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PRACTICAL ISSUES IN LINE CLEARANCE AND STREET TREES

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Abstract

This paper considers the issue of managing trees under powerlines. The management of trees under powerlines is difficult due to the complex nature of streets, community attitudes, government regulations, previous pruning techniques and often poorly selected species of trees. It is very easy for an ill-informed public to be highly critical of management techniques such as removal and directional pruning. However it is essential that the many facets of the problem be discussed in order to appraise and, if necessary revise current management practices.

The causes of conflict and the problems which arise have been outlined and the available strategies assessed. Emphasis is placed on co-operation between local government authorities and the electricity supply authorities to work together to determine economically viable long term solutions. Education and training play a significant role in the management of the problem. On going training of tree workers is essential due to high staff turnover. Education of the broader community and those in positions of responsibility within the local government or supply authority system is also necessary if the conflict between trees and powerlines is to be resolved. Examples are from experience gained in NSW however all States and Territories have the same problems.

1.0 Introduction

The management of trees under powerlines is an extremely complex issue. Whether the trees are in streets in towns or cities or along rural roadsides and paddocks, their management involves the public, local government and all levels of the electricity supply authorities. In many instances it has been a major cause of conflict between all parties.

In all States there is a statutory duty placed on all electricity supply authorities to keep vegetation clear of powerlines. Minimum clearances have been established by all electricity supply authorities depending on the location of the tree (urban/ rural/ bushfire risk) and the voltage and type of the line.

These clearances are required to allow the lines and poles to be maintained in a safe manner and to prevent unauthorised contact and or fires. The implementation of these clearances may lead to some problems for trees, the community and the electricity supply authorities.

2.0 The Problems

2.1 *Economic pressure*.

Throughout Australia, millions of dollars are spent annually by electricity supply authorities and local councils in keeping trees from powerlines. Energex in south-east Queensland has recently increased its annual budget for vegetation management from about $3-4M to about $18M. Pressure can be applied to the authorities by insurance

companies; for example failure to reach the clearances by a certain date may incur a loss of public liability insurance.

2.2 *Aesthetic concerns.*

Traditional lopping practices and unskilfully executed "gully cutting" set phones ringing in council offices and provide sport for the local press. Even relatively sensitive methods of pruning which differ from more radical methods will receive "bad press", particularly from older residents who have grown used to "neatly" trimmed trees on both sides of the street. Other people demand to see trees left alone regardless of what species they are, where they are located, the condition they may be in or the problems they may be causing. It is important to remember that if a tree is genetically programmed to be bigger than the space provided for it (under wires, adjacent to roads and on narrow footpaths) then even with sympathetic and minimal pruning it will never have an entirely natural appearance. Compromises must be accepted by the public and tree workers to ensure a reasonable appearance whilst allowing wires to be maintained.

2.3 *Declining tree health.*

Repeated lopping often results in the decay of branch stubs as well as the production of weakly attached epicormic shoots. The structurally weaker tree is more prone to failure in storms. Regular removal of photosynthetic tissue puts pressure on stored food reserves and places the tree under stress. Gully cutting may pre-dispose trees to sunburn and further secondary problems. Street trees are usually growing in very inhospitable environments; they are subject to pollution, suffer mechanical damage from vehicles, mowers and vandals; have to cope with drought, poor quality and shallow soils; and suffer repeated root damage from trenching, replacement of kerbs and gutters, paving, gas leaks and herbicides. In fact the most significant damage to street trees occurs to their roots.

All of these factors place trees under considerable stress affecting their ability to resist both disease and insect attack. Many of our street trees are already old and declining at a rapid rate due to these stresses. The net result is that trees do not last as long as they should so need to be removed and replaced more often. There is nothing that we can do to make trees live longer than their genetically predetermined life spans, however there are many things that we can do to shorten their lives. This is a cost to the community. Many of these declining trees could be considered hazardous and should be considered in terms of public liability and risk management.

3.0 The causes.

3.1 *Lopping.*

One of the most significant causes of all three major problems ie. economic pressure, aesthetic concerns and tree health, is incorrect pruning or lopping. Lopping in this instance is defined as the removal of branches to a designated clearance and not to a branch collar or other growth point. This approach seems cheap in the short term but the rapid regrowth necessitates many return visits and is therefore expensive in the long term.

This practice is less common now, but was once the prescribed method for clearing branches under power lines. Old lopping practices will dramatically influence the pruning technique required for current clearances.

