



Submission to the

Independent Pricing and
Regulatory Tribunal of New South
Wales

In regard to

Undergrounding Electricity Cables
in NSW

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Introduction

I am pleased to present this submission to the Independent Pricing and Regulatory Tribunal of New South Wales.

The undergrounding of Power Cabling in New South Wales has been a long held belief of mine. This submission will explore the many issues involved and provide opinions and solutions to these issues. However, there is one very obvious point to be made. The undergrounding of all power cabling is an inevitable fact. The issue is just time and realisation that trying to maintain a system developed in the 1800s is not a long term option.

It should be noted that many aspects of the above ground electrical distribution system would not be allowed if it were to be proposed today.

This submission will explore many of these issues.

I am a resident of Faulconbridge in the Blue Mountains" My background includes being a Communications Consultant and Software Programmer with experience in the electrical distribution industry including programming the Feeder Load Analysis suite for the North Western Electricity Board, UK.

I am writing this submission from a personal point of view with the resources available. There are many issues that I will just touch on or not be able to cover given the time and resources I have at my disposal.

My submission is split into three parts: -

1. The need for cables to be underground
2. The implications of Underground Cables required
3. The Costing and methods of implementation.

I am concerned that the multi-million dollar distribution authorities will present cases to continue with the status quo. In 1996 I presented a submission to use common trenching during the installation of the Gas Mains throughout the Blue Mountains. Following that submission I received a reply, included in Appendix 3, which focused on the impact in just the Blue Mountains. I am particularly upset with the response "Furthermore, non of these accidents resulted in a fatality". Since that response a person I knew was killed in just such an accident. I do not want to make political mileage out of other people's loss and sadness however many will be killed in the future under such circumstances on NSW

roads. I include a cutting out of today's paper (28th January 2002) in Appendix 4 of another accident.

The review is to identify the costs, benefits and funding options.

This submission focuses on items which are the real benefits of undergrounding the cabling system.

I cover some strategies for the reduction of costs and possible funding options.

I am not in a position to identify the real costs involved however, I am concerned that the cost to implement the undergrounding of power cabling will be overstated and the avoided costs and benefits understated by the authorities who have a vested interest in maintaining the status-quo.

The photographs use in this submission where all taken in January 2002.

Section 1

The need for cables to be underground

The need for cabling to be underground fall into the following categories:-

- Safety
- Security of supply
- Visual impact
- Design and Maintenance

It has been argued that the undergrounding of power cabling is not a panacea for all the problems. However, on a balance of issues the undergrounding of power cabling is far superior apart from the issue of cost. And it is the issue of cost which often drives the supply authorities to argue these other issues against the option to underground power cabling.

Cost has three components, the cost of the installation, the cost of maintenance and the community cost of accidents, damage to equipment, loss of facilities during an outage and the impact of unsightly infrastructure. The first two costs are used in a "whole of life/1 monetary cost and the third is very hard to quantify. What price do you put on the life of a loved one, what is the price of a well landscaped, neat and tidy suburb?

Cost and value are very interesting subjects. As a consultant I have been involved in multi-million dollar projects. The upgrade of the Great Western Highway involves projects with values between 20 and 40 million dollars each. However, some residents have limited experience with values and have great difficulty in understanding real costs and values involved and opt for the cheapest up-front solution whatever the outcome. Others have experienced nothing but the current overhead distribution system and know no better. However, I have been getting considerable support for my views from the general community.

I look back to people who are now called visionaries and admire their forethought. I see problems today, which could have been avoided with the correct forethought. (Sometime not forethought just common sense). Some of the pictures in this submission will show power poles which will soon have to be replaced, and this is on a newly completed section of Highway costing the State Government \$38 Million.

1.1 Safety

This section, in my opinion, is the most important section. Issues covered in this section demonstrate a real failing by the authorities to properly address fundamental problems.

Overhead power distribution is a classic example of the "Boiled Frog Principle". This principle demonstrates the lack of recognition of change. Put a frog in hot water and it will immediately jump out. Put a frog in cold water and it is happy. Then slowly bring the water to the boil and the frog will not recognize the slow incremental change in water temperature until it is too late and the frog is dead.

Some problems have been recognized by the authorities and policies, procedures, rules and regulations have been put in place rather than implementing a correct solution which will remove the problem altogether.

Other problems have not been recognized, or admitted to as this may cause them legal liability. Examples are restricting the width of footpaths and obscuring view during vehicle movements.

1.1.1 Bare Overhead Cables.

It is plainly obvious that bare overhead high voltage cabling is dangerous. From a safety point of view it is unbelievable that there are still bare overhead cables that require only a small mistake to kill someone. Raise a ladder, use a cherry picker, fly a kite and so on.

The overhead power cabling system includes the distribution and transmission cabling. It is my opinion that eventually all overhead cabling will be seen as too dangerous and be placed underground. The cost to underground the very high voltages (400KV, 132KV) are significant. However, it can be seen that where there is a will there is a way and some very high voltage cables were placed underground for the Olympics. Clearly, all other voltages should be placed underground as a matter of priority in urban and residential areas.

It should be noted that when cables are placed underground, they are designed to be insulated and often include safety designs such as armor plating so that in the unfortunate circumstance that they are accidentally dug up they have some protection.

Bare and exposed overhead cabling provides a significant risk to rescue and emergency personnel. This is a very common occurrence and (though I am just a member of the community not involved in any of these services) I have been present and exposed to these dangers. I have seen car accidents (Great Western Highway at the end of Meeks Crescent); bush fires (Singles Ridge Road, Yellow Rock); frost damage bringing down power lines (St Georges Crescent Faulconbridge) and storms (Queens Road Lawson).

It is current practice to install Aerial Bundled Cables (ABC). These are Insulated Power Cables twisted around a steel catenary cable for support. These type of cables are considerably safer than the bare overhead cables.

Bare overhead cables are being replaced by ABC cables. The cost to do this could be used to offset the cost of undergrounding these cables. **(IPART 3. A comparison of costs associated with maintaining the current network compared to undergrounding; IPART 4. The types of costs which are avoided as a result of undergrounding)**



This Photograph shows bare overhead cables.

A pole mounted transformer and associated unsightly cabling.

The power pole restricting the footpath width.

The power pole causing the footpath to deviate.

1.1.2 Overhead Cables

Overhead cables cause plane and helicopter crashes



"Elvis" flying off to fight a bush fire in the Blue Mountains and loaded with water in close proximity to live power lines.

"Elvis"

Power Lines

1.1.3 Live Overhead Cables -Bridge Construction

These are of a major concern during bridge construction. The crane operator has to be fully aware of the location of the power cabling in situations such as the construction of the bridge at Woodford. The construction of this bridge required the lifting of the main steel supports into position while avoiding the power cabling.



When the steel beams for this bridge in Woodford were lifted into place the construction crew had to avoid live power lines.

Power Pole

Bridge

Power Lines

1.1.4 Live Overhead Cables -Building Construction

Building construction in close proximity to live overhead power cabling causes safety concerns. Temporary shielding has to be installed.



*Temporary
Shielding over
power cabling*

1.1.5 Live Overhead Cables -During Bushfires

There is a considerable concern to bushfire fighters and other emergency workers during bushfire emergencies. Bushfires are emergency situations which require immediate actions therefore the danger of Live Power cabling is considerably enhanced. Even though the emergency workers are trained to avoid dangerous situations split second decisions are required under very stressful circumstances and live overhead power cabling is one life-threatening obstacle which should just not be allowed to occur.



*The after
effects of a
bush fire. The
power pole is
extensively
damaged by
fire and will
have to be
replaced.*

1.1.6 Live Overhead Cables -At Traffic Accidents

Traffic accidents with larger vehicles such as trucks will cause power poles to break and bring live power lines down. These live power lines cause major problems. The power must be isolated before the emergency workers can attend to the rescue scene.

1.1.7 Live Overhead Cables –During Storms

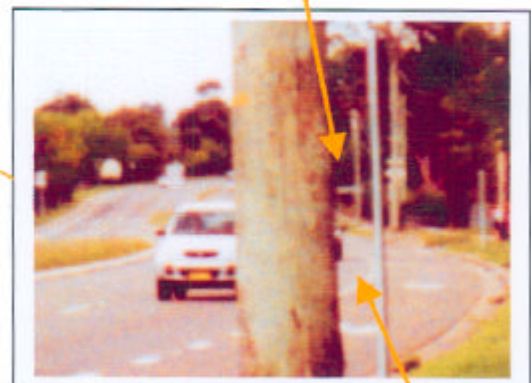
Storms bring live power lines down. Again, these live power lines cause major problems. The power must be isolated before the emergency workers can attend to the rescue or incident scene.

