

Board of Inquiry into  
the Occurrence of Grass and Bush Fires  
in Victoria February 1977

Excerpt from Transcript

Wilson and James recalled. pp1426 to 1508

from Item "Day 27 - 29 Transcript of Proceedings"  
and Item "Day 30 - 32 Transcript of Proceedings"  
Unit ref: VPRS 9823/P0002/12

THE BOARD: You, Mr. Barnard and Mr. Castan, are back in your capacity as appearing for whom this time?

MR. BARNARD: I am back in my capacity for both Strestham and Strathmore.

MR. NIXON: I propose to tender the oscillograms from yesterday's tests.

EXHIBIT 199 ..... Oscillograms from tests conducted on 11/5/77.

MR. NIXON: Before Mr. Wilson is called, I think Mr. Marks wishes to say something.

MR. MARKS: Just to let you know, sir, what I have just found out about, Mr. Wilson did some more research as a result of Mr. Lloyd's cross-examination the other day on instances of flash-overs, or the relationship between burning off under wires and flash-overs. He has that, but it has to be put in another context in that in the list of files we shall be giving you in the analysis, it will appear that there are eight files which are related to lightning arresters; in other words, that there are eight fires associated with the failure of lightning arresters over a period since 1959. I am having those files brought up here. It was a misunderstanding. I thought they were coming up here. But they will be here in a few minutes. The point about it is that what is for the theory that is going to be put forward has to be put in the context of what is against the theory. In other words, it is obviously relevant to know the circumstances in which lightning arresters have been associated with the commencement of fires, and it will be necessary, I should think, to look at the files. I would think Mr. Nixon certainly would want to look at the files to see what is in them. I myself do not know. Mr. Wilson has had a look at them, but he should have them in front of him. I had proposed to ask your leave to perhaps re-open the evidence he gave on that matter, to put it in context.

THE BOARD: Yes, very well.

MR. MARKS: It is a question of whether the files will be here in time. But he can tell you what is in them, and then Mr. Nixon can have a look at them and cross-examine at any time that is convenient.

MR. NIXON: I would suggest that this might be a convenient way of dealing with the matter, that is, that this matter be left in abeyance until the files are produced and until I have had an opportunity of looking at the files, either on my own or with Mr. Wilson, and that matter could be dealt with on Monday or at some other convenient time.

THE BOARD: Mr. Lloyd, as a lot of this arises out of his cross-examination, might want to have a look at them too.

MR. NIXON: Yes, indeed.

THE BOARD: Is that all right with you, Mr. Marks?

MR. MARKS: Yes, certainly. We shall co-operate. We shall be, within the next 48 hours, providing the complete list going back to 1959, and although we were asked to produce the files, I suggested to Mr. Nixon that we circulate the list and see what files are required.

10/02/2009

12-15  
13-13

12-15  
11-11

24x30

THE BOARD: That seems a good idea.

MR. MARKS: And I shall call the man who compiled it, Mr. Kirk.

(Page 1428 follows)

10/02/2009

MR. NIXON: I would indicate that the SES will be represented here in due course. Mr. Shannon, of Counsel, has been briefed, and he wishes to make some submissions about the part played and to be played by the SES.

ANTHONY THOMAS WILSON, recalled and further examined:

MR. NIXON: Mr. Wilson, your full name is Anthony Thomas Wilson?  
---Yes.

You are the Distribution Engineer, Distribution, for the S.E.C., and you live at 13 Neville Street, Mentone, is that right?  
---That is correct.

You have prepared a statement in some detail about relevant matters to this Board; would you read that statement and at any stage that you consider desirable, use the blackboard and any diagram you consider will be of assistance? I think your history has been given in other evidence so if you could start with the second paragraph?---Very well.

The purpose of this statement is to explain the way in which the distribution system operates, the philosophy and practice of protection in the distribution system and, in particular, those facets associated with supply to the Glenthompson area and the Glenfraser Spur. Further, it includes a compendium of data regarding standards for protection equipment and fuses procured for and in use by the Commission and an outline of the historical development of the types of fuses used and a description of those currently available from manufacturers. Finally, a summary will be given, on the basis of the evidence available to the Commission and the Inquiry, of the events on the distribution system associated with the Glenthompson fire of 12 February 1977.

#### 1. DESCRIPTION OF SUPPLY TO GLENTHOMPSON

The distribution system associated with supply to Glenthompson is shown on the attached figure 1 in simplified form.

For clarity, I have had these major figures expanded and they are available without having to look at your own copies.

As with many of the rural distribution systems, it is very complex, having many spurs and sub-spurs emanating from the main 22 kV feeder, many of which are the source of supply to s.w.e.r. feeders. The actual system is shown in figure 2, figure 2 being, in fact, four diagrams pinned together in the submission.

Referring to figure 1, from the Hamilton zone substation (HTN) a 22 kV feeder (HTN3) comes from the 22 kV busbar via a 22 kV circuit breaker. A circuit breaker is an automatic high capacity switch capable of interrupting the high currents associated with faults near the zone substation. This particular circuit breaker is an English Electric model OKD1B, capable of interrupting currents as high as 6500 amperes.

Protection equipment associated with the circuit breaker continuously monitors the current in the feeder. When the current exceeds a preset minimum level, in this case 160 amperes, indicating that there is a fault or overload in the feeder, the protection equipment commands the circuit breaker to open. The equipment includes single shot auto-reclosure, which means that following the opening sequence of the circuit breaker

12.YE/AC.  
Fire.

1428.

WILSON, Rec.

10/02/2009

12-15  
11-11  
10-10

24x30

initiated by the protection there is a time delay of 3-5 seconds and then a command is given to the circuit breaker to close again (or reclose). Should the fault still exist, the circuit breaker will open again and remain open until manually closed.