The effects of lopping on the tree include rapid production of weakly attached vertical and vigorous epicormic shoots. In field work throughout NSW and Queensland, it has been observed that the rate of regrowth is commonly between 10 and 30 times the normal growth rate for that species in that situation. It is always extremely useful to look for normal extension growth and point this out not only to the tree workers but also to the supervisors and engineers who may be responsible for the works.

The practical significance of this style of pruning is that trees are debilitated over a long period of time and may become hazardous and or unsightly; the natural habit of the tree is destroyed; the rapid regrowth requires many return visits; large volumes of material must be tipped or chipped (ongoing expenditure or major capital outlay); and due to hormonal imbalances between shoots and roots, root growth may be stimulated thus causing other problems such as pavement upheaval and drain blocking. The removal of horizontal or lateral branches, extremely functional branches on street trees as they provide most of the shade and screening, leads to difficulties in reworking the tree. Even trees well chosen for the site and mature height and width can be rendered an ongoing maintenance problem by repeated heavy lopping (eg. *Prunus* spp, *Callistemon viminalis*).

The human impact is one of conflict between the public and the tree workers; many electricity workers have been threatened verbally or with various weapons. Most tree workers consider lopping to be a frustrating and never ending chore. Few tree workers really feel good about leaving the trees as stubs on a trunk. However, a significant problem is that to the average non-discerning "person in the street" the fact that the trees eventually "come back" and have a "neat" appearance seems to reinforce the idea that this is an acceptable practice. Many people have come to expect (and sometimes demand) that street trees look like "apples on a stick". The quantity of the regrowth belies the poor quality of the branch framework.

3.2 *Poor species selection and planning.*

Perhaps the other major cause of the problem is that the wrong trees were planted under wires in the first place. The Australian native revival era of the 1970s saw many *Eucalyptus* spp, *Melaleuca quinquenervia* and *Casuarina* spp planted directly under existing powerlines. Other single leader (excurrent) trees such as *Liquidambar styraciflua, Grevillea robusta* and *Araucaria heterophylla* are commonly found under wires throughout the State. Inappropriate species combined with lopping have led to a no win situation of ongoing pruning costs and hazardous, unsightly trees. It is extremely difficult to directionally prune a *Eucalyptus citriodora* away from powerlines yet these and other Eucalypts continue to be selected and planted under wires by local councils and individuals.

Broad-domed (decurrent) trees are the best shape for under-wire planting and lend themselves to early training and directional pruning. Unfortunately. early training and maintenance are often neglected by those responsible for tree planting.

In many suburbs and country towns there seems to be an extraordinary number of streets in which the only significant trees are on the same side as the powerlines. However it is not always that tree planters get it wrong. The location of new services

should involve avoiding conflict with trees as much as possible. Existing trees should be considered when designing street lighting.

3.3 *Blanket clearances for all species.*

Whilst the clearances set down by the Electricity Council of NSW and other authorities are guidelines only, most electricity authorities have adopted them. The traditional measure of the clearance plus "three years regrowth" appears to have been based on regrowth after lopping. Many engineers believe that trees grow at phenomenal rates. In some Sydney suburbs it was common to find clearances of 5 metres under low voltage lines. In other areas bushfire clearances are taken to the suburbs. Some species that in most localities would barely reach the low voltage if left alone (eg. *Prunus cerassifera* 'Nigra', *Callistemon viminalis*, *Lagerstroemia indica*) are stimulated to grow into the wires after lopping. Whilst technically these trees will grow into the clearing space they require only minimal pruning if they do approach the wires. Similarly the slow growth rate of most conifers does not necessitate radical pruning and huge clearances. It is essential that tree workers be trained to identify natural extension growth.

3.4 *A dynamic streetscape.*

Another important point to consider is that whilst many trees may have been well suited to their positions when they were planted decades ago, road widening, increased traffic flow, larger vehicles in streets, sealed road shoulders, sealing of pavements, renewal of kerbs and gutters, replacement and maintenance of underground services as well as unsympathetic pruning may now mean that the species is unsuitable in this altered environment due to its deterioration or the loss of available space. The costs of maintaining these trees may outweigh the benefits derived from them.

3.5 *Lack of training and understanding.*

Imagine in these days of multi-skilling that you are told to be a mechanic for a week. You are given the cars with the instructions that they must be fixed by the end of the week. However no-one has told you how a car functions and therefore how to deal effectively with the problems. This has been the case for many electricity workers (linesmen, linesman's assistants and labourers) for many years....here are the trees, here are the clearances, get on with it. To make matters worse these workers are often abused by their supervisors, the public and the press for simply doing what they were told to do. In many cases the tree is then seen by the worker as the enemy and is treated accordingly. Nobody wins. .