1.1.8 Power Poles restricting the view of the road.

There are many locations where Power Poles restrict the view of the road. It is my belief that this restricted view may have been a contributing factor in a number of accidents.



This is an example of a power pole restricting the view of the traffic. The photograph was taken from the driving position of a car turning right at Lewin Street, Springwood. Behind the power pole is another car almost completely blocked from view.



Wing Mirror just visible

1.1.9 Power Poles cause death and injury

How many newspaper reports and television pictures do we have to endure to realize that Power Poles are just too dangerous to be located near a road. The nature of Power Poles are that they do not absorb any energy of a vehicle impact so the result is significant destruction of the Vehicle with massive death and horrific injuries.

1.1.10 Overhead Power Lines cause death to native animals

Flash bang, there is another fried possum. This is not an unusual occurrence, especially in the Blue Mountains.

1.1.11 Maintenance of Power Poles –Road Safety Implications

In order to perform Power Pole maintenance it is necessary to use a cherry picker and often heavy lifting equipment is placed on the roadway. This has two implications. The first is the danger to the workmen and as such the work site must be made safe with the appropriate signage and temporary traffic diversions. Secondly, the safety implications to the road users who have to avoid an unexpected obstacle. In addition, such maintenance may be emergency maintenance and may block main arterial traffic routes causing significant delays and frustration to motorists.

1.1.12 Maintenance of Power Poles - Safety using Dangerous Chemicals

The maintenance of Power Poles requires the use of dangerous chemicals such as Arsenic Trioxide, Preschem Biogard and Emulsified Creosote. Even though these are applied in a prescribed manner under strict safety regulations in regard to the workers, these and other chemicals are being used in close proximity to the public including small children as many power poles are located on footpaths.

1.1.13 Maintenance of Trees -Road Safety Implications

In order to perform Tree maintenance it is necessary to locate a cherry picker on the roadway. Even though this maintenance uses less equipment than Power Pole or Line Maintenance, it is required to be done on a very regular basis. Again, this maintenance has two implications. The first is the danger to the workmen and as such the work site must be made safe with the appropriate signage and temporary traffic diversions. Secondly, the safety implications to the road users who have to avoid an unexpected obstacle. In addition, such maintenance may be emergency maintenance and may block main

arterial traffic routes causing significant delays and frustration to motorists.

1.1.14 Maintenance of Trees -Other Safety Implications

Tree Maintenance requires working near live high voltage power lines and as such involves significant risk. The management of the risk is by the regulations and training of the workmen involved.

1.1.15 Power Poles restricting the width of Footpaths

There are many locations where the width of the footpath has been restricted. This picture shows an example of a totally unacceptable situation. Even without the power pole the width of the footpath is limited. A child riding a bike, a mother with a stroller, it is just too easy for an accident to occur. Then who is at fault? This picture also shows an example of the current situation. Not so long ago the power pole was on a grass strip. There was no footpath and pedestrians used to walk on the road. However, with the increase in development and traffic this was a totally unsatisfactory situation so the council laid a footpath. Prior to the footpath being laid it \Nould have been relatively easy to dig a trench and lay the underground cables. Now, there would be significant expense in digging up the footpath and then relaying it.



Power Pole Restricting the width of a footpath in Hazelbrook. This footpath width is clearly inadequate.

Also note that the footpath is relitively new.

1.1.16 Power Pole blocking driveway

This is an example of a power pole in a very poor location. Even though it is on a property boundary, the exact location is bisecting two driveways. The inconvenience and dangers it presents are obvious.



Driveway to one house

Driveway to the next house

Power Pole

Untidy growth of weeds

1.1.17 Footpath and Cycle way

A power pole restricting the width of the footpath and cycle way on Hawkesbury Road Springwood



Untidy cabling supplying house

Old Power Pole

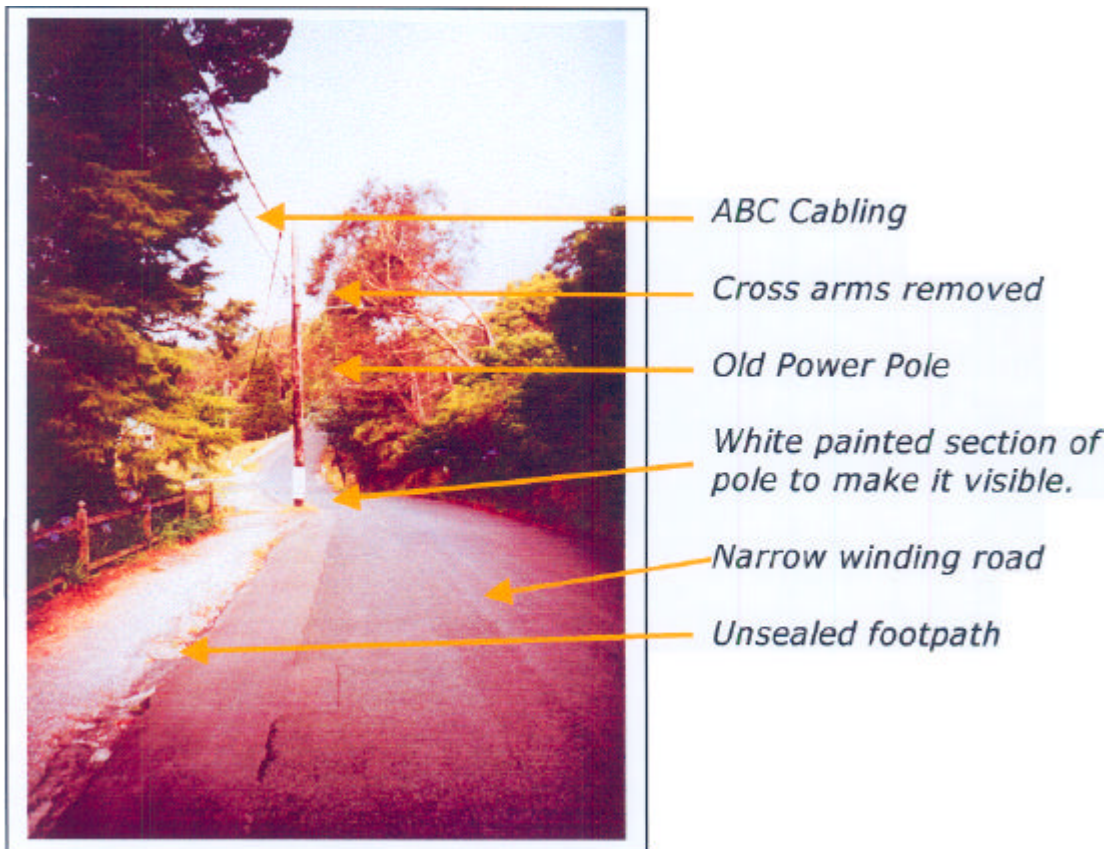
Footpath width restricted

Cyclists are required to dismount to traverse this section of the path.