It is important to realize that the protection equipment associated with the circuit breaker can only detect faults on the main feeder or on spurs off the main feeder close to Hamilton. It cannot "see" faults through isolating transformers into the s.w.e.r. system as the currents associated with faults in the s.w.e.r. system cannot be distinguished, at the point of measurement, from normal load current fluctuations.

MR. MERKS: I was wondering whether it is desirable to have interruptions as Mr. Wilson goes along. That paragraph caused us some difficulty and we had it explained in other language. Mr. Chairman, do you think it is better to let him read the whole statement through first or do you think he should be stopped as he goes along?

THE BOARD: I am inclined to think he should read it through first and people can take notes as they go along, unless there is something so fundamental that it must be known before we proceed to the next paragraph?---I think it might be useful to break at that point and explain why that is so. The voltage that is on the feeder, the 22,000 volts, is approximately constant at Hamilton. As we go along the feeders, the impedance to the flow of current will increase with distance because we are putting more wire and, therefore, more impedance or resistance into the circuit. A fault close up to Hamilton, therefore, is associated with very little impedance and therefore is a very high current. As we get further out along the feeder, the impedance gets greater and therefore the current gets smaller, because the two are related by a very simple formula, that current equals voltage divided by Z for impedance, so as this gets bigger, associated with the distance, the fault current becomes smaller. In addition, each transformer has a significant impedance compared to lines, so a fault on the other side of the transformer from the feeder will have another induced impedance to the transformer, thus resulting in a lower fault current again on the feeder.

(Page 1430 follows)

12. YE/AC.  
Fire.

1429.

WILSON, Rec.

10/02/2009

24x30

THE WITNESS (Continuing): Approximately 2 km along the feeder, where already several spurs and transformers have diverted supply to other areas, is an oil circuit recloser. This device is similar in operation to a circuit breaker in that the protection equipment associated with it continuously monitors current through the recloser. The recloser has a minimum detection level of fault current of 70 amperes and can therefore only "see" or detect faults along the main feeder or in 22 kV spurs. Fault currents flowing in the feeder due to faults on the 12.7 kV side of isolating transformers would be too small to be detected. The recloser, as its name intimates, once having opened, remains open for a few seconds and then recloses. This cycle of open, pause, reclose, may be repeated four times before the recloser locks out in the open position.

Approximately 14 km from Hamilton there is a voltage regulator in the line. This piece of equipment regulates the voltage to ensure that adequate voltages are maintained further down the feeder. It compensates for the variable voltage drop that occurs as the load fluctuates during the day.

The spur that supplies the area near Lloyd's farm is known as the Glenfraser Spur and it "tees off" from Feeder HTN3 about 44 km from Hamilton. A 5 ampere EDO fuse unit on the 22 kV side of the isolating transformer protects the system from faults in the transformer and along the 12.7 kV spur. As it is a relatively short spur, there is no need for a fuse on the 12.7 kV side; the 22 kV fuse being capable of opening for faults even at the remote end of the spur. There are a total of 7 s.w.e.r. substations on the spur, the second of which, at Pole 11, about 2 km from the isolating transformer, supplies the Lloyd property.

At Pole 11 there is a 2 ampere K type clamp-on fuse on the high voltage side of the 10 kVA s.w.e.r. transformer and 55 ampere low voltage fuses in each of the 240 V actives used for supply. I shall deal with the co-ordination and potential operation of these fuses in a later section.

## 2 ILLUSTRATION OF FAULT CURRENT MAGNITUDES

To illustrate some of the practical outworkings of the protection of the distribution system associated with supply to Glenthompson, figures 3-10 show currents in the network for various system conditions, including faults at given locations.

Figure 3 shows the maximum load currents that flow in the various parts of the system, 120 amperes at Hamilton, 50 amperes at the Kyle Recloser, 20 amperes in the 22 kV system near the Glenfraser Spur isolating transformer, 3 amperes in the 12.7 kV s.w.e.r. system of the Glenfraser Spur, 1 ampere in the 12.7 kV side of Pole 11 s.w.e.r. transformer and up to 40 amperes in the low voltage private service lines to the Lloyd's property.

Figure 4 shows the current at zone substation HTN for a fault on feeder HTN3 just outside the substation. This current of 1300 amperes would result in the opening of the HTN3 circuit breaker.

Figure 5 shows the current that would flow in feeder HTN3 for a fault on the load side of the recloser.

10/02/2009

24x30

This current is above the minimum operating level of the circuit breaker protection and the recloser protection. These are designed, or co-ordinated, such that the recloser will respond first, opening the circuit and thereby clearing the fault. Normal supply will thereby be maintained to the part of the system between these two points.

This question of co-ordination will be more fully described later, but as can be seen from this example, its purpose is to ensure that the faulted part of the system is disconnected and normal supply retained to as much of the rest of the system as possible.

Figure 6 shows the currents flowing in the system for a fault on the 22 kV side of the Glenfraser isolating transformer. Again, it should be noted that the recloser will operate to disconnect the fault.

Figures 7 and 8 respectively show the currents flowing in the system for a fault on the 12.7 kV side of the Glenfraser isolating transformer and a fault on the 12.7 kV system near Pole 11 of the Glenfraser Spur. Here it should be noted that the resultant currents in the 22 kV system are lower than the minimum current for operation of the recloser. In these cases the fuse - and by the fuse, I mean the 5 amp type K EDO fuse associated with the Glenfraser isolating transformer - would disconnect the fault from the system.

Figures 9 and 10 respectively show the currents flowing in the system for active to active and active to neutral faults on the low voltage side of the s.w.e.r. transformer on Pole 11. The resultant protection operations in this case will be more fully described later.

### 3 PROTECTION PHILOSOPHY

Each fuse, recloser or circuit breaker in the distribution system is designed such that it will disconnect the part of the system for which it is "responsible" should a fault or excessive overload occur in that part of the system. The part of the system so protected is termed the "zone" of the device. In many cases, through either specific design or because of the electrical characteristics of the system, these zones overlap. This overlap has the advantage that should the protective device nearest the fault fail to clear the fault, the next device back towards the source of supply in the system will "back-up" its operation and ensure that the fault is eventually cleared.

