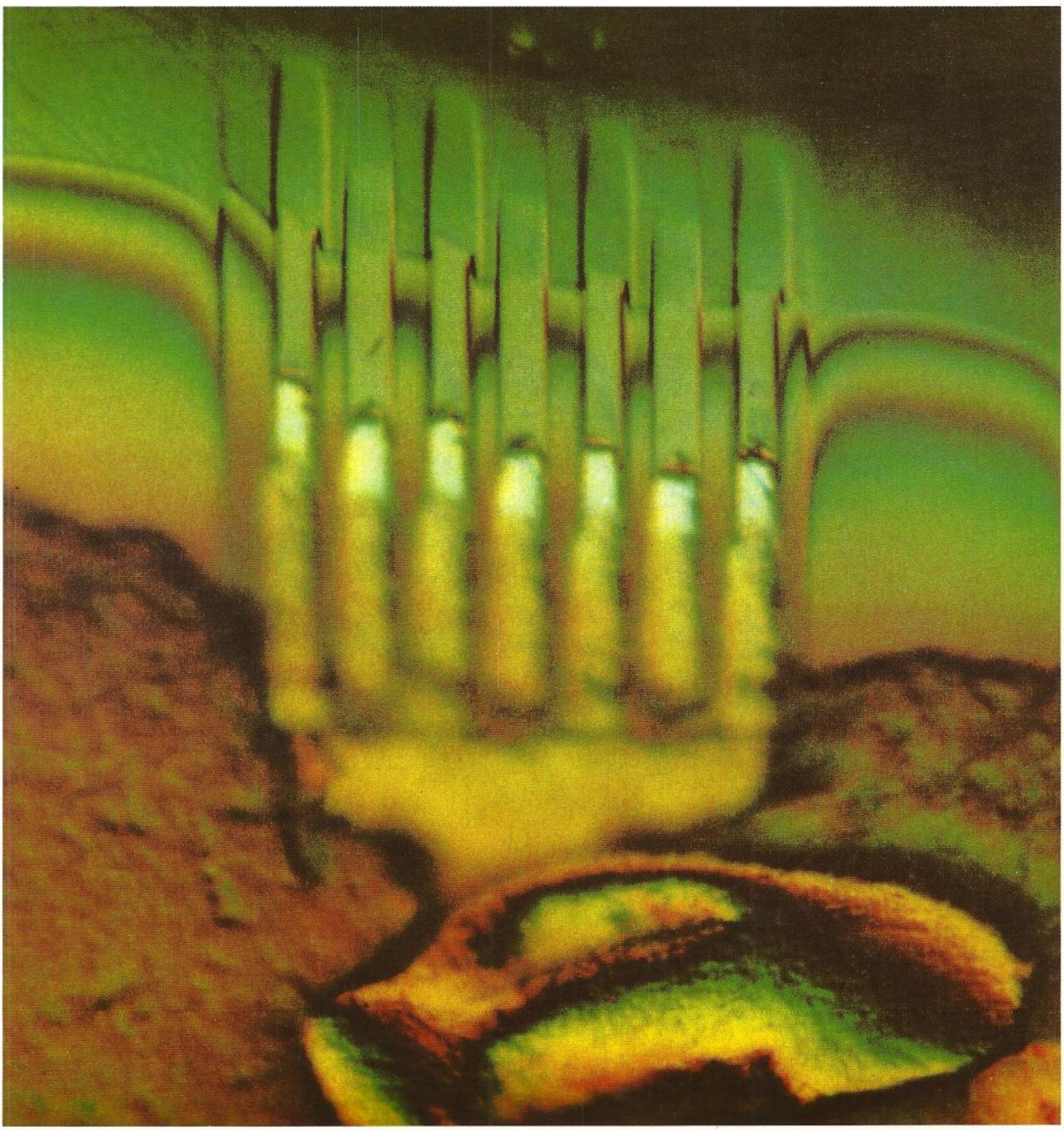
ENGINEERING DEPARTMENT
VICTORIA

10-12 AUGUST 1983

STATE PLAN IMPLICATIONS CONFERENCE

S·P·I·C·E



A HIGH RELIABILITY SILICON N-P-N TRANSISTOR SECTIONED TO REVEAL ITS INTERNAL STRUCTURE

FOREWORD

We held this Conference because of the need to effectively manage the changes as they affect engineering and the acceleration in digital technology upon which many of the new network facilities and products are based.