Relatively new footpath

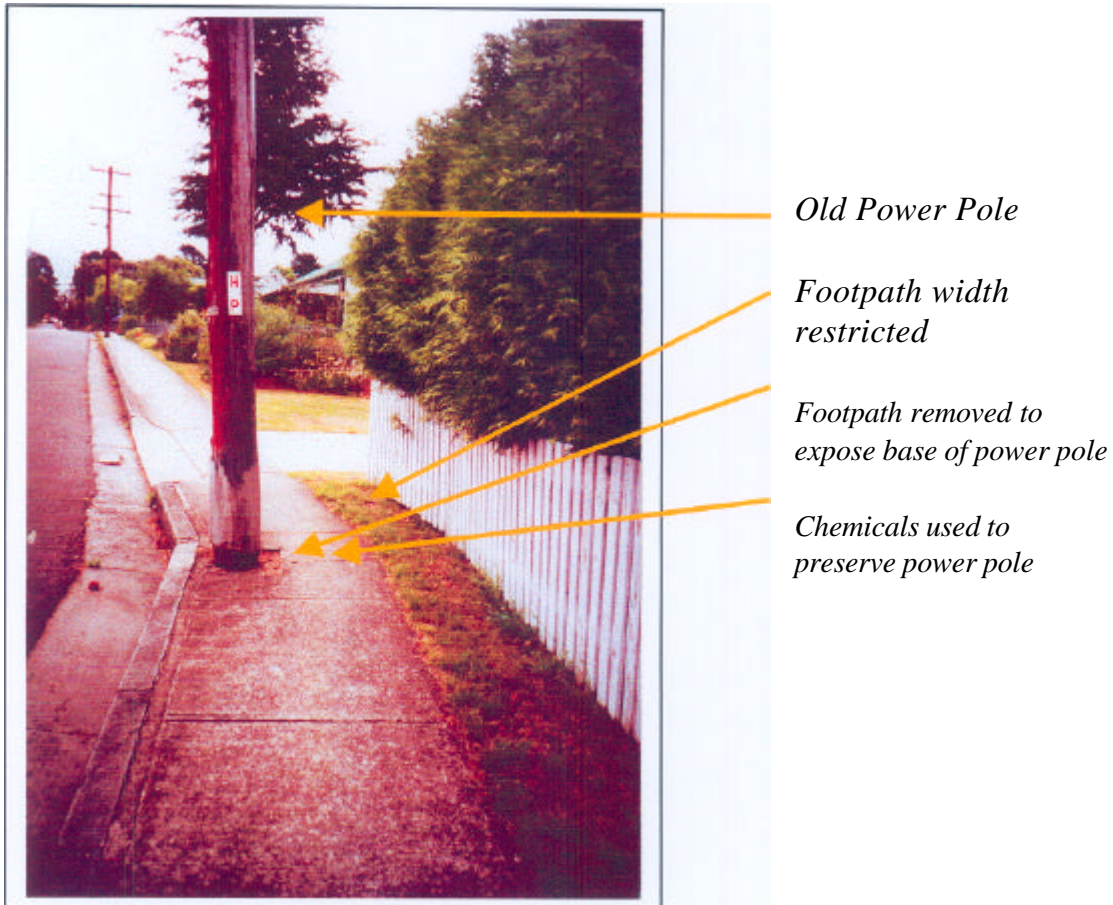
1.1.18 Power Pole in very dangerous position next to road

It continues to amaze me that this situation has been allowed to continue. Since I first raised concerns regarding this particular power pole, ABC cabling has been installed. This is a reasonably busy access road next to the railway track in Lawson. It is a narrow road and the power poles are a significant danger to vehicles. You will see that the power poles have been painted white to make them more visible. This is an old power pole and will need to be replaced soon. Why put ABC cables on an old power pole which is located in a dangerous position? Clearly due to the restricted width, topology of the route and dangers involved, the cables should have been installed underground. Furthermore, this section of the road does not yet have a concrete footpath. This footpath will be installed in the near future.



1.1.19 Power Pole restricting width of footpath

The impact that power poles have on the footpath can not be underestimated. In many locations in Sydney the topology results in less than optimum widths for the road, vegetation strip and footpath. This is particularly true for the Blue Mountains. The following photograph highlights a number of these issues. The footpath width is already below standard. The power pole restricts this width to a dangerous level. To maintain the power pole the footpath has been removed around the base of the Power Pole and the ground left bare. On many occasions dangerous chemicals have been applied to the base of the power pole. Small children and mothers with strollers use this footpath. This again is a totally unacceptable situation.



1.2 Security of Supply

Security of Supply is significantly impacted by Overhead Power Cabling. It is relating to not only the cause of the outage but also the length of time taken to restore service.

The Security of Supply is affected by :-

- Storms
- Trees falling on lines
- Trees and bushes growing into the lines
- Native Animals causing short circuits
- Lightning
- Vehicle Crashes
- Vandalism
- Bushfires
- Cold Weather causing line to break
- Hot Weather
- Flooding
- Maintenance -Replacement of Power Poles.

When an outage occurs the authorities try to restore service as soon as possible but there are many recent examples of outages to many thousands of customers of not just hours but days, especially after storms and bushfires.

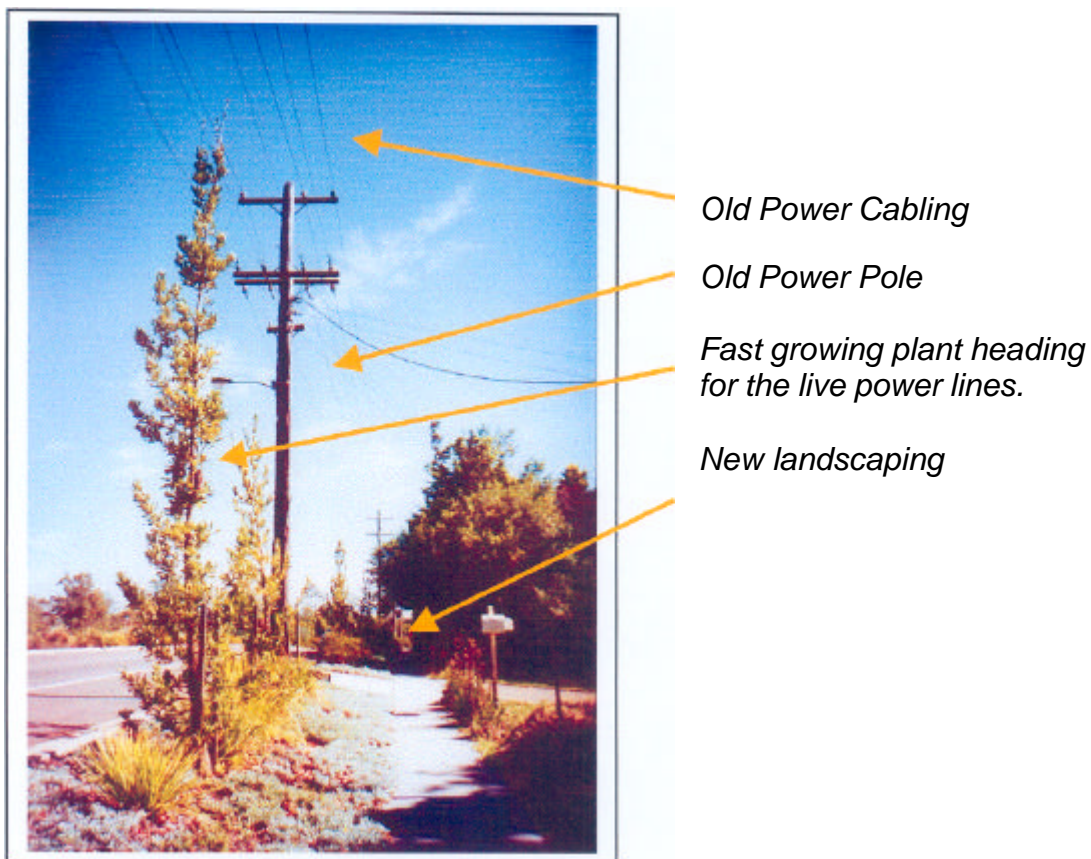
Security of Supply is becoming a critical factor. The world we live in is changing. When electricity was first distributed, its main use was lighting, replacing gas streetlights and oil lamps. Failure of supply did not cause any major problems but as time went on more and more household equipment requires electrical power. In a house a short interruption is often just an inconvenience. However, a longer period can make a house uninhabitable especially if items such as sewage pumps are involved. Even if you can live in a house without power, dangers increase with the use of candles for lighting. The inconvenience for many without power is just not tolerable: -no Hot Water, Lighting, Cooking/Microwave, TV, Video, DVD, Computer/Internet, Hi-Fi/CD/Radio, dishwasher, Vacuum Cleaner, Mobile Phone Charger, Video Games and the list goes on.

1.2.1 Damage to Equipment

During an accident recently the high voltage lines touched the normal 240V lines causing a significant amount of damage to the household equipment of our neighbours.

1.2.2 Vegetation Growing up to live power lines

Some vegetation is fast growing and can become a danger quite quickly. Landscaping is a very important part of the local amenity. Ideally no plants should be grown under power lines, however, where there is limited roadside space plants will be grown. The following picture is at a location on the Great Western Highway between Blaxland and Warrimoo. This is a new section of the highway costing the state Government \$38 Million. The picture shows that the existing old power pole and cabling was retained and that new landscaping was installed along the nature strip.



1.2.3 Vegetation growing into Downer lines

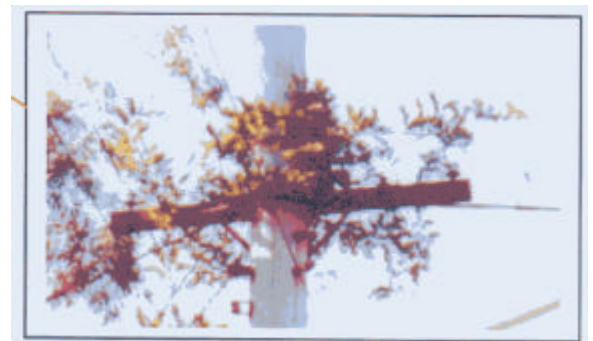
The following picture shows actual plants growing through the live power cabling. This is of considerable concern as not only is it risking shorting out the power supply but also it is a danger to people on the ground through electricity traveling along the plants, especially in the wet. In addition, unless immediate action is taken, the plants will grow into the high voltage cabling, almost certainly causing a blackout or maybe a fire.