Fuses are basically a thermal device that operate on the principle that the higher the current the hotter they get. At some particular current level, termed the minimum fusing current, the element will eventually melt and open the circuit. In terms of definition, the time for which this current must be capable of being carried is defined as one hour. The size of the fuse or its rating is set below this - I think that is fairly obvious as the fuse requires to carry that sort of current for years, not merely one hour - and is related to it by an arbitrary fusing factor. This is the maximum load current we would expect to carry. For example, for a 55 ampere low voltage fuse the fusing factor is currently set at 1.64. The minimum fusing current for this type of fuse is therefore  $55 \times 1.64$ , i.e. 90 amperes. Prior to 1971 the fusing factor ascribed

10/02/2009

12-15  
11-11

24x30

INDUSTRIA POWER S.A.

to these fuses was 2.0 and the rating they then had was 45 amperes. The fuse is the same, only the rating has been altered (i.e. the allowable load current which a fuse, previously rated as 45 amperes, can now carry is 55 amperes).

Obviously, the higher the fault current, the quicker the fuse will melt. Thus, the operating characteristic of a fuse is related to current. The higher the current the quicker the fuse will clear the fault. This gives rise to specified characteristics as shown in Figure 11, for example, for the "Stanger" range of expulsion fuse links.

(Page 1432 follows)

10/02/2009

12.GT.KK  
Fire

14-31A

WILSON, Rec.

12-15

12-15  
11-11

24X30

INDUSTRIA POTENSIA



THE WITNESS (Continuing): The term co-ordination is used to describe the method whereby the fuse sizes in the system are selected to ensure that, where possible, the minimum disruption occurs to the system; that is, the fuse nearest the fault should clear only that part of the system. One cannot use directly the manufacturer's published curves when calculating fuse co-ordination. In the lower current ranges "arcing time" must be added. This is effectively the time taken for the arc, which is formed when the element melts and parts, to be extinguished. Further, to ensure co-ordination, one cannot use the average curves shown, but the "minimum time to clear" curves and the "maximum time to clear" curves that take into account the known variability of the fuse elements and the  $\pm 10\%$  variation allowed from the specified characteristics for manufacturing tolerances. As an example, the calculated curves for the co-ordination of the high voltage and low voltage fuses at Pole 11 on the Glenfraser Spur will be given in section 4 of this submission.

The relays that control circuit breakers similarly are designed to operate faster for higher fault currents and have a minimum operating current level that is set above the maximum expected load current.

#### 4. FUSE CO-ORDINATION AT POLE 11 S.W.E.R. SUBSTATION.

Fuse co-ordination at s.w.e.r. substations is difficult and involves compromise between two basic principles:

- a. The low voltage fuse must be able to clear low voltage faults that occur within the consumer's installation should the consumer's fuse not operate, and should not operate before the consumer's fuse. The Commission has, in general, settled on a 55 ampere low voltage fuse that satisfies these criteria.
- b. The high voltage fuse must be able to clear faults in the transformer and on the low voltage leads between the transformer and the low voltage fuses. For a 10 kV s.w.e.r. substation this criterion results in the use of 2 ampere fuses. Figure 10 shows that an active neutral fault in this location results in a high voltage current of 6 amperes on the 12.7 kV side of the transformer.

The co-ordination curves are shown in figure 12 for an active to neutral fault and figure 13 for an active to active fault 80 feet from the substation.

Here again I think it might be useful if I break and explain what those curves show. Referring to figure 12, the two sets of curves shown are as labelled. The one that is not cross-hatched is for the low voltage fuse, and the one that is cross-hatched is for the Stanger 2 K 12.7 kV fuse. For a given current level - in this case, 5.6 to 5.9 amps is the range for faults between the low voltage terminal of the transformer and 80 feet out from that sub along the low voltage lines - the current will cause the low voltage fuse to blow in about 3 to 6 seconds, taken from that curve. The high voltage fuse, for a similar current, would blow in eight to eleven seconds. Therefore, the low voltage fuse should blow first.

12.JB.BE.  
Fire.

1432.

WILSON REC.

10/02/2009

12-15  
11-11  
10-15

24/30

MR. MARKS: That is, active to neutral?---That is active to neutral faults. For active to active faults, as shown on figure 13, the curves are transposed in position, effectively, and, as can be seen here, for the current level of 22 amperes the high voltage fuse will blow first.

These curves are drawn on a base of the high voltage current so that the co-ordination can be checked. This is done by "reflecting" the low voltage current through the transformer ratio of 12 700/240 or 480 volts as appropriate. Thus, the low voltage fuse curve is in a different position on each figure.

These curves show that for the fault point selected, the fuses are co-ordinated (that is, the low voltage fuse will clear first) for active to neutral faults, but are not co-ordinated for active to active faults for this case. This is accepted on the basis that the majority of faults in the low voltage system are active to neutral (or earth). Further, the only consequence of lack of co-ordination is that the point of disconnection of the supply is at the high voltage fuse rather than the low voltage fuse for the lower probability event.

In the general case where more than one consumer is connected to a s.w.e.r. substation, this would result in all consumers on the substation being disconnected rather than just the one on whose circuit the fault had occurred.

#### 5. FUSES CURRENTLY IN USE IN THE DISTRIBUTION SYSTEM.

The fuses currently used by the Commission throughout the rural distribution scene are the expulsion fuse in its two forms, EDO and clamp-on. There are approximately 106,000 of these fuses currently installed, 84,500 EDOs on the 22 kV system, 5500 EDOs in the s.w.e.r. system and 16,000 clamp-ons in the s.w.e.r. system. The Commission is currently embarking on a programmed replacement of the clamp-on fuse. This has arisen as a result of a change in operating procedures brought about three years ago. Prior to this time, operations on and associated with clamp-on fuses could be carried out without the need to take out an Access Permit. The current need to take out an Access Permit in order to operate on a clamp-on fuse involves a significant increase in the time spent to operate one of these devices. The reason for the change is that there is no requirement at this time to take out an Access Permit to operate on an EDO fuse.

