS

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New mobile solutions in the utility sectors

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1. EXECUTIVE SUMMARY

Study Committee D2 has, over a period of six years completed three reports relating to Mobile Communications. Throughout this time utility companies in different countries have continued to examine solutions which reflect their particular business drivers and needs but it is uncertain as to what decisions have been made in this critical area of business. The aim of this study is to consider and report on the issues involved in implementing new mobile services and systems.

The process involved the collection of data on existing and planned developments in the implementation of mobile solutions by means of a questionnaire. In some regions, notably South & Central America and in Japan companies were able to provide considerable detail in all areas within the questionnaire however, in other regions companies registered concerns about the level of detail in the questionnaire, the issue of confidentiality in the use of the information and the time needed to complete the document. Subsequently many companies were unable to respond in any meaningful way.

1.1 Commentary on the Results

The traditional approach, prior to the roll-out of digital mobile phone networks was for all utility companies to use private mobile radio solutions. The last fifteen years has seen the introduction of competing public mobile phone services in all countries and with companies under pressure to reduce costs, the downward trend in prices for public networks has seen many utilities move the majority of their traffic onto public networks even though they recognise the risk to the service during power outages. The risk has been mitigated broadly in two ways. Firstly, by retaining the existing private mobile solutions as a fallback solution but these are ageing assets which are difficult and expensive to support and maintain and users may no longer have the basic skills to operate them effectively. Secondly, by purchasing or contracting for a small number of satellite phones for emergency conditions.

In Central, South & North America and in Japan there is a continued reliance on private mobile solutions particularly by distribution network operators. Companies use a substantial number of mobile phones but support for operational networks relies on PMR type networks. Geographical coverage by mobile phone networks is very low in some cases however, even where mobile phone coverage is adequate, private networks are retained, supported and used for day to day communications.

The situation in Europe seems to be more complicated. Across Europe, transmission system operators (TSOs) are generally national networks with relatively few operational locations within the country. Typically in more densely populated countries such as the UK, they might have up to 350 locations, in less populated countries closer to 50 locations. These operational locations are likely to have a fixed telephony network which is secure and resilient to power outages. As a result operational mobile communications are used to support a relatively small number of mobile teams and therefore the majority of TSO’s have found public mobile networks meet their operational requirements on a daily basis.

However, TSOs are increasingly being recognised as critical to the support and maintenance of the critical national infrastructure and as such, are being expected to conform to government department guidelines regarding communications networks which are resilient to power outages and which can survive external threats. This is leading some TSOs to consider:

- private secure mobile solutions which can provide a minimal level of communications in power outage conditions
- to share a service with Emergency Services which provides secure, resilient networks
- to rely on a small number of handsets from an alternative network operator such as a satellite network.

Whilst some TSOs are being granted access to Emergency Services networks and are encouraged to participate with the operators of such networks, the take-up is not guaranteed as there may be issues relating to cost, network access and other liabilities which make the service seem unattractive.

Conversely distribution system operators (DSOs) generally have a greater number of operational personnel in the field for day to day control of energy networks and in emergency situations are often faced with the mobilisation of a huge field force to support restoration of supplies. These companies, whether large regional organisations or small municipalities do need effective mobile communications for day to day control of staff and to support emergency repairs.

Those European companies that responded tended to have ageing private mobile networks which are difficult and/or expensive to maintain

Under pressure from governments and regulators to ensure minimal supply interruptions and the fastest possible restoration times, many companies are seeking to reconsider the use of non public networks to support emergency conditions. Some are being allowed and encouraged to take service from Emergency Service networks but visibility of the costs and issues regarding network access, coverage in remote areas and other liabilities continue to cause concern and to date no utility company has implemented large scale sharing with Emergency Services.

Another alternative is for those that have existing, albeit ageing private networks to redesign and refurbish these assets to create low capacity private networks which remain resilient to power outages. Such networks are likely to be single or two channel solutions operating in an all informed wide area configuration. These will provide backup communications in the event of a major failure of the mobile phone networks.