Live High voltage Power Lines

Live normal voltage power lines

Plants growing along house supply cabling and into the live power cables.



1.3 Visual Impact

There is no doubt that the overhead power distribution has a significant visual impact.

The *effect* of this is hard to quantify. However, there is a general feeling of untidiness in locations with overhead power cabling. This "untidiness" translates the to a loss of civic pride.

Many photographs in this submission reflect this untidiness. However, it is not necessary to highlight the untidiness by photographs. Just go to any location with overhead power cabling to experience its implications.

The overhead power distribution has existed for nearly 100 years. The installation, addition and maintenance of this system has resulted in a smorgasbord of effects and visual impacts.

1.3.1 ABC 1

Aerial Bundled Conductors (ABC) are simple to attach to power poles so there is a reduction of the cross arms and insulators however there is a considerable increase in the thickness of the cable and this results in very visible cabling.



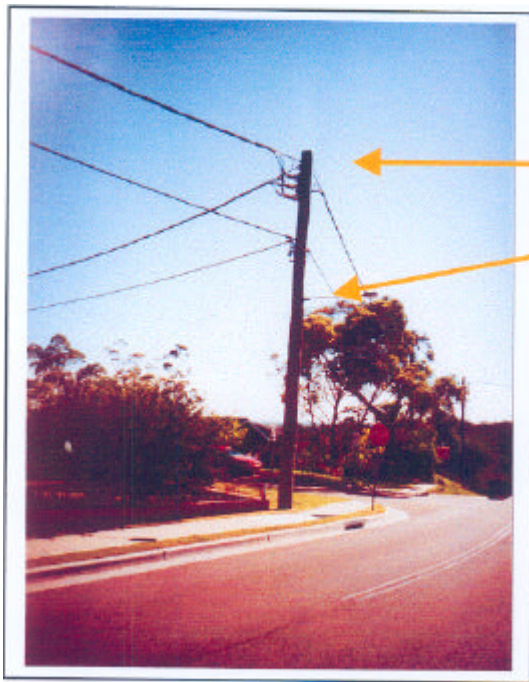
ABC Cabling installed as part of the \$38 Million upgrade of the highway at Warrimoo

ABC Cables transfer to underground through shopping centre.

Shop not considered part of the shopping centre

1.3.2 ABC 2

Aerial Bundled Conductors (ABC) have to be split into the individual single core cables before jointing in such cases as transfer to underground cabling, three way distribution, linking to transformers. The splitting of ABC cabling is particularly unsightly.



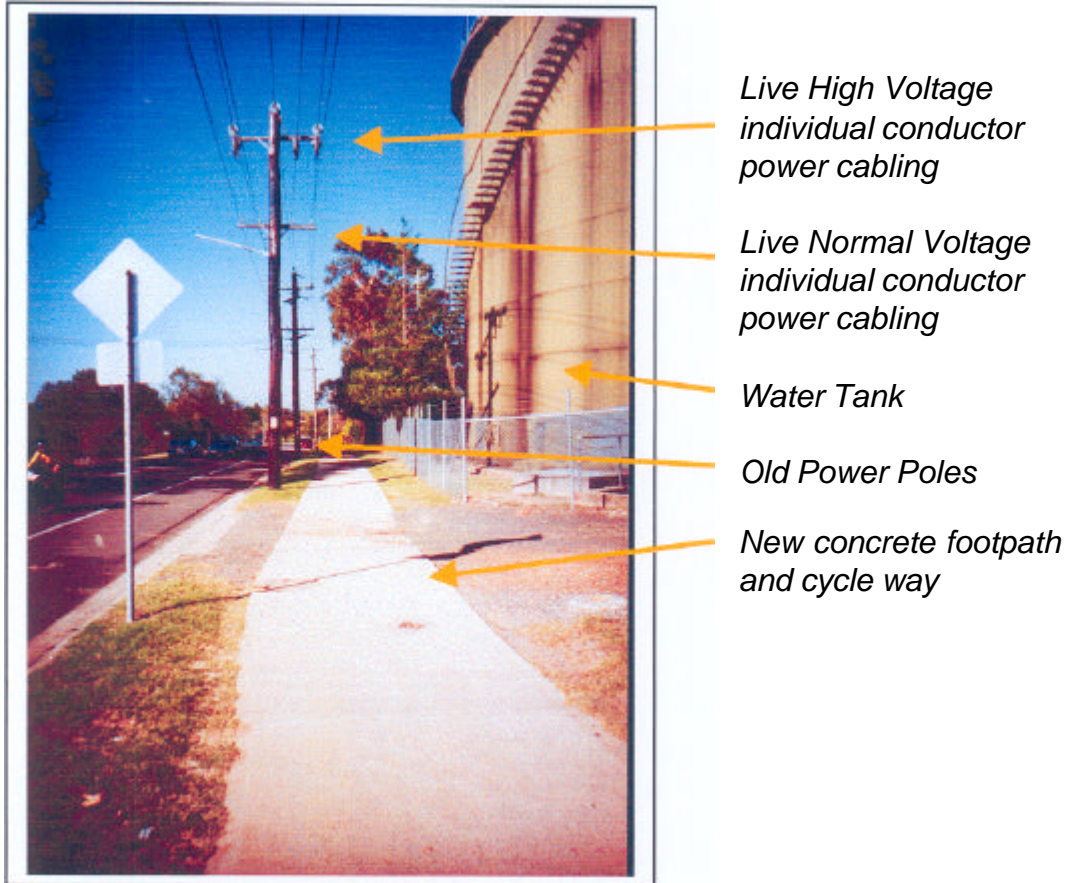
*Three way split of ABC cabling
Bent Power Pole*



*The Split of ABC Cabling to
connect to a transformer*
*High Voltage cabling to the
transformer*
*Normal voltage cabling from
transformer*
Transformer

1.3.3 Lines 1

Bare overhead conductors look out of date. Here, in the picture below, on Hawkesbury Road, Springwood, the single conductor cabling looks particularly unsightly. This is possibly due to the lack of trees and other vegetation around the water tank.

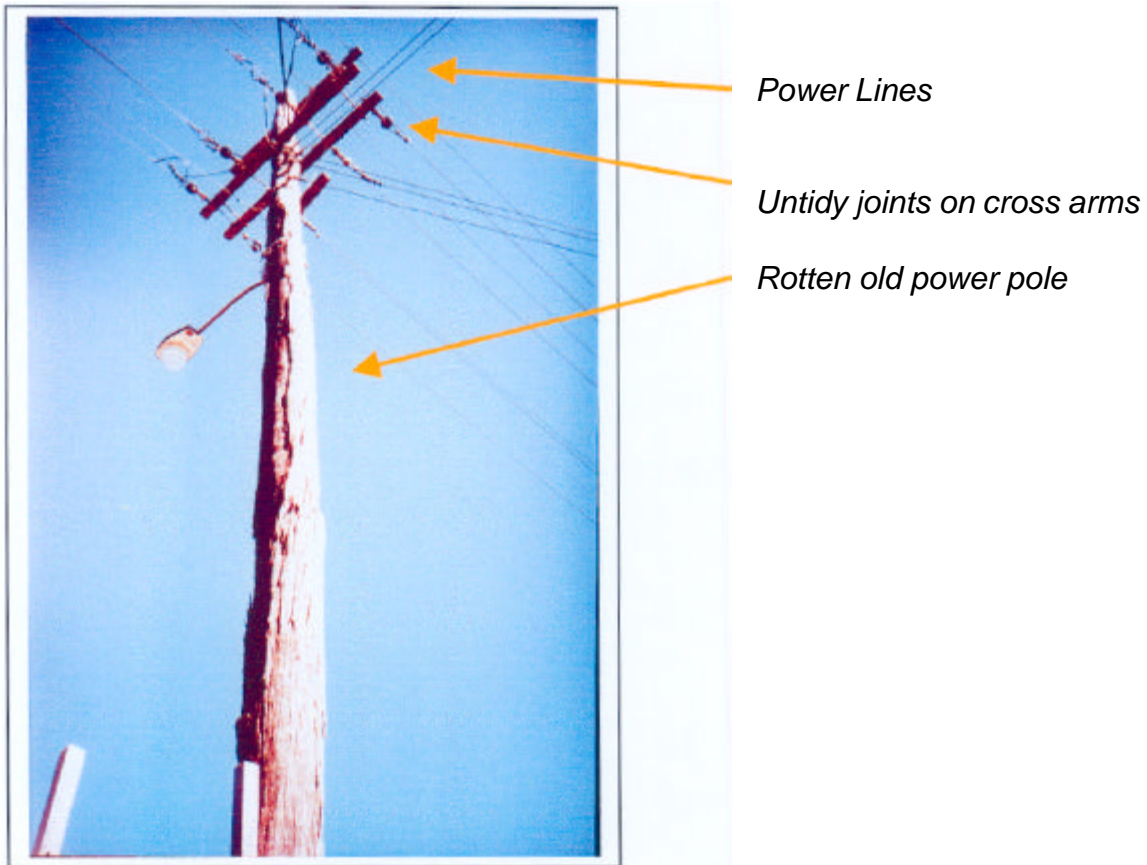


1.3.4 Lines 2

The joints for distribution to houses from bare overhead conductors look untidy.