Replacement cartridges for both EDO and clamp-on fuses are purchased by the Commission from suppliers who respond to annual specifications. A copy of a typical specification for these fuse links is attached. That is titled Specification No. 77/831, and is, in fact, the current specification. The specification requires that the fuses are manufactured in accordance with Australian Standard AS 1033-1971 (yellow document). The supplier for recent specifications has been Stanger.

The Commission purchases some 16,000 fuse links annually and the estimated usage rate due to faults in the system is approximately 10,000. The remaining 6000 are for new installations and for stores and field breakages, etc.

12.JE.BE.  
Fire.

1435.  
(Page 1433 follows)

WILSON REC.

10/02/2009

24x30

Low voltage fuses are similarly purchased in accordance with annual specifications and the specification calls for the fuses to be manufactured in accordance with British Standard BS 88-1975. Copies of the specification and the Standard are attached. The specification is 76/15B, and the Standard is BS 88-1975.

6. HISTORICAL DEVELOPMENT OF FUSE TYPES USED.

In the period prior to World War Two the type of fuse used in the Commission's rural distribution system was the liquid filled fuse, purchased direct from America or manufactured locally.

I have such a fuse here. The liquid within that device is carbon tetrachloride.

These fuses were mechanically unreliable and their characteristics were difficult to co-ordinate. In some cases the liquid leaked out and the fuse exploded; in other cases the liquid discoloured, making it impossible to detect operation of the fuse.

(Page 1434 follows)

12.JB.BE.  
Fire.

1433A.

WILSON REC.

10/02/2009

12-15  
11-11  
10-10

24x30

INDUSTRIA ROTONDA

THE WITNESS (continuing to read): The development of the expulsion type fuse was carried out in the 1930s in America. It was first made in quantity during World War Two by an Australian manufacturer copying the American design. Its application and use spread quickly throughout distribution supply authorities in Australia as it was reliable, simple and extremely cheap.

Field practice and tests have indicated that for applications of this fuse in areas where the fault level was below about 700 amperes, the fuse expelled incandescent material that could reach the ground, as pointed out in the Australian Standard AS 1033. Above 700 amperes, the expelled material appears to be in the form of a metallic vapour which does not reach the ground in particle form.

Two streams of investigation were commenced in the early 1960s by the Commission in conjunction with local manufacturers in an attempt to reduce or eliminate the expulsion of incandescent particles:

- a. To check modification to the fuse link in order to make the fuse link "sparkless".
- b. To catch the incandescent material or cool it before it reached the ground.

I have here an early sparkless link, that would have been about the late 1960s, and a cut apart version of the one you saw operate yesterday.

THE BOARD: That is the one that went black?---Yes,

Sparkless fuse links were developed by a number of manufacturers. These had double sleeves of nylon over the fuse elements which were generally comprised of a number of small diameter fuse wires. This can be seen in the early sample that I have produced. The fuse wires were supposed to vapourise so that no solid particles would be expelled. Tests carried out on this type of link showed that it did not eliminate the expulsion of incandescent particles in all cases. Further, the links proved to be mechanically unreliable; in some cases they failed to operate, resulting in explosion of the fuse body and in other cases they failed to clear low fault currents. There was also a tendency for the hot outer sleeve to be expelled at high speed, constituting a fire and personnel safety hazard. The operating characteristics of the fuses were very fast, causing co-ordination problems particularly with surge diverter installations, which would cause loss of supply in cases where fuse operation was unnecessary.

To explain that, I think, at this time would be also useful, in deference to our last day's deliberations. A normal operation of the surge diverter, you may remember, was for the gaps in the top of the diverter to flash over and enable current to pass down through the blocks to the earth connection and away. Once this surge has been passed, the follow through current is blocked, if you like, by the change in the characteristics of these resistor blocks. However, a small part of that follow through current must get through in order to allow this change to take place. These fuses were so fast that they detected and blew for that small follow through current prior to the arrester resealing. That is different to the situation I was

12. YE/AC.  
Fire.

1434.

WILSON, Rec.

10/02/2009

12 15  
11 11  
10 10

24x30

explaining where, if one of these devices failed, the fuses must operate.

The Commission decided to pursue the second alternative. The "catcher", which could be attached to the fuse body and which cooled the expelled arc and caught the incandescent particles, was developed by Taplin Switchgear Pty. Ltd. to an acceptable level of capability while the various "sparkless" fuse links were still in the developmental stage. The Commission decided to use the second alternative to meet the immediate need, but recognising the "sparkless" fuse link may ultimately become the solution when fully developed and proven.

I would also point out, as from yesterday's tests, the link we had yesterday is a modification which has been added in the last three months only, to the previous model. I will tender those two for your perusal. There is quite a difference in their manufacture.

THE BOARD: Which is the new one?---The new one is of different colour and has a chamfered edge to stop the device rotating when it has been tightened up. The white one is the older one.

#### 7. OTHER TYPES OF FUSES CURRENTLY AVAILABLE

There are a number of alternative types of fuses available for use in distribution applications. Each will be described briefly below with comments as to their application in the Commission's system:

##### . Liquid Filled Fuse (Produced).

As described previously, the liquid filled fuse has been progressively phased out from use in the Commission's system in recent times because of its lack of mechanical strength, liquid discolouration problems, loss of liquid resulting in fuse explosion and unsatisfactory co-ordination performance.

##### . Powder Filled Fuse (Produced).

The application of powder filled fuses has been restricted to high fault level areas where the EDO fuse cannot be used, typical of the metropolitan area and country urban centres. This fuse has doubtful capability to interrupt low fault currents and cannot be co-ordinated with low voltage fuses in rural distribution areas. We have had instances where fuses have become red hot and disintegrated when trying to interrupt low fault currents.