Likewise engineers, the public and the press are also generally ignorant of the biology of trees. The public also has little knowledge of the requirements of maintaining their power supply. In fact all of our problems with trees and powerlines are really 'people problems'.

3.6 *Poor specifications and lack of skilled supervision.*

In the past, the required clearances were shown as straight lines across the tops and or sides of trees. This was then taken very literally by those people doing the work. The next phase of diagrams drawn up by electrical engineers or supervisors have shown the centres removed from trees often perfectly concaved. More recently better

specifications have been drawn up by a few organisations using people with some horticultural background and experience in line clearing which show a range of appropriate options. However unless these guidelines are followed and supervised in the field, the pruning habits of many operators will never change. A significant problem in many county council depots is that an "old hand" who was very much a "lopper" is now the leading hand responsible for the supervision of the tree work. Despite attendances at courses, old habits die very hard.

4.0 The management options.

There are a number of management options which need to be considered. There is no one solution which can be applied to all trees. It is extremely difficult to manage something if you don't know where it is, what it is and what condition it is in. The most logical starting point in this complex tree/ powerlines/ street management problem would be to carry out a full inventory of all trees (street trees and those in adjacent properties) in relation to powerlines, poles and street lighting The most systematic and practical approach with a large population of trees would be to assess them on a street by street basis rather than on an individual tree basis (although individual trees must be considered when establishing the condition of the street population) and then apply the most appropriate treatment for example removal and replacement, aerial bundled cables, pruning, training etc. In all cases the treatment should reflect the cause.

All management options will incur some cost. The challenge is to deal with the problem in the most cost-effective manner (particularly in the longer term) with the limited financial resources that are available at any one time.

4.1 *Trained operators and supervisors.*

A major key to dealing with the conflict between trees and people and powerlines is to train and educate people in the ways of trees. Since 1984, Ryde College of TAFE in Sydney has been directly involved with the training of many local and county council employees throughout the State. The initial request came from Sydney Electricity who had received much flack from the public after pruning for greater clearances after the "Ash Wednesday" fires of 1983. Initially the course was based on a pre-existing Arboriculture short course of 72 hours. After courses in Sydney and Tasmania this was honed down to the present 30 hour `"Tree Care for Electricity Workers" course.

My colleague, Bruce Macleod, and I have delivered over eighty courses to many electricity supply authorities throughout NSW, Queensland and Tasmania and we are convinced that the format provides a good basic understanding and appreciation of trees in the landscape whilst providing a sound theoretical basis for the practical component. Originally, the course was directed at linesmen and other electricity workers or local council employees who were skilled in electrical matters but had little knowledge of trees. Most electricity distributors have moved away from using their own electrical staff for line clearance and have engaged private contractors. The "Tree Care for Electricity Workers" course is now the minimum arboricultural training required by Energy Australia, Great Southern Energy, Integral, Northpower and Energex for any contractors engaged in line clearance.

The pruning technique carried out in the course is described below but essentially involves the selective removal of terminal shoots back to the branch collars of lower laterals, ie. reduction pruning. American literature describes the technique as lateral,

natural or drop crotch pruning (Goodfellow *et al*, 1987, Johnstone, 1988 and Harris, 1992).

In addition to the training sessions for the workers, it is also recommended that a brief seminar be held for engineers and supervisors from both the electricity supply authority and the local councils as well as elected councillors and other interested parties. The aim of this session is to present an overview of the problem with possible management strategies from an independent viewpoint. These have been successful in opening up lines of communication and demonstrating goodwill between the various parties. In fact one of the most frequent comments by participants in the full course is that "the boss" should hear the same story otherwise work instructions are unlikely to change. It is essential that anyone responsible for the supervision of the pruning be up to date with the latest techniques.

The most successful courses have been for electricity supply authorities who have taken the problem seriously and have supported it from the General Manager through to the labourers on the tree crew.

The rewards for co-operation and communication between local council and electricity supply authority are savings in tree trimming costs. A documented example is from Central West County Council for the town of Forbes. The tree trimming budget was 600 hours to prune the trees in the town. After the first course it was carried out in 320 hours and has since averaged around 150 hours. It was obvious to the superintendent that there would always be some pruning but that it was more manageable. Three added bonuses were that there was much less material to be disposed of at the local tip (no chipper), there were no calls of complaint from the public and the people doing the work were much happier working on the trees. However if the rewards are to be truly long term, ongoing training for new staff and refresher courses for others is essential.