1.3.5 Power Poles 1

Old, rotten power poles look very dilapidated and detract from the image of an area. The following photograph is of a power pole on the new \$38 Million, upgraded section of the highway at Warrimoo



1.3.6 Power Poles 2

Old power poles which have had a change of use show where cross arms once were located.

1.3.6 Power Poles 3

Many power poles are bent especially where it has been impossible to install a support cable on corners and at "T" intersections.



1.3.7 Power Poles 3

New Power Poles are Chemical Green. This has an unhealthy feel to some people.

1.3.8 Power Poles 4

The mixture of old and new power poles makes the place look untidy.

1.3.9 Power Poles 5

The location of Power Poles is not consistent. There appears to be an attempt by the authorities to locate new power poles on property boundaries now the ABC cabling is used, however for various reasons it is not always the case. In many cases power poles are located right in the way of a proposed footpath, in the middle of driveways and other totally unsatisfactory locations. This has a very significant visual effect.



New Power Pole in upgraded section of the highway at Falconbridge located right in the pathway

New path diverted around the new power pole showing a total lack of co-ordination

1.3.10 Trees 1

Of course the most noticeable visual *effect* is the inappropriate tree pruning where the centre of the tree has been removed and the branches extent in an arc on both sides of the cabling.



Power lines

Trees cut to avoid power lines

1.3.11 Transformers 1

There is a very noticeable negative visual *effect* with the cabling to Pole Mounted Transformers.



High voltage power cabling

Normal voltage power cabling

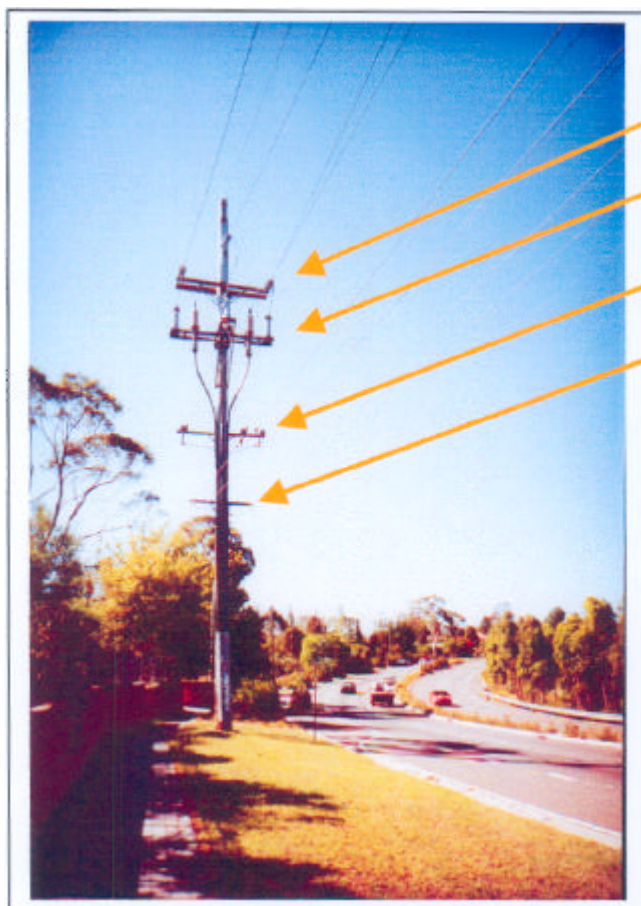
Transformer

1.3.12 Pay TV Cabling

One of the most annoying visual impacts is the Pay TV cabling. This cabling is just so visually intrusive with boxes and kinks in the cable to avoid cable strain.

1.3.13 Transfer from substation Underground to Overhead Cabling

Here very high voltage cabling is routed to the Warrimoo Substation. Large insulators are required for the transfer from underground to overhead cabling.



Very high voltage cabling

High voltage cabling

Normal voltage cabling

*Steel protection of cables
at lower part of the power
pole*

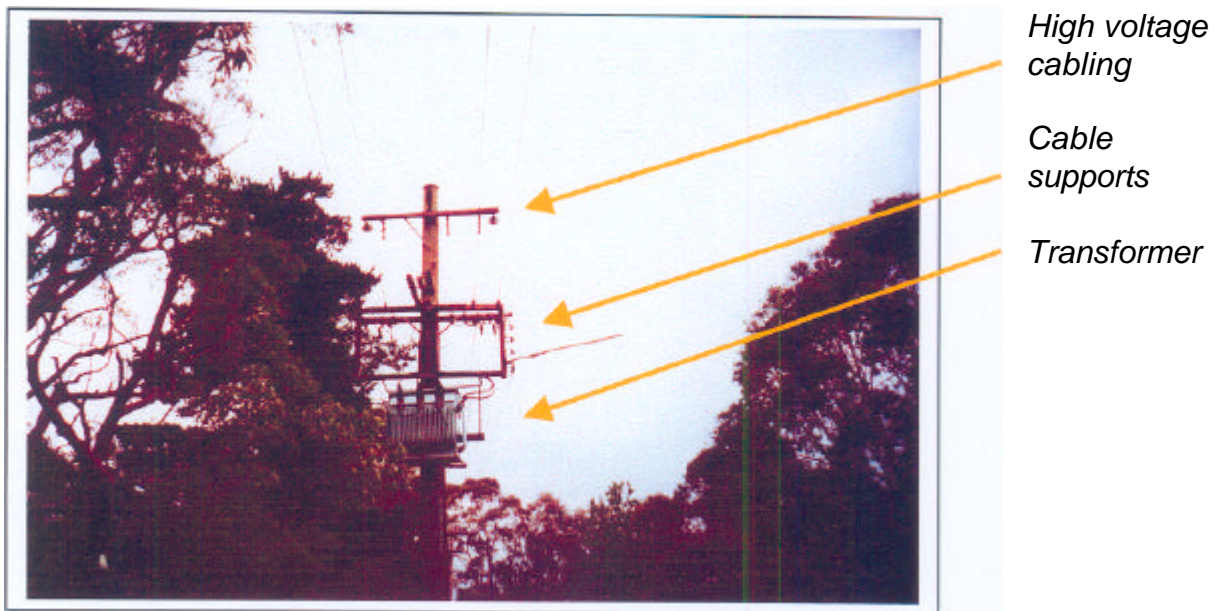
1.3.14 Unsightly ABC cabling high voltage section switches

The power distribution system includes switches. Some of there are pole mounted and have a very high visual impact when used with ABC cabling.