I have some photographs here of the remains of such a device.

##### . Boric Acid Drop-Out Fuses (Produced).

I will ask that we take note of the little note at the bottom, "Do not remove or loosen this cap".

Boric acid drop-out fuses are available from American manufacturers only, Westinghouse Type 'DBA' and S & C type 'SMD'. Neither are available in current ratings lower than 3 amperes at this time and the characteristics are such that they could not be relied upon to clear solid faults on the transformer low voltage terminals, and they cannot give any measure of

12.YE/AC.  
Fire.

1435.

WILSON, Rec.

10/02/2009

12-15  
11-11  
10-10

24x30

protection against faults inside the transformer. We have also had an example of this type of installation exploding under normal service conditions.

. Full Range Powder Filled Fuses (Produced).

So-called "full range" powder filled fuses are available from McGraw Edison (type NX) which have characteristics similar to an EDO type of fuse. At this time the smallest rating available is 8 amperes, which would be too high for our applications. Similar comments therefore apply to this type of fuse as to the Boric Acid type above.

One additional comment - at this time they are only available in indoor types, not in outdoor types.

8 COSTS OF ALTERNATIVE TYPES OF FUSES

The table below shows the relative costs, excluding installation, of fuse elements and fuse holders for the types currently available:

These estimates have been made in the last month.

(Page 1437 follows)

10/02/2009

12-15  
11-11  
10-10

24x30

INDUSTRIAL POWER

THE WITNESS (Continuing):

1977 Estimates

a	22 kV Expulsion Drop-out Fuses	\$
	Fuse element	1
	EDO fuse holder assembly	48
	Fire catcher	12
		<u>\$61</u>

As a point of interest, the sparkless fuse links are between \$3 and \$4 at this time.

b	22 kV Liquid Filled Fuses	
	Liquid filled fuse	10
	Typical fuse mounting	100
		<u>\$110</u>

c	22 kV Powder Filled Fuses	
	EMP powder filled fuse	25
	Fuse mounting complete	75
		<u>\$100</u>

d	22 kV Boric Acid Fuses	
	Fuse element	65
	Fuse holders	118
		<u>\$183</u>

e	22 kV Full Range Powder Filled Fuses	
	Fuse element	70
	Fuse holders	120
		<u>\$190</u>

f	12.7 kV Clamp-On Fuses	
	Fuse element	1
	Fuse holders	12
	Terminal assembly	2
		<u>\$15</u>

Note: In cases where current prices are not known, estimates have been made on the basis of previous costs obtained from manufacturers and current escalated cost increases.

Considering the number of fuses currently installed in the Commission's system (106 000) and the usage rate of elements (some 10 000 per year), it can be readily seen from the table that apart from the technical reasons given above for the use of EDO fuses, cost to the Commission of the alternatives would be high. Replacing approximately one-third of the EDO installations, which is an estimate of the number installed in high fire risk areas, would cost approximately \$7M in capital expenditure and a further \$7M for costs associated with their installation. In addition, approximate usage of some 3000 fuses per year in these installations would cost some \$210 000 compared with \$2000 for expulsion fuse links.

6002/20/01

12 15  
11 11  
10 10

24x30

INDUSTRIA POWER S.A.

9                   EVENTS ON THE DISTRIBUTION SYSTEM ASSOCIATED  
                      WITH THE GLENTHOMPSON FIRE OF 12 FEBRUARY 1977

The direct evidence available to the Commission and presented to the Inquiry to date indicates that there were four incidents on or associated with the Glenfraser Spur on 12 February -

a           Evidence from people living in the area of a dip in voltage for a period of from 3-5 seconds would have been the result of the recloser in Feeder HTN3 operating and successfully clearing a transient fault somewhere in that feeder. The Commission has no records or evidence of the operation of the 22 kV circuit breaker on this feeder at Substation HTN. As previously stated, this recloser cannot "see" faults in or on the Glenfraser s.w.e.r. spur on the low voltage side of the Glenfraser isolating transformer.

b           Evidence presented by the Lloyds described a bright flash associated with loss of power to their property just prior to the commencement of the fire.

c           The high voltage fuse on the s.w.e.r. substation at Pole 11 operated and disconnected that transformer from the system.

d           Subsequent inspection of the low voltage conductors supplying the Lloyds' property have revealed recent burn marks consistent with low voltage conductor clashing.

The description by the Lloyds of the flash which "lit up the inside of the house" is consistent with the result of low voltage conductor clashing. It is impossible that the operation of the clamp-on fuse on Pole 11 would have resulted in a flash of the intensity described. It is therefore postulated that initially the low voltage conductors clashed and this clash caused the high voltage fuse to operate and clear the fault. Operation of the high voltage fuse for faults of this type is consistent with the fuse co-ordination of this substation as described previously.

I understand that there is some contention that the recloser operation on the main feeder caused the fuse to blow as a result of inrush current on the transformer when the power was restored to that part of the system. In order to dispel this theory, the attached figure (figure 14) shows the relationship between the level of inrush current calculated for this transformer and the fuse co-ordination curve. The levels of inrush current as determined could not have resulted in blowing of the fuse. To do that the curves would have had to cross or the inrush current would have had to be above.

The only other possible cause of the high voltage fuse blowing would be a fault in the transformer itself. Such faults are usually permanent in nature, the only exception being flash-overs of the external bushing that occur when lightning hits the line. As the transformer has been operating satisfactorily and with no evidence of subsequent failure, the transformer must be assumed to have played no part in the events in the distribution system on that day.

MR. BARNARD: Mr. Wilson, there are some matters I do not fully understand and upon which I would like your assistance. The first is, you describe yourself as a Development Engineer

12.PA.KK  
Fire

1438

WILSON, Rec.