Over 3 days a cross section of engineering management were exposed to presentations outlining the political, commercial and technological environment in which we expect to be working for the next few years. We are indebted to those who prepared and presented the papers.

It was concluded that not only is Telecom entering an era of unprecedented change, but considerable application will be necessary in the development of the related knowledge and the creation of proper understandings.

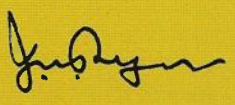
Although the work is technically advanced and indeed in some areas standards are yet to be defined, we need to master this new technology - the process of self-enlightenment will need to be accorded adequate priority. And then because a large number of people will ultimately become involved, the sooner we start to carry forward the message and develop an understanding of our objectives and strategies to those who will need to implement them the better.

The State Plan sets out the basic framework and during the meeting explanation of the policies behind the plan and the new facilities and advanced technology ahead created a broader perspective. However, there is some risk that the new networks will become quite extensive before we are in a position to exploit their potential or manage them properly. We shall need good working relationships between all the parties in the various Departments in the State and at Headquarters to deal with this.

High confidence was generated by the people at the Conference in the ability of the Engineering Department to meet this challenge. This was evident from the positive attitudes and the constructive manner in which the issues were considered.

This report is a summary of papers presented, conclusions arrived at and recommendations made.

Now that the issues have been identified it remains to initiate the steps for the effective management of the changes involved. This we shall do.



J.M. Ryan,
CHIEF STATE ENGINEER

OPENING ADDRESS

P.R. Brett: State Manager Telecom Victoria

Telecommunications in Australia is a growth industry and meeting the expectations of the public is an increasingly challenging task. Business is preferring to use capital to save labour, and efficient, cost effective communications are essential to modern business. The cost structure of the telecommunications industry has also changed because of the ability of electronics to provide a large increase in processing and analytical capacity with ever-decreasing real cost.

Potential competitors have recognised that there is a solidly based consumer demand and that technological developments are bringing about a substantial reduction in real costs. They would like to enter the market in the more profitable areas of telecommunications activities. It is our objective to remain in business, to hold our market share, to be alert and responsible to customers needs. Recent market research has suggested that after sales service is an aspect on which our customers are placing increased importance, and the building of a good reputation based on guaranteed reliability seems to be a very sound basis for a marketing stance. When a large business places the safe carriage of its information in our hands, it is a very great responsibility for us and high reliability is essential. It is not good enough for us to be providing in 1984 the sort of service which would have been adequate in 1974 or even in 1980. We must keep pushing up the standard and quality of our service to be in accord with the highest expectations of our customers.

Customer networks are growing and becoming very sophisticated, and there is evidence that we have problems with them at their interface with our public network. What we are seeing is the development of a very complex system which, in order to meet the ebb and flow of market demands, is in a continuous state of change – change in its total concept; change in its various elements and change in the relationship between those elements. It is an Engineering responsibility to find ways of managing these changes so that we continue to provide national communications with an integrated system which is effective and efficient and anticipates the demands of a public even before the public have worked out what it is they want. The rate of change is increasing and we need to set our minds to finding ways of keeping ahead.

The idea of change is not always easy to accept. It means sometimes leaving well known and comfortable surroundings and foregoing the surety of getting good results that comes with operating in familiar territory. It means moving to and adapting to a new environment, acquiring new skills, certainly setting up new contacts and understandings. It involves taking some risks and even occasionally making mistakes. It requires courage, but this is not the first time we have faced up to change and our knowledge and experience and attitudes have not let us down in the past.

What is going to happen in the future? The concept of the integrated services digital network (ISDN) which will be discussed in the Conference calls for much higher speeds of information transfer to be handled in the distribution network – 64 KB, 80 KB, 144 KB, 2MB, sometimes using the existing plant, sometimes by new plant yet to be defined, designed, planned, introduced. Practices will need to be developed in terms of construction and in terms of maintenance. It will require a great deal of engineering. This revolution is not merely conceptual, it is very practical. A large workforce steeped in its own traditions will also need to appreciate and accept changing objectives and acquire the necessary changes in skills.

With regard to the public network in Victoria, we are well advanced in the commissioning of the first integrated digital network (IDN) in Australia. The third digital AXE exchange is about to cutover and the first digital tandem. It is one thing to define an IDN as a network which provides transparent digital paths between terminal exchanges. It is another thing to plan, design and install one. It is yet another again to manage it and the overall management of it, its operation and maintenance, is something which has yet to be brought into focus.