4.2 *Correct pruning techniques by trained operators.*

Pruning can be defined as the directed and purposeful cutting of a plant towards a predetermined end. It is the selected removal, for a specific reason, of any part of a plant. In this case, the removal of branches which do or may interfere with powerlines, poles or street lights. All pruning is at a biological cost to the tree so all pruning should only target the problem area.

In the early days of the "Tree Care for Electricity Workers" course the learning curve for us was extremely steep. Horticulturists are vocal critics of most street tree pruning as the result often looks nothing like the tree in the textbook; there is nothing like having to make real decisions on a site to change one's perspective. The early methods involved removing stubs and branches back to branch collars with particular emphasis on the area beneath the wires. This tended to leave a relatively bare centre with 'wings' ie. a technique sometimes referred to as "gully" cutting. This technique allowed lots of light into the centre which encouraged more epicormic shoots. Whilst these epicormic shoots were perhaps slightly less vigorous than those from lopped stubs they still presented a problem. The general response was to remove them entirely.

By returning to the same areas it became clear that leaving large gaps was unsatisfactory on two counts - light and regrowth as well as aesthetics. Since about 1986 we have been training tree workers to 'tip back' shoots to lower laterals, ie to use the practice of "reduction" pruning as defined in AS4373 *Pruning of Amenity Trees*. This process is described below. Another step in the learning curve has been to realise

the significance of the timing of the tip pruning particularly if the tree has been heavily lopped.

If trees have not been pruned, early training or formative pruning of suitably shaped young trees is the most successful long term method of pruning under powerlines. This involves removing the central leader and other apically dominant shoots down to lower lateral branches. However, for this method to be successful it requires sound knowledge of the growth characteristics of the particular species.

This method of pruning appears to be most successful with most species that are apically controlled in their juvenile phase and which then become co dominant in maturity - the most common examples would be *Platanus, Fraxinus, Pistacia, Pyrus* etc.

(This method is not recommended for *Jacaranda mimosifolia*. The pruning of Jacarandas is best left until they are within 1-2 metres from low voltage lines. In most parts of New South Wales this species will be in its mature form by then - that is broad-domed and the growth rate relatively slow. At this stage smaller branchlets can be removed back to branch collars without opening up the canopy too much and therefore stimulating vigorous epicormic shoots.)

Early pruning takes little time, leaves small wounds, requires unsophisticated equipment such as pole-pruners, creates little rubbish and achieves long term time savings in future pruning but unfortunately is rarely carried out bv the people responsible for planting the trees.

Reduction (lateral/ natural/ drop crotch) pruning is much more difficult to achieve in trees which have been lopped for decades. In this case the aim is usually to slow down the rate of growth and to attempt to rebuild a framework of lateral branches within the tree. In a severely lopped tree, the procedure may include the removal of dead or unproductive stubs from immediately beneath the wires, the thinning of the most vigorous regrowth from other stubs and or the "tipping back" or reduction of some shoots to lower laterals or buds. Whenever possible all horizontal branches and non-problem branches are left alone and an effort is made not to open the canopy too much. This process is repeated on all return visits.

Selective reduction pruning of regrowth leaves the tree looking more natural than lopping or gully cutting however it is inevitable that there will be a dip beneath the powerlines. To satisfy the desire for "neatness", that is to trim or "round over" the entire tree, could not be considered cost effective. Reduction pruning leaves no stubs, minimises suckering, eventually slows the growth rate to normal, removes less foliage, recognises aspects of tree health, has less impact on roots and stored reserves and is generally a more satisfying pruning practice to use. The long term aim is to reduce the number of return visits to the tree and or the time spent at the tree. It is important to realise that reduction pruning does not negate the need for future work.

It is difficult to achieve the final desired effect after one pruning and the process may take several years. Unfortunately few of the electricity supply authorities have kept accurate records of gains in productivity as a result of improvements in pruning practices. Most would agree that savings have been made, however other innovations such as bundled cable and tree replacement programmes have also contributed to overall improvements.