1.2 Conclusions

There are a number of conclusions which can be drawn from this study.

What is indisputable is the fact that for the majority of utility companies there has been a fundamental change in their approach to the provision of mobile services in that they almost all rely on public mobile phone networks for day to day communications.

Many companies are continuing to support but only in a few cases use, an ageing private mobile network. Evidence suggests the vast majority of networks are already more than seven years old and it is indicated many are in excess of 20 years old.

For transmission companies that are now separate businesses segregated from the requirements of electricity distribution, mobile phone networks are all that is required. In a small number of cases satellite phones form a back up communications service.

There are regional differences in approach to mobile communications for distribution businesses. In reacting to a range of new business drivers and efficiency initiatives many companies are taking advantage of the competitive mobile phone services and using them as a primary service for mobile communications. They have transferred their day to day operations onto mobile phone networks because:

- Competition has driven lower prices
- The convenience of use
- Reluctance to make capital investment
- Lower maintenance and support costs

Some companies have completely decommissioned their private mobile networks. Only a very small number are relying solely on PMR solutions.

The answers to the questionnaire create an impression that the utility sector worldwide is unsure as to how to approach the future delivery of mobile services to support their businesses and as a result will continue to use mobile phones. Mobile phone networks provide an almost ideal solution if only the three major issues could be resolved. Network coverage has been addressed in many areas but those associated with the provision of telecoms services in the utility sector also understand that the issues of guaranteed access and power failure are very difficult to resolve because they are influenced by government policy and cost considerations respectively.

2. INTRODUCTION

Study Committee D2 has, over a period of six years completed three reports relating to Mobile Communications, the last one identifying the key strategies used by utility companies around the world in considering the procurement and implementation of new mobile solutions. Throughout this time utility companies in different countries have continued to examine solutions which reflect their particular business drivers and needs.

The aim of this study is to consider and report on the issues involved in implementing new mobile services and systems which identify with the three major strategies described in the report of SCD2 TF .09. This will be carried out by research within the utility sectors to identify the current status of investment in new mobile projects which have been implemented in the last two years.

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3. SCOPE & OBJECTIVES

The objective for the study is to:

- Identify real mobile projects within each strategic category
- Understand the rationale for the chosen solution taking into account the major influencing factors such as the regulatory regime, company investment strategy and availability of spectrum
- Relate the business requirements to the chosen solution
- Understand any specific design, procurement issues and risks associated with the new systems and understand how they were mitigated
- Understand any problems associated with network implementation and how they were resolved
- Consider the overall benefits to the utility company
- Develop a view on the potential for the new systems to meet future demands and changes in technology
- Consider changes in working practices and process driven by the new solution

4. METHODOLOGY

Study group decided the most appropriate approach was to gather data on a range of mobile related issues from the widest possible number of sources through the circulation of a questionnaire. Recipients of the questionnaire were asked to distribute the questionnaire within their country or region and to illicit as many responses as possible.

The questionnaires asked for considerable detail relating to:

- Primary Company function
  - Transmission, distribution, production etc
- Size of company in employee numbers
- Competitive mobile phone networks offering services
- Potential to use Emergency Services networks
- Existing use of private mobile solutions
- Summary of existing voice & data services
- Future requirements
- Future plans for mobile services
- Attitude to investment in mobile services
- Interest in providing external telecoms services

In some regions, notably South & Central America and in Japan companies were able to provide considerable detail in all areas within the questionnaire. Within other regions companies registered concerns about the level of detail in the questionnaire, the issue of confidentiality in the use of the information and the time needed to complete the document. Further concerns centred on the impact of any of the information being used by regulatory authorities. These issues meant, in reality, that many companies were unable to respond in any meaningful way to the questionnaire.

In an attempt to gather more responses, the Chairman of SCD2 gave assurances on confidentiality and a short form questionnaire was created and issued. This was used with some success but yielded only very basic facts relating to some mobile services. Lastly a number of personal interviews helped to provide additional information.