60027/20/01

12-15  
11-11  
10-10

24x30

ESMITH'S PRINTING WORKS



of Distribution. What functions does that involve?---  
I am responsible for three sections of the Distribution  
Engineering Department - the protection and control section,  
which is responsible for protection and control of the  
sub-transmission system, and the setting of guidelines  
in protection in distribution areas; the system design  
section, which is responsible for future forecasting of  
system requirements in the distribution system, and the  
investigation section which, as its name implies, has a  
wide ranging function, depending on any investigation  
required at any time on any specialised technical matter.

Investigation section is not something on which you work all the time.  
It is only when there is an inquiry involving the Commission  
that you are asked to carry out work?---No, they are carry-  
ing out investigations at the moment on the use of computers  
for keeping records of all our distribution assets. This  
is continuous and on-going work. They have not been  
involved at all in this bush fire investigation.

I understood the first one about the protection system; is the  
second one related to the distribution?---The systems  
design section.

What do you refer to as "systems design"?---They are effectively  
designing and laying out future requirements for electrical  
assets in the State - distribution in substation areas,  
that is, current load forecasts, current loading conditions  
in substations and setting down requirements for new  
substations, new assets in general.

It does not involve the design of installations, the design of  
transformers, for instance?---No.

It is the overall system of design?---That is correct.

On the other hand, in the first area of your work, you are involved  
in the design of protective devices in the system?---Yes.

And detecting whether or not protective devices are performing  
adequately their function?---Yes.

And replacing them if they are not?---"Arranging" for their  
replacement, would be a better way of putting it.

Or for the designing of improvements?---That is right.

So that if in fact the fuse was not operating efficiently, a fuse  
within the system was not operating efficiently, it would  
be your Department that would examine it, design a replace-  
ment and arrange for a replacement, is that so?---A type  
of fuse.

A type of fuse?---Yes.

Likewise, it is your department which would carry out investigations  
as to how protective devices throughout the system are  
working?---Yes.

No doubt, there is a deal of material which is fed to you for that  
purpose, on a continuous basis, is that so?---That is  
correct.

So far as fuses are concerned you, in your statement, have referred  
to the philosophy of fuses. Would you agree that these  
principles are the function of fuses being part of a  
protective system, to remove the fault as quickly as  
possible?---Yes.

6002/20/09

12-15  
11-11  
10-10

24X30

10/02/2009

And to remove only the fault section from the power system?---I would have added,"where possible".

And to operate only for fault conditions and to remain stable for all other conditions?---Yes.

They are the three basic principles of your philosophy, is that so? --- Yes.

The high voltage 2 amp fuse at Pole 11 on the Glenfraser Line is the type of fuse which has been in existence for a number of years, has it not?---Correct.

It has been accepted in other single wire earth return systems throughout the world?---Correct.

You would agree, would you not, that the purpose of that fuse, the use of the clamp-on fuse, is to provide protection for the transformer and as a means of disconnection of the transformer, is that correct?---That is correct.

Its purpose is solely to provide protection for the transformer, meaning also the lead to the transformer, the pieces associated with it?---That is its primary function. You could add one more - the low voltage leads down to the low voltage fuse holders.

You would agree that this has always been regarded as the sole function of that clamp-on fuse?---I would agree it is the primary function.

I would suggest it is the sole function?---I still prefer "primary" function.

There has been a great deal of literature put out about this fuse and about this system?---Yes.

Have you ever seen in any literature any suggestion that that fuse ought to perform any other function?---No, not specifically.

You, in your statement, refer to the question of zones, do you not? ---Yes.

The zone which has to be covered by that fuse is the zone you have described as the transformer, the lead to the transformer and the wiring from the transformer to the low voltage fuses?---Yes, that is its primary zone.

In your statement on page 3 and at the top of page 4, you state, "The part of the system so protected is termed the zone of the device"?---Correct.

(Page 144C follows)

24x30

12-15

12-15  
11-11  
10-10

INDUSTRIA PAPER NEW

MR. BARNARD:

You go on to say, "In many cases, through either specific design or because of the electrical characteristics of the system, these zones overlap. This overlap has the advantage that should a protective device nearest the fault fail to clear the fault, the next device back towards the source of supply in the system will 'back up' its operation and ensure that the fault is eventually cleared." When you speak of 'back up' there, it is really like in school boy cricket where you have a back stop, where the wicketkeeper fails to take a catch or stop a ball, he has a backstop?---Correct.

It is not as though the wicketkeeper is not meant to stop the ball, or in the case of the fuse, it is not as though the fuse further down on the load side is not meant to clear the fault, the back-up is to cover it when it is defective or for some other reason, is that so?---Correct.

As a matter of philosophy, in protection systems, it is bad design to have fuses co-ordinated so that by reason of the design of the fuse the fault on the load side can entirely pass one fuse as a matter of design and cause a fuse further up towards the source of supply to fail. Do you follow that?---I do not agree with the words "bad design", because there are systems, such as this one, where it is an invariable characteristic of the system, one cannot design the thing out.

It is something you have to try to avoid as a matter of philosophy, is it not?---Something we attempt to avoid as a matter of philosophy, yes.

It is viewed as an undesirable feature if it can be avoided, is it not?---Yes.

Of course, when you come to the zone at Pole 11 for the low voltage 55 amp fuses, the zone for those fuses is those fuses and what may be described as the house fuse, is that so?---That is its primary zone of protection.

It is the zone it is designed to protect, is it not?---To clarify my use of the word "primary", the primary zone is the zone it is responsible for, the secondary zone is the zone it will cover.

It should be designed to cover all faults which occur within the zone which it is designed to protect?---Yes.

And that zone is between it and the house fuse?---Yes.

When we speak of the house fuse, I am not too sure what it is, but a lot of houses - and I think this is the same at Mr. Lloyd's - where the wires reach the house or the building there is set up on the eaves or on the side of the house a little box which often has a curved top on it and the fuse screws into the bottom of it?---Yes.