Two overseas trials demonstrate the savings that are possible and provide a sound basis for producing planting and pruning guidelines for local authorities. Johnstone

(1988) reports on a study of productivity gains achieved over 5 years due to improvements in scheduling, supervision and lateral pruning rather than lopping. Another study by Goodfellow, Blumreich and Nowacki (1987) looked at the branch and sprout response of six species of street trees over a number of growing seasons following different pruning techniques. Not only did this confirm that pruning to laterals reduced regrowth when compared to lopping it also highlighted a number of species where regrowth was too rapid, even after lateral pruning, to be considered economically viable to retain in streets.

The absence of local data reinforces the need for a much more systematic approach to information collection and processing. In particular attention should be paid to surveying the tree population - age, species, condition, previous pruning/ growth regulator treatment; detailed recording of tree-related power failures - whole tree failure, branch in storm, 'summer branch drop', included bark, tree species and age, other factors such as root damage; and relating this information to other activities which may be happening in the street through the activities of the local council and other service authorities. This would enable more efficient scheduling of appropriate works (removals, bundled cable, pruning), identification of problem species, targeting of hazardous trees, and opportunities for cost sharing if major redevelopments were scheduled for particular areas.

4.3 *Selection of appropriate trees.*

Overhead powerlines are a major constraint in planning street plantings. An easy way out is to plant low growing shrubs however shrubs generally do not allow adequate visibility nor do they provide enough scale in the landscape. Single leader trees are inappropriate as are tall-growing, open-habit eucalypts. The best shaped tree is domed as it not only provides shade but, due to the branching habit, allows any necessary pruning to be carried out early and in a more sympathetic manner.

The selection of trees is in itself a complex process as there are many other constraints within a streetscape and many aesthetic and functional requirements to be considered. Local councils have hundreds of kilometres of trialing grounds at their disposal (streets, parks, reserves, schools) where many potential new street trees can be tested under local conditions. Perhaps botanic gardens could be approached for new and exciting material to broaden the generally boring and conservative pallet of trees in most suburbs. Many rural towns and cities have shown greater imagination than their urban counterparts.

In a number of joint ventures, several electricity distributors in NSW and Queensland and the relevant Nurseryman's Associations' have developed a plant tag indicating the suitabilify of tree species for planting under powerlines, These should be placed on small growing trees rather than on small shrubs. Integral Electricity has established a display planting of its recommended "Low 50" trees and shrubs and other distributors are planning similar plantings.

It is important to mention that a species of tree is not necessarily a problem if the reason for its failure is due to poor management techniques such as lopping. To discard a species because it regrows quickly after lopping is certainly to "throw the baby out with the bath water'.

4.4 *Removal of inappropriate trees.*

Trees that no longer serve a function in the landscape or which are too expensive to maintain or which are beyond redemption by selective pruning or those which are hazardous may need to be removed. All things die and street trees tend to deteriorate more quickly than trees growing in more ideal environments. Whilst this option appears to be unpopular with many people there is no escaping its inevitability. Trees have the wonderful advantage of being a relatively easily renewed asset. It is possible and indeed necessary to start again. It is, however, necessary to define what constitutes a tree that is beyond redemption!

Any removal option considered by the electricity supply authority requires consent and consultation with the local council. Advertising the intent to remove trees to the public and the reasons for doing so are also important. Depending on the constraints in the landscape it may be decided not to replant. The trees in question may be adjacent to a park or a school with well established large trees and so it may be unnecessary to put new trees into the street.

4.5 *Power supply options.*

Many people say "Put the wires underground." In new sub-divisions this is the usual option with the additional cost borne by the developer. However, where existing overhead wires occur the cost of placing those services underground is approximately five to ten times more expensive than conventional overhead wiring. The reality of undergrounding in an established residential area is that trenches would be dug on both sides of the street, across roads and into private properties (ie. through driveways, footpaths, tree roots, other services etc). Considering the number of pre-existing underground services, locating new ones may be a problem in some areas. In 1993, the then Prospect Electricity estimated that it would cost $1.96 billion to convert their 300,000 domestic customers to full undergrounding of existing overhead systems (Anon, 1993b). This could only have been achieved by doubling consumer's electricity bills for the next ten years and so it was not a viable option. In a few instances where the cost can be justified, poles and wires may be relocated to avoid trees. Improving technologies such as directional boring may see the undergrounding of powerlines becoming more cost-effective.

In a policy statement by Sydney Electricity in 1993 it was stated that it was pursuing a programme of converting overhead 11kV (high voltage or HV) to underground in instances where reliability of supply is in doubt particularly where four or more tree failures occur annually and where the recurrent costs for repairing storm damage are high. Where undergrounding is required by a local council in the broad community interest such as around foreshores, historic areas and similar then it is done on a 50/50 cost share basis with the council. At that time almost 62% (4709km) of the existing high voltage mains have been undergrounded. All new HV construction in urban areas will also be undergrounded.