We have to develop a philosophy for managing and operating networks under full or partial digital modes and, of course, implementation will involve many groups in various Departments. At the very least what will be required is an adequate appreciation and education programme for staff who will be involved; the development of training techniques and organisation to ensure the effective management and control of the IDN under operational conditions and the integration of the various facets in the Departments involved.

There will also need to be some changes to improve resourcing flexibility to manage the shifting parts of the ECP, for example, we need to take account of changed emphasis in customer services demand – reduced growth in telephone services but increased requirements for data services, different demand emphasis between districts, movement from analogue to digital, both in switching and transmission, changing balance between numbers of technicians and linesmen, reallocation of motor vehicles to meet priorities, change in resource requirements associated with the policies regarding rental and selling of terminal equipment.

This Seminar is being convened so that the various issues emerging in the management of a vast change in commercial and technical policies can be identified, initially so far as the Engineering Department is concerned. The objective of the Seminar is to gain an appreciation of what the future holds insofar as it can be conceived at the moment, to identify the issues which seem to require immediate attention and to provide advice on how the organisation might approach the changes of the future. Speakers will present papers which will be informative and stimulating. Time has been allocated to syndicate work and the syndicate topics and the composition of the syndicates can be expected to provide for lively discussion and imaginative solutions to the issues which are identified.

Gentlemen, I have much pleasure in declaring this Seminar open, and I look forward to seeing the results of your work.

A NATIONAL PERSPECTIVE

E.R. Banks: Director Business Development Telecom Headquarters

Telecom and Our National Responsibility

Telecommunications is an increasingly important element in all aspects of modern life. It is therefore a matter of national importance that all Australians have access to telecommunications services of world standard in terms of quality, timeliness, reliability, accessibility and price.

We as the staff of Telecom, and who in fact are Telecom, therefore have a major national responsibility, to deliver these services and to husband and develop on behalf of our fellow Australians a major national asset namely the investment on telecommunications infrastructure currently standing at $9,000M.

With such a significant national asset in our trust, Telecom must expect to be subject to constant review. We must be able to stand up to exposure and questioning, and be able to handle such experiences.

As a result of the debate and enquiry of the last two years there is a community consensus acknowledged by both the major political parties that we need to be the National common carrier, the National Telecommunications Service enterprise, and that we have a social, as well as an economic responsibility in fulfilling this role. These correlations are important to our service, investment, and pricing decisions.

Telecom is a means to an end not an end in itself. Our right to the exclusive national service responsibility must be earned on the basis of our performance in delivering cost effective telecommunications services to the Nation. The moment we take the stand that we have a preordained right to exist because of who we are, we will be in trouble.

Objectives:

1. A fundamental objective for Australia is the provision of nationwide world-parity telecommunications services equal to those in leading industrial nations. These services are a vital infrastructure in the economy and must reflect social, business, government and national needs and priorities.

2. A second objective is the continued development by Telecom staff of an efficient, responsive, national telecommunications service and viable business enterprise.

3. A third objective is the provision of an opportunity for Australian industry to play a part in the design and development as well as the production of modern electronic equipment.

Strategies:

1. To win and strengthen customer loyalty.

Competition and the threat of competition is here to stay and we must be prepared to face it. We must win the loyalty of our customers and this will depend on how we treat them.

Customers expectation for service has increased and will continue to increase.

We need to earn a good reputation for service including timeliness, reliability, continuity and speed of restoration, economy and efficiency. We will continue to be judged in a vital way by the standard and responsiveness of our "grassroots" service.

2. To maintain a clear leadership position in the development and delivery of new and existing services. To retain a good share of the terminal market to protect our position in the distribution network and as common carrier.

There are a lot of people in the radio business – mobile radio operators and the radio telecommunications area who move a lot faster than people who operate in the traditional Telecommunications area. We must ensure that without being unwise we must be more venturesome in the nature of our initiatives. This approach applies particularly to new technologies and service opportunities such as cellular and mobile radio. We must continue to keep on winning in the market place.

Another example is the private line business where we should be looking at the most effective way of providing cost effective service no matter what the technology.

The real challenge will be in the application of the most service relevant transmission technology where the potential now exists for quite dramatic changes in approach to take place.