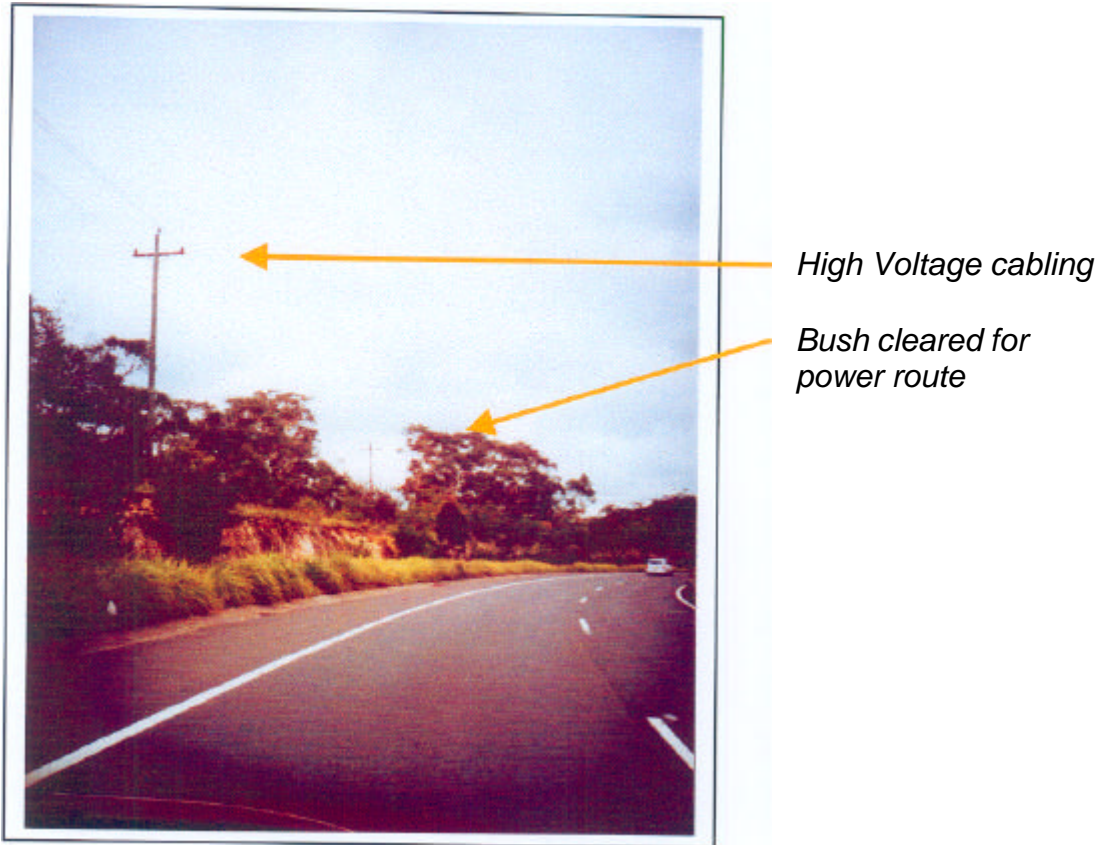
1.3.15 Unsightly street distribution

Pole mounted transformers for street distribution are a real eyesore.



1.3.16 Visual impact of clearing bushland vegetation

The following photograph is taken from the east bound lanes of the Great Western Highway through the Woodford Bends. The Blue Mountains is a very popular overseas tourist destination. Many of the photographs used in this report are located on the Great Western Highway. The visual impact therefore has more significance. Here, bushland has been cleared to provide a route for the distribution cabling.



1.3.17 Owners choose to install underground cabling

Given the opportunity, most people will choose the option to install the clean, neat and tidy undergrounding of all services. The following photograph shows such a situation. The result is a mixture of the benefits of a very visually appealing house and garden but with the negative aspect of overhead power cabling to the property boundary.



Old power pole

Small steel power pole at property boundary

Nature strip, please note currently no footpath but this is likely to change in the future

1.3.19 Unsightly power poles and ABC Cabling

Where there are no trees, the power poles and cabling really stand out. Here the power poles are also used for lighting. This may be seen as a benefit however, locating a power pole close to the road is really unacceptable from a safety point of view. The resultant image is very ugly. Again, this is located on the new \$38 Million section of the upgraded Blaxland to Warrimoo section of the highway.



High voltage power cabling

Normal voltage power cabling

Telephone cabling? As the RTA and Integral were not undergrounding cabling in this section of the highway and the RTA fund the relocation of services it is probable that the telephone cabling also lost out.

1.3.19 Small Pole Mounted Transformer with ABC Cabling



This photograph shows the visual impact of ABC cabling to a small pole mounted transformer. The wooden structure to support the cabling totally dwarfs the actual transformer

High voltage ABC cabling

Normal voltage cabling

Wooden structure

Small transformer

1.3.20 New footpath about to be laid.



A new section of concrete footpath is about to be laid in Lawson. This photograph shows an old power pole restricting the footpath width.

Also, live overhead cables are a concern for workmen when heavy machinery such as concrete trucks and concrete pumps is used.

Old Power Pole

Power Pole restricting footpath width

Ground prepared for new footpath

1.3.21 ABC Over Highway

This item is arguably the most visually unattractive overhead cabling item in the Blue Mountains. The RTA spent \$38Million upgrading the Highway from Blaxland to Valley Heights. It is totally unbelievable that this cabling option was allowed to occur. This shows the total disregard by the supply authorities to providing a quality product.



This picture has a number of interesting features. First it clearly demonstrates the different visual impact of single conductor cabling and ABC cabling. The SRA cabling is still single conductor on old power poles using cross arm and insulators. These power poles will soon need to be replaced and I make comments in regard to joint works further in my report. This picture demonstrates a strange lack of common sense and logic, the power lines needed to go underground to cross the rail track, however instead of maintaining an underground scheme to cross the highway the cable was transferred to overhead. Careful planning would have resulted in a shorter distance of underground cabling.

1.4 Design and Maintenance

In 1995 Integral Energy produced an Environmental Management Manual. Section G, 'Infrastructure Development'; is a very interesting section. The whole of this section is written in a way that implies that the infrastructure will be overhead cabling. For example "Climate -The design of the electrical infrastructure generally incorporates safeguards against lightning strikes, extremes of temperature, high winds and flooding" with the reference to flooding not underground cabling but "A substation is required to be located away from flood prone areas" and "Power lines can often be constructed with higher poles or towers to keep conductors above flood levels"

It is clear that overhead cabling has significant design maintenance issues concerning the areas of :-

- Climate
- Hydrology
- Topography
- Soils
- Vegetation
- Wildlife
- Bushfires
- Visual Character and Sensitivity
- Aboriginal Archaeology
- European Heritage
- Land Use
- Access and Traffic
- Electromagnetic Environment

Of course undergrounding of power cabling does not eliminate these issues however it considerably reduces the problems in these areas.

1.4.1 The Cost Of Maintenance

Maintaining an overhead cabling system has significant cost implications.

Replacement of Power Poles -There is a cost for the replacement of power poles when they reach their life expectancy. There are a significant number of old-power poles which are rotting away. These power poles are monitored and when they reach a state of significant deterioration they are programmed for replacement.

Inspection of Power Poles -There is a cost in the programmed planned inspection of all power poles.

New Power Poles are chemically treated by the manufacturer to protect them from soft rot and termites. Even so they can still become infested. The authorities therefore have a regular program of inspections of all the power poles with the older power poles being inspected on a more regular basis.

Maintenance of Power Poles -There is a cost for the maintenance of power poles. During inspections, or on a programmed basis, it may be necessary to treat power poles using powerful and dangerous chemicals such as Arsenic Trioxide, Preschem Biogard and Emulsified Creosote.

Tree Maintenance -There is a cost for the maintenance of trees. The authorities have a legal responsibility to trim any trees that may come in contact with overhead power lines.



A typical example of tree maintenance

Live power lines

Centre of tree cut off

1.4.2 Topography Issues

Power Poles or Towers close to creeklines or in regularly inundate areas can require the construction of expensive foundations.

1.4.3 Electromagnetic Environment

Shielded Bundled underground cables emit considerably less Electro Magnetic Field (EMF) radiation.

It is reasonable to assume that high doses of EMF radiation or long exposure could cause harm to human cells. Under these circumstances it is wise to opt for the "Prudent Avoidance" principle. That is to select options which minimise exposure. Undergrounding of power cabling is an option for minimising exposure.

1.4.4 Access and Traffic Implications

Installation and Maintenance of overhead cabling involves access and traffic implications. Road safety implications are covered in the safety section. However, there are additional costs involved and time taken is setting up a safe work site for line maintenance, Power Pole Installation and replacement and Tree Maintenance.

Section 2

The implications of Underground Cables including planning required

The most significant change will need to be a change of attitude and culture on the part of the supply authorities. The idea that all planning will need to be for undergrounding of cabling will take some effort. There will no doubt be resistance with excuses such as "Too Much Rock in the Blue Mountains" or "Too Few Resident" in a particular location to justify undergrounding of Power Cabling.

The extent of the undergrounding system needs to be identified. I suggest that all urban areas and all major traffic routes in the greater Sydney area be included. All urban areas should be identified by using the development zoning allowing residential development, offices, factories and shops. Overhead distribution should be planned to be phased out in the countryside with priority given to major traffic routes.