Is that so at Mr. Lloyd's?---I have not inspected that installation. I would doubt that would be the case. I think the wiring would go directly through to his switchboard inside the house. So the first fuse would be the fuse protecting his own internal distribution.

In a lot of these cases you do have such a fuse?---Yes.

12. CI. BE.  
Fire.

1440.

WILSON REC.

10/02/2009

12-15  
11-11  
10-10

24x30

INDUSTRIAL POWER SYSTEMS

If you have such a fuse, the only people authorized to touch that fuse are the employees of the SEC?---Correct.

And the only fuse which the house owner can touch is the 8 amp, 10 amp or 15 amp fuses inside the house?---The regulations theoretically state they should only be touched by a licensed electrician.

In any event, the zone for the 55 amp fuses, where there is one of these screw-in fuses in the fuse would be between the 55 amp fuse and that screw-in fuse?---Correct.

That screw-in fuse would be designed to protect all faults occurring on the load side or on the house side of it?---Correct.

Likewise, if it goes to the switchboard, the fuses in the switchboard are designed to protect against all faults occurring on the load side or house side of that switchboard?---Yes. It is not quite correct. Because of the number of people who "fiddle" with the fuses in their own installation and other installations which have 3 inch nails and other devices in place of fuse links, that SEC fuse will in fact cover faults anywhere within that installation.

What do you call the SEC fuse?---Either on the device, or in this case the low voltage fuse on Mr. Lloyd's pole, Pole 11.

Both of these will cover this?---Yes.

If Mr. Lloyd is using a power saw and he keeps blowing the fuse and he puts a bit of copper wire in, that will blow the fuse on the device or on the pole?---Should he have a fault on the installation.

As a result of this philosophy, there is a necessity at Pole 11 for what you call co-ordination between the high voltage fuse and the low voltage fuse, is that so?---Yes.

And it is also referred to as discrimination between the fuses? ---Yes.

What do you see as the function of the 55 amp low voltage fuse on Pole 11?---It has three functions. First, to clear faults in these low volt service lines. Secondly, as I just described, to clear faults in the installation of Mr. Lloyd should they not be cleared by his own fusing system on the switchboard.

That is the back-up job?---Yes. And the third is so that we can remove it to cut off supply to Mr. Lloyd should he not pay his bill.

The last one is really not a protection reason, is it?---No, but it is a reason for the installation of 55 ampere fuse boxes.

The back-up reason is one which you hope would exist with all fuses and all protective devices, is that not so?---Yes.

The primary reason is the protection against faults in the low voltage line?---Yes.

If we turn to those faults, Mr. Wilson, firstly the type of fault one could get is a contact between an active and active wire going to that house, is that not so?---That is one form of fault.

And that is a 480 volt fault?---Yes.

12.JB.BE.  
Fire.

1441.

WILSON REC.

10/02/2009

12-15  
11-11  
10-10

120-25

24-30

12-15  
13-13

FIRENZA

10/02/2009

The fact is, this low voltage fuse does not perform its function in relation to that fault, does it?---It would perform its function should the high voltage fuse not be there.

You say should it not be there, but that would mean you would have no proper protection for your transformer if it was not there?---That is correct.

In the circumstance of this system as it is designed - - - ?---This particular system.

This particular system, there is no co-ordination such that the 55 amp fuse can properly perform its function in relation to a 480 volt fault on the low voltage wires?---That is correct. In fact, there is no way one can design that system.

You agree that any 480 volt fault will of course blow the 55 amp fuse?---Yes.

I apologize, it will never blow, the 480 volt fault will never blow the 55 amp fuse before the 2 amp high voltage fuse?---Yes, the high voltage fuse always blows for these faults in that installation.

The other type of fault which can occur, of course, is a fault between the active and the neutral wires?---Correct.

If I might turn to that, can you say which fuse that will blow first?---It will blow the low voltage fuse.

Always?---In a significantly high percentage of times.

Are you able to tell us on what number of occasions it will?---Better than 60 per cent.

How are you able to say that?---From the co-ordination curves and calculations we have done on that basis.

The co-ordination curves and calculations which you refer to are the ones which are shown on figure 12, is that right?---Correct.

When were those curves drawn?---That particular curve would have been drawn about three to four weeks ago.

about when?---Three to four weeks ago.

Who drew it?---One of my staff members, which one I could not be precise. It was in the protection section.

I just wanted to know if you did or not?---No.

The way in which it has been drawn, can you tell us that?---Yes. The information we have from the manufacturers as regards the fuse characteristic.

The time current characteristics of the fuse?---The time current characteristics of the 2 K fuse.

When you refer to the information, you are referring to the Stanger time current characteristics, which is figure 11?---Correct.

And what other time current characteristics do you have for the unshaded area?---Including the manufacturing tolerance and the tolerance to which those things are manufactured.

12.JB.BE.  
Fire.

1442.

WILSON REC.

10/02/2009

You are speaking now of the high voltage fuse, are you?---Yes.

But it was worked out on the basis of the time current characteristic put out in the Stanger literature, figure 11?---Yes.

The basis of the other graph, that was worked out on time current curved characteristics for the HRC fuse cartridge BCV 55 amps from Neilsons Development Laboratories Pty.Ltd. ---That would be so.

You say there was also, to make the graph as it is, the tolerances were taken account of?---Correct.

Prior to three or four weeks ago, had this exercise ever been carried out?---Not for this particular installation.

Had it been carried out for any installation?---Yes, for typical installations of this type. We have a large number of possible s.v.e.r. installations, co-ordination curves would have been drawn for these.

This curve would have been applicable to all substations, would it not, where you have a transformer of this size, and where you have wires leaving it and the 2 amp fuse above, is that not so?---Correct.

There would be thousands of examples of this throughout Victoria, would there not?---There would be a large number, I would not like to say whether it is thousands or hundres.