5. INDUSTRY CONTEXT

Utility companies of all sizes use a range of fixed and mobile telecommunications services. The traditional approach has been for a company to design, procure and construct a telecoms infrastructure which serves it's specific requirements for secure, reliable services for control and operation of the energy networks and for corporate applications and management information. This is certainly true of large city based, regional or national companies but is not necessarily true of small municipalities where the population is very sparse or for those companies that serve small towns or communities.

In some countries, a competitive telecommunications market capable of offering alternative solutions to the privately provided network has allowed some TSOs and DSOs to choose a managed service model for corporate telecoms functions and in a few cases also for operational telecoms services.

The area where the competitive telecoms market has had the greatest impact is in the provision of mobile services with most countries and regions of the world having a choice of several mobile network operators offering many different tariffs and service offerings.

5.1 Public Mobile Communications

Virtually all countries currently have a number of competing mobile network operators offering a diverse range of services and tariffs to business users. The mobile network companies specifically target utility companies as they are seen to be capable of providing a consistent revenue stream and respond positively to the potential savings within longer term contracts.

There is no doubt the convenience and portability of mobile phones, allowing personal communications even within difficult environments is a major consideration for day to day communications. Downward pressure on prices has been a further encouragement for long term contracts to be put in place with most companies.

Public mobile networks can also offer integrated mobile data services to support workforce management applications. Such services benefit from economies of scale of the mass market for terminals and applications.

The three issues which have always been of concern to utility companies when relying on public mobile networks are:

- priority access to the network
- coverage in remote areas
- resilience of the network to power outages**.**

These problems were evident when digital public mobile networks were first constructed and whilst the coverage issue can be solved the other issues remain. Those companies that rely solely on public networks for mobile communications must accept that they may have limited communications access to their field

workforce under extreme weather conditions or periods when mobile networks are overloaded or offer limited availability.

5.2 Strategies for Provision of Mobile Services

Strategies for the Procurement and Implementation of New Mobile Solutions fall into three broad categories.

5.2.1 The PMR/PAMR-Strategy

Using this approach, there are three potential options to consider:

- Build a Utility Owned PMR - Building a dedicated private mobile radio service ('PMR'). The only possible solution in former times and still may be a valid, but capital intensive approach.
- Build a PMR/PAMR with Partners - to mitigate costs, finding partners for a private mobile radio system or a public access mobile radio system ('PAMR') - e.g. TETRA based - may be a solution. Teaming up with non-Governmental emergency organisations or emergency services would seem to be most appropriate.
- Use a 'Managed Service' - in areas, where 'Managed Services' exist- e.g. Networks services being offered in Holland. Use of such services may provide a more cost effective solution for a utility than building a PMR or PAMR solution.

5.2.2 The 'Public Service' Strategy

Without any doubt the most economical solution is to use one of the public services - e.g. GSM mobile phone network. The main issues with such a solution are the utilities requirements for coverage, resilience and access. A public operator - utility partnership may address these issues but there is no evidence that any such partnerships have been successful.
One special solution for a utility may be to gain 'Mobile virtual network operator (MVNO)' status and to be able to use the base station subsystem of the public operator although there are special technical issues to resolved with this solution

5.2.3 The 'Mixed Service' Strategy

Using a 'Public Service' for general traffic and either a PMR/PAMR Service for critical applications or a separate service during emergency conditions (e.g. satellite based services or simple direct mode radios). This may be a strategy to overcome the disadvantages of public services at a minimum of additional cost. There is evidence that utility companies in areas which have been subject to a strong regulatory regime are carefully examining this solution.

5.3 Key Factors Which Influence Strategy

There are a number of key factors which influence any chosen strategy.

Lack of Alternatives to Self Provided Systems - Where alternatives are not available in the form of PAMR or GSM services the Utility may be forced to develop its own

mobile solution to meet their needs. This has been the case for many utilities in the past but the introduction of competing mobile phone networks is providing alternative solutions.