The location of all pad mount substations needs to be planned. Provisional locations could be allocated and then relocated if superior locations are generated as part of any redevelopment in an area. The provisional locations would then enable correct planning to occur in the area. The authorities have correctly identified that ground level transformers take up more usable space than pole mounted transformers. It is important that we do not create a problem by locating these transformers in inappropriate locations. The key to success here is planning.

One concern I have is the Pay TV cabling. The folly of allowing it to be installed on power poles in the first place and now the cost and legal implications of placing it underground. Of course this could be a benefit in offsetting costs if the PAY-TV company also shares the trenching and relocation costs.

Items which need to be addressed:-

- The cost/subsidy/deferred payment and method of installing underground cabling from the property boundary to the house.
- The installation of new street lighting at locations that used the power poles.

- Sale / Disposal of Pole Mounted Transformers. -Is it possible to sell these to other countries?
- Planning for locations of Padmount Substations.
- Do any of the Pole Mounted transformers contain PCB's or other hazardous materials?
- Relocation/undergrounding of co-located cabling such as Pay TV and Telephone cabling.

Section 3

The Costing and Methods of Implementation

The capital cost to underground the cabling system is more than the capital cost to install an overhead cabling system. However *f* there are a number of factors which need to be highlighted:-

1. An overhead cabling system costs more to maintain.
2. Underground cabling costs are higher than necessary because the authorities are structured to install and maintain an overhead cabling system
3. An overhead cabling system is more unreliable
4. An overhead cabling system is more dangerous
5. An overhead cabling system is more unsightly

In order to minimise costs a number of strategies need to be developed. First, a whole of government approach needs to be taken in planning the future.

One significant cost is the trenching and remedial works after. All major Road Works should include trenching and installation of conduit for future installation of underground cabling.

In the Blue Mountains we still have many unsealed roads, and roads without footpaths. Trenching and conduit installation should be performed before the installation of new footpaths or the sealing of roads. Such works would minimise costs.

Water, Sewer, Gas and Telephones are all underground. That statement is not strictly true. Again, in the Blue Mountains some telephone services are not yet underground and we do not have cable TV.

Careful planning and negotiations with cable TV, Telephone Companies and Internet service providers could provide an opportunity to share costs. Currently only Telstra has the local loop infrastructure, that is the physical line from the telephone exchange to the home. There is a possibility of providing cable access for other telephone companies, PAY-TV and Internet. In fact the distribution authorities may consider implementing such system and leasing them to the suppliers of data, PAY-TV and telephone services.

This may be an opportune time to investigate options in providing high-speed data as well as electrical supply to the home. Telstra offer ADSL services which are medium speed (about 10 times faster than a standard modem) Internet connection using the existing telephone cabling. Real high-speed access requires a different cabling system.

A set of strategies need to be developed to :-

- Plan for the future undergrounding of all power cabling.
- Regulate development and planning laws so that all new development has underground power to the property boundary. Included in this is all redevelopment of properties.
- Competition needs to be implemented for the undergrounding of cabling on an area by area basis. This needs to be well planned so that real price benefits can be achieved by not releasing more work than contractors available can undertake.
- Regulations need to be implemented which force the RTA and the SRA to provide underground conduit for underground power cabling in accordance with any planning documents.
- Regulations need to be implemented to force the authorities to underground all new power cabling and cabling requiring relocation or maintenance.
- Planning is required to ensure additional empty conduits are installed to allow future installation of additional cabling to meet any and all future demands. The life expectancy for this work should be 100 years. We do not want roads to be dug up in 25 years time because the current underground cable has been directly buried or there is no room left in the conduit to add another cable.

In this submission I have noted some situations which are Blue Mountains specific: as I am aware of these. However similar situations apply in other areas.

The principle issues is that of minimising costs by taking action now and planning for the future.

Funding Options

I stated earlier in this submission that there needs to be a whole of government approach to the issue of undergrounding cabling. This whole of Government approach also extends to the funding issue.

The Following are a set of ideas on the methods of funding.

From an Increase in Electricity Charges

The primary method of funding is by an increase in the cost of electricity. I propose that the increase be an increase of 3% each year over 3 years giving a total increase of just over 9%. The federal Government should be asked to refund the GST component of the increase. This additional 0.9% would then equate to an amount of just under 10% available for the undergrounding of Power Lines by the power authorities.

In addition, as the increase is only 3% each year it should be able to be absorbed by the customer with minimal impact.

This 3% is in addition to the expected CPI increase.

From An Increase in Council Rates

The next method of funding is an increase of 1 % each year for 3 years on council rates. The council funds should be used by the council to install conduits for power cabling prior to the installation of footpaths, sealing of roads or any other work which would add to the cost of installing underground cabling later. These funds are to be quarantined and totally allocated to the physical work of undergrounding power cabling. The councils would also have to allocate some money from general revenue for the planning, co- ordination and ancillary work involved. After all, this will be benefiting the residents.

From the RTA

The RTA must budget for the installation of conduits on all projects. Currently the RTA pays for the relocation of services. In my proposal the RTA would not fund all the work but only the trenching and installation of the conduits. The supply authorities would fund the actual undergrounding of the power cabling out of their new funds. This proposal has a win-win component in that both parties know exactly their own responsibilities and as such should reduce any conflicts which currently exist. In addition, the end result would be completely satisfying to both parties. The RTA may need an

increase in funding under this proposal as **ALL** projects would need conducting to be installed. However, there is an offset, as many projects would not need the full cost of the relocation of the Electrical Services to be funded.

From The SRA

Again, from a whole of Government approach, the SRA distributes power for the metropolitan rail services. This cabling should also be placed underground. Joint facilities could be developed. For example, one set of trenches could be constructed for the installation of conduits for both the SRA and the supply authorities. The cost would be shared on a 50/50 basis.

From the Civil Aviation Authority

The undergrounding of power lines near airfields and locations and where helicopters, light aircraft, Hang Gliders, Gliders, crop dusters and other users frequent would result in an increase in safety. A small fee should be used to fund works within the "safety radius" of such locations.

From The Federal Government

In addition to the refund of GST on the increase of the electricity charges, the Federal Governments should be approached to fund specific works. Such works would include the undergrounding of Power Cabling to Federal Establishments such as the Army, Navy and Air Force facilities.

From the State Government

Some funds from the State Government should be allocated on a similar basis to Federal Funds.

Appendix 1

Independ Pricing and Regulatory Tribunal

Terms of Reference

INDEPENDENT PRICING AND REGULATORY TRIBUNAL
OF NEW SOUTH WALES

Terms of reference

**IPART Review of the Costs, Benefits and Funding for
Undergrounding Electricity Cables**

This review is to be conducted by the Independent Pricing and Regulatory Tribunal (IPART) under section 9 of the *Independent Pricing and Regulatory Tribunal Act*. The review is to identify the costs, benefits and funding options for undergrounding electricity cables in NSW. In considering these matters, the Tribunal shall have regard to:

1. The level of capital expenditure required for putting electricity distribution cables underground in NSW urban areas (including Sydney and regional centres).
2. The feasibility of undergrounding electricity cables with other utility services including telecommunication, and any economy of scale that can be achieved.
3. A comparison of the costs associated with maintaining the current network compared to undergrounding.
4. The types of costs which are avoided as a result of undergrounding.
5. The distribution and timing of benefits to those who benefit including an appraisal of the overall public benefit to the wider community.
6. Options for funding undergrounding projects having regard to:
 - improvement to the urban environment and public amenity
 - reliability of electricity supply
 - types of undergrounding projects including main roads, CBD/regional centres, shopping centres and residential streets
 - impact on electricity pricing
 - those who benefit and those who pay.
7. The impact on customers and in particular any differential impact on rural or urban customers, pensioners and low income households.

In conducting this review, IPART is requested to:

- provide an interim report to the Minister for Energy in March 2002
- undertake consultation including a public workshop in April 2002
- provide a final report by 10 May 2002.

Appendix 2

**Advert by IPART published in
the Sydney Morning Herald
7th January 2002**

INDEPENDENT PRICING AND REGULATORY TRIBUNAL
OF NEW SOUTH WALES

Undergrounding Electricity Cables In NSW
(Sydney Morning Herald, Monday 7 January 2002)

The Minister for Energy has requested the Tribunal to provide assistance under Section 9 of the *Independent Pricing and Regulatory Tribunal Act 1992* (the IPART Act) in identifying the costs, benefits and funding for undergrounding electricity cables in urban areas of NSW.

The full Terms of Reference can be downloaded from the Tribunal's website www.ipart.nsw.gov.au or by contacting Ms Renee Smith on (02) 9290 8435 or renee_smith@ipart.nsw.gov.au.