3. To develop the market relevant and cost effective network infrastructure prerequisite for the marketing of network services. The IDN and preparations for ISDN are important central initiatives.

The movement to digital transmission is a crucial one and a fundamental break-through. It will enable the utilisation of the transmission spectrum to be more effective. We must ensure that we maintain a leadership position in Australia in relation to developments in this areas, particularly in the junction and local networks. The advances in the use of the radio spectrum and lasers will also mean dramatic changes, in the way we deliver service.

Whilst the satellite will provide a new dimension to the infrastructure it does not detract from the central importance of the terrestrial network both now and in the future.

4. To maintain financial resilience by improving cost effectiveness and cash flows and to provide a margin for strategic adjustment of tariffs if necessary.

Despite the current economic climate we must be ready to cope with demand when it turns up. We must go on winning business and be in a position to meet demands when they are made.

Whilst the growth in standard areas of telecommunications services might be softer at this time, in data and special services it is still strong.

5. Efficient management of resources and improvement of productivity.

However economies of scale must not be achieved at the expense of making our network too vulnerable. Engineering have to make sure that resilience in networks guarantees that service continuity can be maintained.

It is also vital that we continue to develop our human resources not only maintaining the necessary level of professional and technical skill and application but also providing good, safe healthy and satisfying working environment for our staff.

Implications:

Meeting customer requirements for service is today more than ever before the base for the existence of our organisation. Our charter represents an entitlement which carries with it a clear obligation to perform and deliver, if we are to retain this entitlement. We have the kinds of skills, capacities and capabilities to match the ambitions of potential competitors. We must keep our eye on the ball and manage with the best judgement in the technological and commercial areas. We must recognise that with the increasing use of communications by business and industry, some of our biggest customers are capable, if we do not perform, of becoming competitors.

Technology is paramount to the continuing prosperity of Telecom and the insights and perceptions of the professionals, the technologists and the organisation are vital to ensuring that we proceed in the wisest possible way.

Your Engineering strength is required by the Commercial people who rely on you to deliver the infra-structure and advice on which in vital measure a successful customer interface reaction depends.

The Engineering Response Required

"To occupy the commanding heights of telecommunications technology."

OUTCOMES

Planning

Identification of the new networks and facilities naturally lead to a call to ensure that planning aspects are kept well to the fore.

- Telecom's changing environment increases the need for the network development to be more anticipatory rather than reactive.
- All plans must be attended by consideration of resourcing requirements - improvement is required in resourcing flexibility to manage the shifting emphasis within the ECP.
- Prepare plans and implementation strategies for the establishment of the IDN and the reworking of the existing networks.
- Determine criteria for establishing IDN in country areas. Consider possibility of "geographic" centres as distinct from established hierarchy.
- Consider special measures needed with respect to the survivability and security of the IDN in the introductory phases as this will be the most vulnerable stage.
- Initiate engineering investigations into services and facilities which the network and reticulation can support.
- Great emphasis should be placed on market research and forecasting to identify the potential areas so that provision of a long lead time network infrastructure can be timely - perhaps Engineering should assist in identifying facilities which could and should be sold to acquire a good market share early.
- Undertake study of the interconnectability of emerging non-voice services with the IDN as it develops towards an ISDN. Prepare appropriate Contingency Plan.
- Maintain close contact with HQ personnel as the corporate approach to the ISDN is developed.
- Undertake characterisation of the distribution network to ascertain its capacity to carry the 64 Kbit service or higher.
- Prepare plans and guidelines for the development and usage of subscribers reticulation including optical fibre cable reticulation.
- Prepare an Operations Plan to complement the State Development Plan.
- Determine replacement policy for obsolescent equipment including RAXs and later ARKs.

Network Management and Maintenance

- Establish standards and procedures for customer interfacing with high technology networks.
- Determine how customers problems can be effectively and responsively handled eg, interworking between PABX and PSTN.
- Establish standards and procedures for:
  Management of the IDN and ISDN
  Maintenance of the IDN and ISDN
- Consider network management aspects of the IDN - survivability and security.
- Reduce risk at critical centres by examining the suggestion that installations or nodes should be 2 yearly.
- Reconsider network management role of NPAC in network pattern analysis; Network control should be centralised and not inhibited by District boundaries.
- Identify the role of common channel signalling in Network Management.
- Give special consideration for high technology environment requirements for buildings, energy and air conditioning.