Regulatory Environment - Regulatory requirements in terms of public and staff safety and cost considerations are important factors. Mobile communications have always been essential to maintain safe working practices and public safety but the choice will be influenced by service and cost constraints imposed by industry regulators and governments. Regulators in industries where natural monopolies are deemed to exist are placing greater pressure on Utilities to eliminate perceived inefficiencies and to drive out unnecessary cost. They are demanding that utilities provide high levels of service to their customers by meeting strict targets for emergency response, service provision, network availability and the provision of customer information. Utilities that do not operate in a safe manner are likely to be subject to litigation and compensation claims from government, staff and the public.

Asset Ownership/Investment Policy - A Utility's attitude to asset ownership and its investment policy will influence its Mobile Communications strategy. An inclination towards asset ownership will drive the utility towards an owned infrastructure. An outsourced solution creates several options such as shared ownership, service provision in the form of a PAMR service provider or, at the other extreme, full service management for those utilities with a negative attitude to telecoms asset ownership. Such decisions on asset ownership require a medium term perspective but where industries are subject to significant merger & acquisition activity there is little incentive to favour telecoms asset ownership.

Government Policy - In some countries governments will mandate the provision of emergency communications networks. These networks are often confined to the so-called 'Blue Light Services'. Some countries include the utilities in this category, although the ITU-world radio regulations don't categorise utilities among this class of service. Access to such a network for emergency purposes may reduce the Utility's need to invest in a Mobile Communications network.

Attitude to Risk - The Utility's attitude to risk will have a significant bearing on its Mobile Communications Strategy. A risk averse organisation may want to have a network that will survive during major storm conditions as a communications network of last resort in the absence of public operators' services that may have limited availability. All utility companies would categorise themselves as being low risk organisations but a combination of business drivers are steering the majority towards mobile phone networks.

New Applications – The development within the industry of new applications can have a strategic impact on procurement of communications systems and services and therefore on mobile solutions. One such example is the huge interest that is being created in the provision of two-way communications to serve the requirements of Smartmetering for electricity and in some countries gas meters. The scale of such undertakings are enormous and it is envisaged radio based solutions will have a large part to play in overall communication schemes.

6 ANALYSIS OF RESPONSES

The vast majority of responses came from three regions, Europe (15), South, Central & North America (11) and Japan (8). The remainder came from a small number of companies in Canada and Africa.

Using the shortform questionnaire as the basis for the information provided, the task force full time members developed a spreadsheet which was populated with summary data extracted from the responses.

6.1 Primary Business Activity

Responses were received from a total of 37 companies with a wide range of primary responsibilities from across the electricity supply chain. The table below has grouped the number of respondees according to the core activities supported by each company.

Core Activities								
Generation	**x**		**x**		**x**		**x**	
Transmission		**x**	**x**			**x**	**x**	
Distribution		**x**	**x**	**x**	**x**			
Not Specified								**x**
Number of Companies with one or more core activities	**2**	**2**	**7**	**6**	**6**	**8**	**3**	**3**

This wide divergence of interests and in many cases the fact that mobile services are shared across all of the different businesses makes direct comparison of mobile services used in any one element e.g., distribution businesses very difficult.

No attempt has been made in this analysis to make such comparisons. Rather the work of this study group should be seen as providing an overall assessment of the level of activity within some geographic regions in developing mobile solutions.

6.2 Mobile Communications Environment

6.2.1 Private Mobile Services

Of the companies that responded, 80% had an existing private mobile solution. There was a range of technologies using all areas of spectrum from Low Band (60MHz) up to UHF (450Mhz). The key points to note are:

- The age of such systems varied from 6 to 40 years, the vast majority being between 5 and 25 years old
- Wide area, multi channel trunking solutions were favoured, including analogue MPT1327, TETRA, APCO 16/25.

Approximately 30% of companies were still using wide area low channel capacity solutions.

- Only one company had implemented a new solution in the last two years
- All companies had designed resilient networks with battery backup of a minimum 6 hours, the vast majority provided 8 - 24 hours. 30% of companies could support their private network for more than 24hrs
- Design coverage varied considerably, two companies used private networks for just 30% of their area, the remainder indicated coverage at 80% of territory, a few companies indicated 100% territorial coverage.