The Tribunal invites submissions from interested parties. Submissions should be made in writing and can cover some or all of the terms of reference. There is no standard format for preparation of submissions. Copies of longer submissions should also be provided on computer disk.

All submissions for which confidentiality is not claimed will be made available for public inspection at the Tribunal's offices and via the Tribunal's website.

The due date for submissions is Monday 4th February 2002.

Thomas G Parry	Level 2	PO Box Q290
<i>Chairman</i>	44 Market Street	QVB Post Office
17 January 2002	SYDNEY NSW 2000	NSW 1230

Appendix 3

1996 Response from Integral Energy regarding common Trenching Proposal



25 November 1996

Hon Bob Debus, MP
Minister for Corrective Services, Minister for Emergency Services,
and Minister Assisting the Minister for Arts
Member for the Blue Mountains
Shop 3
107-109 Macquarie Street
SPRINGWOOD NSW 2777



Dear Minister,

Re: Proposal by Mr Michael Parker, 10 Meeks Crescent, Faulconbridge NSW 2776.

Earlier this year you forwarded a proposal on behalf of the above constituent to NSW Minister for Energy, Michael Egan, regarding a suggested strategy for the undergrounding of power lines in the Blue Mountains.

A detailed report by Integral Energy was supplied to the Department of Energy in September, 1996, in reply to this proposal. In addition, Mr Egan has recently reviewed Integral Energy's report on this issue and asked that I respond directly to you on this matter. For your information, please find attached a copy of the report prepared by Integral Energy.

Mr Parker's paper for the undergrounding of power lines in the Blue Mountains region included a detailed proposal on joint trenching with AGL and arguments for a blanket policy on placing all overhead lines underground. Integral's response addresses the main points raised by Mr Parker in his submission, as well as providing an overview of the proactive steps taken to reduce the visual impact of our electrical infrastructure.

I can be contacted on (02) 9853 6102 if more information is required on this matter.

Sincerely,

Alex Walker
Chief Executive Officer

Your contact: Alex Walker Direct: 02 9853 6102
In Reply Quote:
Huntingwood Drive, Huntingwood NSW 2148
Telephone: 131 081 Facsimile: (02) 9853 6000
Postal Address: PO Box 6366, Blacktown NSW 2148. DX 8148 Blacktown
integral@integral.com.au



UNDERGROUND CABLING -BLUE MOUNTAINS

The following report was provided by Integral Energy to the NSW Department of Energy in September, 1996, in response to concerns raised by Mr M Parker of 10 Meeks Crescent, Faulconbridge NSW 2776, regarding the undergrounding of power lines in the Blue Mountains.

This document addresses the points made by Mr Parker in the detailed paper he submitted to Hon. Bob Debus, Member for the Blue Mountains in June 1996.

1. Introduction

Integral Energy agrees that the preference is for undergrounding powerlines. That is the approach that Integral Energy has taken in all new residential areas for the past 25 years. Since 1990, Integral has also spent more than \$12 million on environmental enhancement projects to minimise the visual impact of its network.

While the inclusion of Integral Energy's cables in the AGL's trenches would align with its environmental philosophy, there are a number of factors, including technical and safety issues which make this approach a difficult proposition.

2.0 Problems of overhead power lines

2.1 Security of Supply

The undergrounding of the distribution system to prevent interruptions to electricity supply caused by trees, lightning, winds, other climatic conditions and vehicle impacts is not a panacea to the problems perceived with an overhead system. While it is possible to underground a distribution system, the transmission system will remain overhead and subject to the same elements. The cost of conversion from overhead to underground cannot be justified on the basis of climatic events that are short lived and infrequent.

2.2 Safety

Statistics from the RTA between April 1990 and June 1995, on the Great Western Highway between Emu Plains and Mt Victoria, indicate that 1642 accidents occurred with 67 involving utility poles (power poles, telegraph poles and traffic signals). Therefore, less than 4% of accidents on this busy highway have involved poles. Furthermore, none of these accidents resulted in a fatality.



There is also no evidence of power poles restricting widths of roads through the Blue Mountains.

There are also no known instances of aircraft accidents in the Blue Mountains.

The Coroners Inquiry into the 1994 bushfire did not implicate power lines as a cause of the bushfire. Following the Ash Wednesday bushfires of 1983, Integral fitted "spacers" to all low voltage circuits to avoid clashing of lines and contact with trees in bush locations.

Integral's system is operated so that the EMF levels are substantially lower than the National Health and Medical Research Council's (NHMRC) guidelines permit. Integral also maintains its system in accordance with all international standards and Australian guidelines on EMF .

Placing power lines underground does not eliminate EMF.

There is no evidence of any chemicals used in maintenance leaching into the water Supply. Sydney Water's catchment management officers are aware of Integral's procedures in this area and are more than satisfied with Integral's approach. Chemicals used by Integral are handled strictly in accordance with environmental guidelines and occupational health and safety guidelines.

2.3 Maintenance

Whether the system is underground or not, maintenance is required. The maintenance of an overhead system, however, enables visual examination and assessment of repairs.

2.4 Aesthetics

Integral is aware of its environmental responsibility and has actively pursued a program of minimising the visual impact of existing overhead lines. This approach has included environmental enhancement projects largely involving undergrounding works in areas of maximum community benefit.

Last year, Integral spent more than \$620,000 on such projects in the Blue Mountains, the largest allocation of environmental enhancement funds within our service area.



3. Social perspective of overhead power cabling

4. Blue Mountains issues

Integral Energy agrees that the preference is for undergrounding powerlines. That is the approach that Integral Energy has been taking in all new residential areas for the past 25 years. Since 1990, Integral has spent more than \$12 million on environmental enhancement projects to minimise the visual impact of its network.

It is also worth highlighting that Integral has among the highest proportion of underground cabling in the Australian electricity industry, with approximately 30% of its electrical network placed underground.

Integral is also committed to avoiding any further infrastructure development in the World Heritage nominated area of the Blue Mountains.

The relocation of the electrical assets on the Great Western Highway is the result of a highway widening. The assets are relocated to the property boundary and are replaced with aerial bundled cabling (ABC). This practice has been agreed to with the RTA and the Council over a long period of time. The RTA pays for the asset relocation and provides an extensive landscape screen when the work is completed.

5. Costs

The cost of converting the Blue Mountain's electricity distribution system to underground has been estimated at approximately \$500 million. A cost saving of 40% of this figure could be achieved if it were technically feasible to use joint trenching in an area such as the Blue Mountains. When these commercial constraints are considered, along with the fact that there is already an efficient and effective overhead supply system in the area, it is very difficult to justify an expenditure of approximately \$300 million.

There are also a number of direct costs to the community that would result from undergrounding Integral's distribution network. The cost to each household of converting existing aerial service mains to underground would be in excess of \$600, per home. In addition, sites would be required for the pad mount substations which would replace the existing pole mounted substations. Since the lots which are currently supplied by overhead lines were not laid out to allow for pad mount substations, these would mostly have to be located on the footpath (restricting pedestrian access) or on the front of residents' properties.

None of these impositions are likely to be popular with the residents concerned.



6. AGL

To allow Integral Energy to make full use of the AGL's pipeline route it would be necessary for the pipeline and Integral's main feeder routes to share the same route. While this is the case for some sections, it is not always so. In those areas where it is not, it would be necessary to re-design and possibly re-build the electrical system -in the process losing any advantage gained by sharing trenches.

There are also issues of practicality of using one trench for a number of services The AGL trench is just wide enough to hold the gas line. To include Integral's services, the power line would have to be put either underneath or above the gas line. Either of these options would result in the upper service blocking access to the lower. This would affect both the time required to correct any problems and the number of services interrupted by the work

An alternative to this layout would be to expand the width of the trench to allow services to run side by side. This is the existing way in which services are laid out in underground areas and the additional costs involved would also negate any advantage from using the AGL trench.

AGL also uses electrolytic methods to protect its steel pipeline from corrosion. This consists of passing a small electric current through the pipeline and the ground. Placement of Integral's cables in close proximity to the pipeline results in the current flowing into the electricity cable sheaths and actually accelerating corrosion of Integral's cables.

7. Conclusion

As indicated, Integral Energy is supportive of initiatives to underground electricity cables. This is demonstrated by Integral's undergrounding policy which has been in place for more than 25 years, along with Integral's considerable environmental expenditure for much of this decade. While Mr Parker's joint trenching proposal with AGL has some merit, there are a number of off actors, most notably technical, safety and cost issues, which make this approach an unsustainable proposition.

Appendix 4

**Cutting from Sydney Morning
Herald 28th January 2002**