Management and Organisation

- Acknowledge the advantages of conserving expertise by concentration.
- Determine the proper organisational relationship between plant specialists and network specialists.
- Establish the organisation to ensure that advice from specialist groups is fully utilised.
- Extension of MEMO agreement to cover those areas not included in the current agreement.
- State Support Centre role needs resolution with respect to the number of centres needed to handle different disciplines and relationships.

Education and Training

It was obvious from the addresses by HQ Engineers that we have a great deal to learn about the principles of the technology wave behind the one we are currently addressing. Since knowledge of proposed change is not widespread we should widen the appreciation and deepen the understanding of the forthcoming changes.

- Invite Research staff to describe their work and expound their views in appropriate fields including:
  Mobile Services
  Cellular Radio
- Provide a short appreciation course to make staff aware of the changes in the network.
- Initiate meetings with union executives.
- Set up working parties to examine high technology papers.
- Consider the possible expansion of the State contribution to RDI work in the area of digital switching and transmission where our experience is advanced.

The rate of change requires increased flexibility and responsiveness against the background of a long term training strategy plan.

- Prepare a "skill-power" plan as an input to the strategy plan.
- Reconsider training methods and use of tertiary facilities versus Telecom training and training organisation.
- Rotate specialist groups into Training for specific periods.
- Organise the appropriate component of on-the-job training.
- Provide and maintain engineering hands on expertise in network operation.
- Improve the effectiveness of the training system by ensuring that only those who require the training are nominated and that those nominated attend.

SYNOPSIS OF TALKS

VICTORIAN PLANS

F.A. CAMPBELL, P. DUNNE, D. WHITFIELD

The Victorian State Development Plan approved by Headquarters on 19 May 1983, provides for the introduction of digital working throughout the State and outlines the development of the Integrated Digital Network. It points the way towards the future where we foresee various networks being brought together into an Integrated Services Digital Network.

The State Plan covers the range of networks provided by Telecom but it concentrates on the Public Switched Telephone Network (PSTN). The PSTN is the major revenue source within Telecom and requires the application of the majority of our resources.

The State Plan is the key document in a hierarchy of plans for the State:

- *State Plan*
- *Melbourne Plan*
- *Trunk Network Plan*
- *Regional Network Plans*

Other plans will cover:

- *Digital Data Network (DDN) Development*
- *Special Services Network (SSN) Development*
- *Packet Switched Network (PSN) Development*
- *Melbourne Central Business District*
- *Advanced Facilities*

To date only the State Plan and the Melbourne Plan have been printed although frameworks for the other plans have been prepared within Planning and a discussion draft for trunk and country network modernisation circulated.

Melbourne Telecommunications Development Plan

The primary thrust of the Melbourne Plan is the introduction of digital working throughout the Metropolitan area. This will:

- *Reduce the cost of developing the network.*
- *Permit the provision of a wider range of customer services.*
- *Improve transmission performance.*

The digital switching equipment used will be AXE both as local (LSS) and remote (RSS) Switching Stages. The digital group selector (GSS) will be associated with the local switching stage to form the nodes in the network. AXE equipment will also be used for digital trunk switching.

The digital transmission equipment will be 2 Mbit/s streams on pair cables, with higher order digital systems over coaxial and optic fibre cables and digital radio.

The same switching and transmission systems used for the public switched telephone network, and creating the integrated digital network (IDN) will also be used wherever possible for the other networks; DDN, PSN, SSN, WSN.

Trunk and Country Modernisation Planning Aspects

The major thrusts of the trunk and country modernisation plan are:

- *Establish a digital network as an overlay on the analogue network.*
- *Develop a country network largely independent of Melbourne Trunk Exchange.*
- *Provide for:*
    1. *Reserve capacity on high revenue routes.*
    2. *Switching and transmission diversity and security.*
    3. *Contingency routing.*
    4. *Fast response to commercial pressures and challenges.*
    5. *Digital presence at all major centres by 1990.*
- *As purchases for analogue equipment cease, the need for modifications to analogue equipment will minimise.*
- *Establishment of RTSS earth station at Bendigo.*
- *Replacement of SxS and RAXs by 2000.*

NETWORK MANAGEMENT

A. MORTON, L. WHITE, J.F. RYAN

One of the Engineering Department's important tasks is the management of the vast and complex nationwide communications network. As well as planning and constructing the network, Engineering must ensure that the network is capable of meeting customer demands and is in a healthy position to meet outside competition. The business community and our general way of life is becoming increasingly dependent on an efficient and reliable communications system. The network is a national asset in terms of the country's growth and defence.