6.2.2 Public Service Operators

Mobile telephony using 2nd and/or 3rd generations technologies is commonly used in most countries all over the world. Of all companies that responded five indicated they do not use any mobile phones within their organisation. Other public service network operators offer alternative public service technologies but these were in a minority when compared with 2nd and 3rd generation solutions and targeted specific market sectors with specialist requirements.

6.2.2.1 Number of competitors

In all countries there exist two or more competing network operators. Some companies indicate more than 10 operators. In most countries there are between two and four networks providing 2nd and 3rd generation services. In some cases the same operator offers 2nd and 3rd generation networks as a homogonous solution. A dual mode mobile with both 2nd and 3rd generation functionalities is able to choose the best available network for given applications.

6.2.2.2 Technology

Given responses were received from many parts of the world, it was expected that a wide range of technologies were being used for public services. By far, the majority were 2nd and 3rd generation networks but public services were also being offered in MPT1327, NMT450 and TETRA technologies for voice services and in two of the countries WIMAX was also available.

2nd generation mostly is of type TDMA (Time Division Multiplexing) and 3rd generation is of type CDMA (Code Division Multiplexing).

The technology used for 1st generation mobile systems is analogue, and most of these systems are phased out and replaced with 2nd and 3rd generations' systems.

2nd generation systems are still prevalent and most operators continue expanding the system. 2nd generation's systems are GSM, PDS, IS95, and D-AMP. These systems are good for speech but have limitations in terms of capacity for packet data. GSM packet data technology is called GPRS and EDGE. 2nd generation systems operate on 800-900 MHz band and 1800-1900 MHz band.

In Europe, Africa, Asia (excluding Korea and Japan) and some areas in America, GSM is the most dominant technology. Whereas PDC is used in Japan and IS95 and D-AMPS in the Americas.

3rd generation systems has not replaced 2nd generation yet, but have the possibility to take care of the increasing traffic volumes and the demand of high capacity packet data communications. 3rd generation standards are WCDMA (UMTS), CDMA-2000 and TD-SCDMA (China).
In most cases WCDMA is used by old GSM and PDC operators and CDMA-2000 by old D-AMPs and IS 95 operators, but there are exceptions. Some new operators only have 3rd generation network. 3rd generation systems mainly use frequencies which are higher than 1900-2200 MHz, but lower frequencies like 800-900 MHz and 400-500 MHz are also allocated.

Satellite telephony is not so commonly used. The cost of the usage is quite high but the outdoor coverage is 100%. Sometimes satellite telephony is however the only alternative. Only one company indicated operational use, but it is recognised more companies use these services in situations where there are longer power failures or no coverage with other systems.

Few companies indicate the usage of WiFi or WiMax. These systems are mainly used for small areas. They do not have the possibility of a handover function and are not yet real mobile technology.

6.2.2.3 Level of coverage

At least 80% of companies suggested mobile phone network coverage was 80% of their territory with the vast majority indicating coverage was greater than 90%. The 2nd generation systems has better coverage than 3rd generation. In countries with nationwide operators the coverage is 70-100 % for 2nd generation and 25-70 % for 3rd generation.

For the small number of companies with access to WiFi and WiMax systems, coverage was limited to 20-25 % of the companies' planning area.

6.3 Blue Light Network

In some countries specifically within Europe unified mobile solutions are being implemented to provide nationwide systems for the 'Blue Light Services'. The users of these services are generally Police, Fire Rescue and Ambulance. Networks are being funded for each of these individual services or, where they are

open to coordination and sharing of networks, for all three services on a common network.

These networks tend to provide a high percentage coverage of the landmass but it should be noted that the primary focus coverage tends to be the road network. They are also designed as resilient networks in that they are provided with battery backup and dual routed backhaul solutions.

Companies from seven countries, six in Europe and one in Africa reported that Blue Light services were being considered and/or implemented nationally. In five of these countries the electricity industry was allowed access to share the networks. In all the remaining countries, there was no awareness of an intention to create a national Blue Light network.