Perhaps the most potentially useful innovation is the use of aerial bundled cable (ABC). The policy of most electricity supply authorities is that all new low voltage (LV) overhead construction will use ABC. New generations of both low and high voltage ABC are being developed and trialed. Standard HVABC is particularly heavy and expensive so its use has been generally limited to densely treed locations. However Integral has adopted HVABC as its standard overhead conductor for new lines and augmentations in urban and rural residential areas up to 11kV (Anon,

1993a). Projects are underway with individually coated and insulated high voltage lines which are less expensive.

ABC has a number of advantages in terms of tree management; clearances range from 0 - 500mm depending on branch diameter; cross arms are eliminated from poles thus reducing the extent of side clearing; and in some cases the poles are removed entirely and the cable placed on buildings. However, the installation of bundled conductor is not costeffective for trees beyond remedial pruning.

4.6 *Co-operation between electricity supply authorities and local councils*.

In many towns, cities and suburbs it appears as though the electricity supply authorities have had to assume responsibility for the management of trees in the proximity of powerlines. Many electricity distributors get no help from their constituent councils, financial or otherwise, in tree management activities. This situation hardly seems fair when "ownership" of most trees in streets would be vested with the local council.

Both Energy Australia and Integral Electricity have developed initiatives to foster cooperation between themselves and their local constituent councils. These have included offering local councils subsidised rates on the replacement of existing open-wire constructions with ABC. Other initiatives have been to fund tree removal and replacement programmes and, in the case of Integral Electricity, the establishment of Customer Environmental Liaison Committees.

A similar approach taken by Seattle City Light has been documented by Barnes and Greenlee (1991). In 1988 this electricity supply authority established a Citizens' Advisory Forum on Tree Replacement. The forum was charged with the development of policy recommendations for the removal and replacement of trees that interfered with powerlines. The recommendations they made included an inventory of all trees, analysis of the information with respect to current and alternative pruning practices, guidelines for deciding when to remove a tree, the establishment and implementation of a tree replacement programme, development of training programmes for inspectors and pruning crews, customer involvement and responsibility as well as funding options. Test site locations have been established to put these recommendations in place and these continue to be monitored and the programme modified as needed. The overall conclusion by those involved was that everyone in the community need to be involved and committed to take some part in correcting the conflict between trees and powerlines.

4.7 *Lost opportunities*.

How much effort, energy and money are we expending on depressingly mismanaged mistakes. A quick look around any suburb or town would reveal many opportunities for tree planting where there are few constraints. Wide grassy nature strips with no overhead powerlines, edges of playing fields and schools are all available for exciting plantings of a diversity of trees and shrubs to bring nature and interest back into the city. In these times of Greening Australia, Landcare and greater environmental awareness perhaps these areas could be targeted by local councils and electricity supply authorities as multifunded community projects. This is an area in which TREENET clearly has a role.

5.0 Conclusions.

There is clearly no easy answer to resolving the conflict between trees and powerlines. At present the balance of the responsibility for managing trees beneath powerlines appears to be borne by the electricity supply authorities. Most of the initiatives be they staff training, improved pruning techniques, community liaison, removal and replacement programmes or aerial bundled cable have come from the electricity authorities rather than local Councils. Is this reasonable?

A much more systematic and mature approach to tree management is required by all parties concerned. The benefits of carefully planned, implemented and updated tree inventories cannot be understated. The identification of those trees which have little function and that are a continual drain on limited budgets should be targeted for removal and if necessary replaced. Similarly those areas where pruning costs can be off-set by the installation of aerial bundled cable should be high on the agenda. Responsible tree planting by local councils, particularly exploiting the lost opportunities of areas without powerlines, would also contribute significantly to better and more cost-effective streetscapes.

What is clear is that gains have been made in the last decade and with on-going training, greater and more fundamental co-operation between electricity supply authorities and their constituent councils, and education of the general public that the situation can only improve.

(Note: This paper is an edited and updated version of "Powerlines and Trees can Work Together" presented by Judy Fakes at the 1994 RAIPR Conference in Canberra.)

A more detailed account of the pruning techniques used in the "Tree Care for Electricity Workers" course can be found in Fakes, J (1997) "Pruning for Powerlines", Arbor Age, Vol.2 No. 2 pp 18-24.

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