Network Management can be viewed as covering timely provisioning and efficient utilisation of network facilities under normal traffic conditions, and optimisation of network usage during emergency situations and periods of plant failure. To effeciently manage the network, a great deal of information has to be collected, analysed and then acted upon.

Over recent years considerable attention has been given to developing Network Data Acquisition Systems, eg CENTOC, such that we can more efficiently plan the network and readily determine particular operational/maintenance trouble spots. Real time control of traffic has not until recently received much attention. Overseas administrations, and in particular USA, are using Network Management techniques in an attempt to ensure that the call carrying capacity of the network is optimised at all times. By means of real time traffic control we can provide a better service for customers and increase our revenue.

The Victorian Network Management Task Force involved, along with Project Teams in NSW and HQ, in developing real time plant performance and traffic monitoring and control systems which can be applied in the current networks.

One of the Victorian projects is to develop a Network Management Centre which it is proposed to locate at Exhibition Exchange. This Centre will be involved in monitoring plant performance and traffic and carrying out traffic control functions. It will be co-located with the SRTCC, which has recently been transferred to Exhibition, and NPAC which is to move into Exhibition in 1984. This co-location of SRTCC, NPAC and NMC makes sense in that these groups carry out related functions.

It is envisaged that the 3 groups at Exhibition will eventually be in a position to monitor the performance of the network at all times, to determine trouble spots, give advice on short and long term network relief and be in a position to arrange traffic controls such that we make the best use of our network during plant breakdowns and in circumstances such as disasters when traffic level becomes abnormally high.

Other matters being investigated by the Task Force include:

- *Investigation of the scope and form of a Recorded Voice Announcement network for network management purposes.*
- *Investigation and specification of common control equipment time-out reduction to reduce network overload in abnormal traffic conditions.*
- *Development of dynamic traffic control in terminal crossbar exchanges including the application of priority calling for essential customers and STD access barring to non-essential customers.*

INTERNATIONAL NETWORK DEVELOPMENTS

DR A. GIBBS AND MR P. GERRAND
(TELECOM RESEARCH DEPARTMENT)

Developments in Other Countries – Dr A. Gibbs

On the International scene voice channels, though important, are not so important as formerly as the "bit rate" rises to the forefront. Optical fibre development is extending, though this technology is already with us. In Italy coaxial cable is being used up to 140 Mb/sec largely because of the quantity installed and availability of spare capacity – a situation not so prevalent in Australia. Single-mode optical fibre looks to be our future together with digital radio up to 34 and 140 and in some cases down to 2 Mb/sec. Future developments look like using wavelength of 1300 and 1500 nanometres. Multi-mode optical fibre is a designers nightmare and is obsolescent.

Cellular radio offers good prospects in future development for mobile radio, point to point/multi-point with connection to local networks and satellites. Business Development and Research will make some presentations on this in the next few months. America is proposing to move to cordless telephones by 1998 using this form of development.

Techniques to be used include spread spectrum and frequency hopping techniques at present used chiefly in military type work. This technology requires quite a sophisticated switching and transmission medium.

In the local networks ISDN requires 144 Kb/sec from the subscriber to the exchange. Whilst we know a lot about the financial value of the local network reticulation ongoing Research activity is proceeding in relation to the Victorian local network to determine possible strategies. Among the techniques which will most likely be used is the burst or "ping pong" mode, hybrid with echo cancellation and frequency separation. In the 1990's we will see heterodyne/coherent modulation and demodulation system using ASK, FSK, PSK or even 16 QAM or 32 QAM. Also there are expectations from long wavelengths in radio which could offer the possibility of transmission with no repeaters between Melbourne and Sydney.

CCITT Activities – Mr P. Gerrand

The 1980 recommendations were made with ISDN in mind, requiring common channel signalling (CCS) as the means of implementation. However, only telephony and switched data were specified, but only telephony has been implemented.

Switched data has instead been covered by the recommendations for Packet Switching Networks which included the interfacing protocols for various terminal types and data speeds.

The 1984 recommendations will be more closely oriented to ISDN. The signalling architecture to be specified will provide commonality between telephony and data call establishment, which will affect the perception of the network by ourselves and our customers. Operations and maintenance signalling will be specified in general terms and Telecom will need to fill in its own details for use in our networks.