In all cases bar one, the technology for such networks was TETRA. In one country, the adopted technology was Tetrapol. TETRA is seen to be the de facto solution for Blue Light services in Europe and it is being widely adopted in many regions of the world.

It should be recognised that the sharing of Blue Light networks needs careful consideration for utility companies. In principle, the three primary issues for utilities, coverage, access and resilience still need to be thought through. Network coverage and resilience should be inherent in the Blue Light design but the issue of access and the order to priority to the network can be more problematical.

The utility sector can be seen as a lower priority service and arriving at satisfactory agreements for access to the service can be problematical. The utilities and many other similar organisations are being encouraged to support Blue Light services. In those Blue Light networks that are currently operational, many other government services have agreed to share the service but there has been no large scale support from any of the utility companies.

6.3.1 Overview of Blue Light Network – United Kingdom Case Study

In the United Kingdom, a national Emergency Service network was designed and built as a shared service for all of the police services. The network was conceived in the early 1990s and was finally commissioned in 2005. The national TETRA network which has some 3500 base stations, a highly resilient switch architecture and supports voice and data traffic for in excess of 120,000 terminals. The network provides very high levels of security through the use of sophisticated encryption solutions.

In recent years, this network has been expanded to provide communications services for all of the UK's Fire Services and each of the Ambulance authorities. This expansion has required additional base stations for specialised coverage and an increase in the service functionality because of the business requirements demanded by the new sharers.

The network can also be made available to other government organisations which need to work closely with the Emergency Services. A formal procedure is in place

for organisations to submit an application for access rights and once access is agreed, the service is provided to these additional organisations on a commercial basis.

Utility companies in the electricity, gas and water sectors applied for and were granted sharers access rights to the network around 2001/2002. A separate case was developed and submitted by each sector and in due course relevant access levels were granted.

Whilst this would seem to offer an ideal mobile solution for the utility sectors, non of the UK's electricity, gas or water companies have signed a contract for large scale deployment of TETRA service terminals. The authors of this report do not have direct access to the conditions under which these contracts might operate but the following issues seem to be problematical:

- Utility company users will not be given priority network access over Emergency Service users of the system
- Commercial terms are complex and costly
- Each utility company could be liable for breaches to the high levels of security employed in the system if terminals were lost

To date many of the utility companies have successfully used a small number of trial terminals and discussions are ongoing to resolve issues relevant to each sector.

6.4 Applications Currently Supported Over Mobile Networks

With responses being received from many diverse regions, it is realistic to assume there would be different priorities as to what functionality is demanded of mobile networks, but in all cases there is an overriding requirement for voice communications between field teams and from field staff to central control points.

Whilst there is some emphasis on the specialised functions offered by the private mobile solutions, group calls, closed user groups, priority access levels and emergency call knockdown the vast majority of respondees required one to one personal calling.

Data services have been implemented by 75% of the companies who responded and of these:

- 90% used mobile networks for electricity network control & monitoring.

- 30% had mobile workforce management solutions

- 25% used mobile solutions for metering, it is not clear from the responses but it is assumed these relate to bulk supply metering and not household consumer metering

6.5 Future Plans for Mobile Networks

When considering plans for renewal of mobile solutions, just less than 50% of companies favoured the PMR/PAMR strategy outlined in section 4.2.1 of this document, the development of private networks. It is clear some of the companies have not formulated investment policy in this area suggesting that the plans are in early stages of development and have yet to be subject to a business case or detailed cost analysis. Companies are considering a range of technologies including TETRA, MPT1327, APCO 25 and Smartzone.

Of the remaining companies, 30% stated categorically that they prefer to outsource or use managed service contracts for their mobile communications needs, these companies rely upon public mobile phone networks using largely GSM technology. Within this group:

- five companies indicated satellite services formed part of their strategy to overcome the resilience issues associated with mobile phone networks
- seven companies, all within Europe had the possibility to take a managed service from “Blue Light” networks although only one company had committed to this solution and there were very specific reasons why this had been chosen
- A small number of companies in northern Europe are also considering the option of a planned public mobile network using CDMA technology at 450MHz. This appears to be a unique solution that could offer an advanced network technology solution at relatively low cost due the better coverage that can be achieved at UHF frequencies. This network is not being developed within any other region.