Telecom will need to upgrade the AUSTPAC network to match the new specifications, basically to allow for increased facilities.

We will find that the present AUSTPAC switching devices are too small and too slow to cope with the data switching demand which is exceeding anticipated levels, on a world-wide scale.

Common Channel Signalling No.7

Overseas administrations are actively introducing CCS-7. It would be to our advantage to be planning for its introduction now, ahead of the wider establishment of the IDN.

Initially CCS-7 will simply replace the traditional signalling of MFC and T-pulse techniques. Widespread introduction of CCS-7 will enable introduction of advanced facilities to customers and provide for greater network management capability.

To achieve its introduction, the CCS network must be planned as an infrastructure in its own right.

TRANSMISSION AND SWITCHING DEVELOPMENTS

G. NOWOTNY AND W. CLOSE

Convergence of switching and transmission technologies in a digital environment requires that system planning be based on an overall network analysis, as distinct from link by link or exchange by exchange approaches. Digital and analogue networks do not readily work together, and the digital network will largely be an overlay on the analogue network, requiring its own diversity and reserve capacity.

The over-riding thrust will be to digitise the network as rapidly as possible. Planned new transmission systems will generally be digital from 1983 onwards, and purchase of analogue transmission equipment will virtually cease after 1984/85. The objective will be to allow widespread penetration of digital facilities across the network quickly and economically.

New transmission elements to be introduced include:-

Digital Radio Systems –

Short haul for junctions from late 1983
Long haul for trunks in general use from 1985.

Digital Line Systems –

on existing co-axial cable from 1984/85 (no new co-axial cables).

Digital Radio Concentrator Systems –

for rural and remote areas from 1984/85.

Satellite Services –

for remote areas from 1985.

Optical Fibre Systems –

Trial installation between Melton and Ballarat in 1985, probably Melbourne-Sydney in 1988, together with early widespread use in local networks.

Initially we will focus on an integrated digital network (IDN) providing for digital transparency across the telephony inter-exchange network. The National IDN plan already published will provide the framework for the development.

This will be followed by a progressive integration of networks and services within the IDN in which some parts of and facilities provided by present dedicated networks (eg DDN, SSN, PSN) will be carried on the IDN as a ***multi-services IDN****.*

Digital transparency will also move out towards the subscriber, and services will be integrated in the subscriber to exchange connection leading to a full integrated services digital network (ISDN).

Penetration of digital transmission will be greatly accelerated by the major break-through which has occurred in optical fibre technology. The cost of producing high quality mono-mode fibres has fallen dramatically, and this has allowed us to start planning for extensive use of this medium in both local and trunk networks.

The main features of digital switching development will be rapid growth of digital switching in the trunk network (50% of metro trunk terminations will be on AXE exchanges by 1990). In the country as in the metro digital switching will be provided as an overlay on the existing network and a rapid spread is expected with most country secondary switching centres and up to 60% of minor switching centres having a digital presence by 1990. This will ensure that the majority of customers in the country have the option of obtaining access to enhanced customer and network facilities via AXE at the earliest possible time.

METROPOLITAN EXCHANGE MAINTENANCE ORGANISATION (MEMO)

B. BENNETT, D. McBRIDE, R. HOWARTH

The MEMO agreement was developed after extensive debate in the Arbitration Court and lengthy negotiations with ATEA. The agreement is a legal document and has been registered with the Conciliation and Arbitration Commission.

The organisation being introduced for the maintenance and support of SPC telephone exchanges is a four tiered structure comprising:

1. *A National Support Centre*
2. *A State Support Centre in each State*
3. *A District Support Centre in each DTM District, and*
4. *A new field organisation with exchanges grouped for maintenance purposes (Exchange Maintenance Groups).*

The implementation of this new organisation is being co-ordinated by a MEMO Steering Committee.

The area covered by the MEMO agreement in Victoria consists of:

1. *Melbourne Metropolitan Network ie, the "03" CNA*
2. *Mornington Peninsula ie, the Mornington and Dromana Minor Switching Areas*
3. *Part Geelong Minor Switching Area.*

In total there will be 42 Exchange Maintenance Groups and 9 stand-alone exchanges for the metro area plus 3 EMGs for Geelong and 2 for the Mornington Peninsula.

The introduction of group working does not affect the level of resources needed to maintain and operate the exchanges in the group. The manhours specified by the FYEOP process are controlled entirely by the type of technology and the general productivity indicators.

RESOURCES IMPLICATIONS: MANHOURS/MANPOWER SKILLS/TRAINING

J. DOWSE, E.J. ANGEL, G. MORRIS, G. TUENO

The introduction of new inter-related technologies in association with the development of AXE, PCM Digital Radio and the more sophisticated customer services, as well as the IDN, ISDN, SSN and DDN networks has a considerable effect on the traditional co-ordination of men, money and material resources. The new technologies also call for re-training of existing staff as well as the development of new techniques. A new range of skills and the relative skill mixed is called for and these must be considered both from a short term and long term effect as the developments proceed. Telecom's decision to improve its competitiveness by attractive pricing policies has resulted in increased demand for its services and facilities and we must build this ingredient also into our resources programme, in other words we must be anticipatory in catering far ahead.

In modern society the social provision built into the working environment represent an important economic consideration in the assessment of our manpower needs and productivity attainments. Manpower is a significant proportion of our costs and in its application we must be cognisant of this fact. These consideration, present in manhour/manpower applications, must not only be understood but appreciated for the ultimate realisation of the socio-economic gains latent in new technology.

Manpower needs embrace not only volume but a variety of skills less static than previous, requiring a dynamic approach to meet current and forward challenges. There is always the danger of becoming engrossed with the "generalised" and losing sight of the specific and quick reaction is essential to meet the challenge to 2000. We must react to ensure that basic skills are not deficient, or for that reason, outdated. The nature of modern communication development cannot guarantee the automatic right or luxury to train all in specialised skills at all times.

It is essential that the Training process be built into the Commission's planning process and, in particular, that the important relationship with the Manpower Plan be recognised. To this end, the establishment of a formal Training Plan would ensure better co-ordination of the planning phase and generally enhance the Training process.

Before a realistic Training Plan can be established, it is necessary to assess all future staffing needs (Internal and External Plant) in terms of:

1. *Type and level of expertise/skill required.*
2. *Depth of knowledge to be acquired.*
3. *Critical timing requirements and priorities.*
4. *Technological change and its impact on skills required.*

From this data, it becomes possible to apply and manage the Training resource to achieve the organisation's objectives.

TELECOM'S COMPETITIVE RISK

R. CULPIT

On available evidence the areas at risk to competitors are:

1. *STD traffic*
2. *Private networks of all types*
3. *PABX market*
4. *Telephones*

The threat to STD depends on fundamental government level decisions interlinking the common carrier/satellite role for Telecom. In the post Davidson environment it cannot be assumed that the status quo will be retained even in the medium term and certainly not in the long term.

In the private networking area the potential for lost business is also linked to government decisions. However, there is an added dimension in that Telecom could without significant policy change become simply the provider of bearers and not the high technology which makes effective use of bearer capacity.

Third generation PABXs are the visible example of convergence of Data and Voice technology. We contracted to supply the first of these in February 1983. This contract was won against fierce competition which we can expect to continue. Telecom needs to have the gear at the price and with the technology support to remain in this business.

Telephones are a competitive market in which we will lose a significant share. This is probably inevitable and as long as we retain a major part of the business, little harm will result.

The conclusion which I draw from the analysis so far is that a significant segment of our revenue base (as much as 25% of business revenue) is under present threat or potential threat dependent on government decisions.

It is my belief that the threat will become very real if Telecom fails to provide the highest (best) technological back up to its products across the board. Poor technological support will create a desire from customers to have choice and will lead them to lobby for such change at government level. The major customers are of course best fitted to carry out this lobbying.

In a number of significant customer oriented projects over the last year there have been problems in the following general areas:

1. *Interface problems between customer networks or equipment and the Public Network;*
2. *Insufficient capacity for customer demand in advanced technology products – DDN, Wideband Services;*
3. *Difficulties in new products – Mobile Telephones, Commander S, CENPEX;*
4. *Basic transmission problems between complex customer equipments.*

Telecom's strength in providing a national public network is not in question, but the balance of resources spent on this activity compared to the relatively small resources devoted to direct customer related work must be questioned.

OPERATIONS SUPPORT SYSTEMS

K.J. REED AND D. TURNER

The paper described systems in use and under development and the relationship between them.

Because of the scope of the subject and the need for a suitable reference it will be published separately.