6.6 External Telecoms Service Provider

Three of the companies confirmed an interest in offering external telecoms services. Of these, one was focused on leveraging telecoms assets which can be seen to be suggest a low risk attitude to external service provision but the other two companies indicated an interest in providing a wider service portfolio.

The remainder emphasised their intention to focus on core business and not to enter the competitive telecoms market.

7 COMMENTARY & CONCLUSIONS

7.1 General Commentary

The traditional approach, prior to the roll-out of digital mobile phone networks was for all utility companies to use private mobile radio solutions. The last fifteen years has seen the introduction of competing public mobile phone services in all countries and with companies under pressure to reduce costs, the downward trend in prices for public networks has seen many utilities move the majority of their traffic onto public networks even though they recognise the risk to the service during power outages. The risk has been mitigated broadly in two ways. Firstly, by retaining the existing private mobile solutions as a fallback solution but these are ageing assets which are difficult and expensive to support and maintain and users may no longer have the basic skills to operate them effectively. Secondly, by purchasing or contracting for a small number of satellite phones for emergency conditions.

In Central, South & North America and in Japan there is a continued reliance on private mobile solutions particularly by distribution network operators. Companies use a substantial number of mobile phones but support for operational networks relies on PMR type networks. Geographical coverage by mobile phone networks is very low in some cases however, even where mobile phone coverage is adequate, private networks are retained, supported and used for day to day communications.

There is recognition that:

- the existing private mobile networks are ageing and in many cases in need of replacement and that the way forward in the medium term will rely on the creation of new private mobile networks
- companies will have make a capital investment to procure these networks
- it is important to maximise the benefits by enhancing the utilisation of any new investment by extending the reach of electricity network control and data functionality

That said, of all the respondees only one company has within the last six years completed an investment in a new private mobile network.

It is apparent that many companies are considering their future strategy for mobile networks. In Central, South & North America the focus is on PMR solutions whilst in Japan no clear strategy is emerging, many organisations seem to be content to support their existing systems even though many are in excess of 10 years old.

The situation in Europe seems to be more complicated. Across Europe, transmission system operators (TSOs) are generally national networks with relatively few operational locations within the country. Typically in more densely populated countries such as the UK, they might have up to 350 locations, in less populated countries closer to 50 locations. These operational locations are likely to have a fixed telephony network which is secure and resilient to power outages. As a result operational mobile communications are used to support a relatively small number of mobile teams and therefore the majority of TSO’s have found public mobile networks meet their operational requirements on a daily basis.

However, TSOs are increasingly being recognised as critical to the support and maintenance of the critical national infrastructure and as such, are being expected to conform to government department guidelines regarding communications networks which are resilient to power outages and which can survive external threats. This is leading some TSOs to consider:

- private secure mobile solutions which can provide a minimal level of communications in power outage conditions
- to share a service with Emergency Services which provides secure, resilient networks
- to rely on a small number of handsets from an alternative network operator such as a satellite network.

Whilst some TSOs are being granted access to Emergency Services networks and are encouraged to participate with the operators of such networks, the take-up is not guaranteed as there may be issues relating to cost, network access and other liabilities which make the service seem unattractive.

Conversely distribution system operators (DSOs) generally have a greater number of operational personnel in the field for day to day control of energy networks and in emergency situations are often faced with the mobilisation of a huge field force to support restoration of supplies. These companies, whether large regional organisations or small municipalities do need effective mobile communications for day to day control of staff and to support emergency repairs.

Those European companies that responded tended to have ageing private mobile networks which are difficult and/or expensive to maintain

Many companies in Europe whether operating on a regional or national basis have tested the business case for a new private mobile solution such as TETRA but the high investment and support costs have proved to be unacceptable for most of them. A small number of TETRA solutions have been successfully implemented. The networks tend to be smaller and limited to a low number of sites. A number of companies in Eastern Europe are progressing with the business case for large networks by including SCADA/telemetry and potentially meter reading as well as other applications which can be supported on private trunked digital networks.

Under pressure from governments and regulators to ensure minimal supply interruptions and the fastest possible restoration times, many companies are seeking to reconsider the use of non public networks to support emergency conditions. Some are being allowed and encouraged to take service from Emergency Service networks but visibility of the costs and issues regarding network access, coverage in remote areas and other liabilities continue to concern utility companies.

Another alternative is for those that have existing, albeit ageing private networks to redesign and refurbish these assets to create low capacity private networks which remain resilient to power outages. Such networks are likely to be single or two channel solutions operating in an all informed wide area configuration. These will provide backup communications in the event of a major failure of the mobile phone networks.

7.2 Conclusions

There are a number of conclusions which can be drawn from this study.

What is indisputable is the fact that for the majority of utility companies there has been a fundamental change in their approach to the provision of mobile services in that they almost all rely on public mobile phone networks for day to day communications.

Many companies are continuing to support but only in a few cases use, an ageing private mobile network. Evidence suggests the vast majority of networks are already more than seven years old and it is indicated many are in excess of 20 years old.

For transmission companies that are now separate businesses segregated from the requirements of electricity distribution, mobile phone networks are all that is required. In a small number of cases satellite phones form a back up communications service.

There are regional differences in approach to mobile communications for distribution businesses. In reacting to a range of new business drivers and efficiency initiatives many companies are taking advantage of the competitive mobile phone services and using them as a primary service for mobile communications. They have transferred their day to day operations onto mobile phone networks because:

- Competition has driven lower prices
- The convenience of use
- Reluctance to make capital investment
- Lower maintenance and support costs

Some companies have completely decommissioned their private mobile networks. Only a very small number are relying solely on PMR solutions.

In countries where there is a mature regulatory environment is a growing awareness that the availability of mobile communications during emergency conditions is paramount. In some geographical areas companies are currently considering new low cost solutions for mobile services to operate in parallel with mobile phone networks. This could result in the development of minimal cost wide area services or the use of a shared service solution e.g., an Emergency Services network.

The answers to the questionnaire create an impression that the utility sector worldwide is unsure as to how to approach the future delivery of mobile services to support their businesses and as a result will continue to use mobile phones. Mobile phone networks provide an almost ideal solution if only the three major issues could be resolved. Network coverage has been addressed in many areas but those associated with the provision of telecoms services in the utility sector also understand that the issues of guaranteed access and power failure are very difficult to resolve because they are influenced by government policy and cost considerations respectively.

References:

"The Use of GSM2+ in the Utility Sectors" TF35.05, TB173 Published December 2000

"The Benefits of Mobile Data – How Can They be Realised" TF35.07, TB217 Published December 2002

"Strategies for utility companies seeking to move to improved mobility"TFD2.09, TB267 Published February 2005

List of Abbreviations:

APCO –Association Public safety Communications Officials
CDMA - CODE Division Multiple Access
D-AMP – Digital Amplification
DSO – Distribution Services Operators
EDGE - Enhanced Data rates for Global/GSM Evolution
GSM –Global system for Mobile Communications
GPRS – General Packer Radio Service
MVNO – Mobile Virtual Network Operator
MPT1327 – A signalling Standard for Trunked Private Land Mobile system
NMT450 – Nordic Mobile Telephone
ITU – International Telecommunication Union
IS95 - Interim Standard 95
PDS – Packet Data System
PDC – Personal Digital Cellular
PMR – Private Mobile Radio
PAMR – Private Access Mobile Radio
SCADA – Supervisory Control And Data
SCD2 TF – Study Committee D2
TD-SCDMA – Time Division-Synchronous Code Division Multiple Access
TDMA – Time division Multiple Access
TETRA – TErrestrial Trunked Radio
TSO - Transmission Services Organisation
UMTS – Universal Mobile Telecommunications system
WCDMA – Wideband Code Division Multiple Access
WiMAX – Worldwide Interoperability for Microwave Access
WiFi –A trade name for wireless technology