(Page 1444 follows)

12.JB.RE.  
Fire.

1443.

WILSON REC.

12-15  
13-13

12-15  
11-11  
10-10

FIRENS

24300

MR. BARNARD: You did mention this tolerance matter, and perhaps I should take you to that just so that we understand we are talking about the same thing. On page 4 of your statement, I think, you referred to this matter of tolerance. You spoke firstly of the matter of the fusing factor. You said, "The size of the fuse or its rating is set below this and is related to it by - - -" - and you added "an arbitrary fusing factor"?  
---Yes.

Is that correct?---The fusing factor is set by the Commission in conjunction with manufacturers, for the low voltage fuses in particular.

But it is not arbitrary?---I used the word "arbitrary" there to mean that one does not ascribe the same fusing factor to the same fuse forever. As I said there, as to the low voltage fuses of the 55 ampere type, we were previously rating them as 45 amperes with a fusing factor of two. The fusing factor was brought down to 1.64 following discussions between my own department and the chief electrical inspector who was involved in ensuring that that fuse could still adequately cover faults within the installations in the homes connected to the system.

But a fusing factor, in terms of definition, has a wellknown meaning for all fuses, does it not?---Yes.

What is it?---I think I have described it in here.

How do you work it out?---It is the relationship between the minimum fusing current, which is the current that the fuse can carry for one hour, and the rating.

It is the minimum operating current over the rated current, is it not?---Yes.

The way the fusing factor is calculated for the 55 amp fuse is that, as a matter of physical testing, the minimum operating current is 90 amps, is it not?---Not quite, because we specify a rated fuse and a fusing factor, and a manufacturer then has to adjust his fuses to ensure that they meet that specification.

Yes, it was specified, and the minimum operating current of these is 90, is that right?---Particular fuses, yes.

Yes, the 55. And, of course, the rated current is 55?---Yes.

So your 1.65 comes from dividing 55 into 90, does it not?---Correct.

That is not arbitrary at all; it is a matter of the fusing factor as a result of the way the fuse is manufactured?---We are at cross-purposes. I am saying that the inclusion of a fusing factor in our specification is a matter of arbitrary definition by the Commission of what it requires from the manufacturer. The proof of that fusing factor by the manufacturer leads him to the techniques you are describing.

Perhaps I should ask you this, then. When you changed from a 45 to a 55 amp fuse, did you specify a different fusing factor?---Yes.

So that really it is a different fuse, is it not?---The fuse is, in fact, the same. The specifications that went out prior to that time asked for a 45 ampere fuse with a

12.JB/AG.  
Fire.

1444.

WILSON, Rec.

10/02/2009

12-15  
11-11  
10-10

24330

12-15  
13-13

INDUSTRIAL PHOTOGRAPHY  
FIRENZ

fusing factor of 2. Therefore its minimum operating level was 90 amperes. The fusing specifications currently in vogue are for a 55 amp rated fuse with a fusing factor of 1.54, with the same minimum operating current of 90 amperes.

All right. All I am wanting to have from you is that you now have a fuse with a different specification from that of the 45 amp fuse?---Yes.

You go on lower on page 4, and you say that one cannot use directly the manufacturer's published curves when calculating fuse co-ordination." "In the lower current ranges 'arcing time' must be added." When we are speaking of arcing time for a fuse, what period of time are we talking of? Ten, twenty milliseconds?---No. As shown in the tests yesterday - for a different type of fuse, admittedly - for the 2K fuse, that could have several cycles.

What time is involved in that?---100, 120 milliseconds. Of that order. Some of those yesterday were of that order.

That sort of figure is really not capable of being shown on the graph, is it?---100 milliseconds is the first scale division on the bottom of the graph.

But it makes no substantial difference to the drawing of a graph of this scale, does it?---I have just realised that there is a mistake in my submission. That should be "in the higher current ranges". It is not "the lower current ranges".

What are you looking at now?---That is what is confusing. Fourth paragraph, seventh line. It says "in the lower current ranges". That should be "in the higher current ranges". It affects the curve of the graph at the bottom, not at the top.

Not at the top, and not in the sort of area we are talking about?  
---No, not in the area we are talking about.

So that in making a comparison between the two fuse curves, for the purposes of this sort of fault we can disregard arcing time, can we not?---Yes.

Then you go on and you say, "Further, to ensure co-ordination, one cannot use the average curves shown, but the 'minimum time to clear' curves and the 'maximum time to clear' curves and take into account the known variability of the fuse elements and the  $\pm 10\%$  variation allowed from the specified characteristics for manufacturing tolerances??"  
---No, you changed the word "that" to "and", which makes a significant difference to the meaning of the statement.

Did I? I shall read it again. "Further, to ensure co-ordination, one cannot use the average curves shown, but the 'minimum time to clear' curves and the 'maximum time to clear' curves that take into account the known variability of the fuse elements and the  $\pm 10\%$  variation allowed from the specified characteristics for manufacturing tolerances." Is that right?---That is correct.

What you are saying there is that you can take into account the "minimum time to clear" curves and the "maximum time to clear" curves, and then add plus or minus 10%?---No. The "minimum time to clear" and "maximum time to clear" curves, which are, in fact, the two curves of the extremities of

12.JB/AC.  
Fire.

1445.

WILSON, Rec.

10/02/2009

13-13  
12-15

12-15  
11-11  
10-10

INSURANCE  
FIRE

2430



the area of fuse operation, are calculated taking into account the known variation, variability, of the fuse element and the plus or minus 10% variation - and/or, in fact, the plus or minus 10% variation.

You are not seeking to add plus or minus 10% to the minimum/maximum time to clear curves?---For these particular fuses, no.

That is because there are two different specifications, are there not? There is a "minimum time to clear" curve plus 22%, or alternatively, there is an average curve plus or minus 10%, is that right?---That is perfectly correct.

It works out to the same, does it not?---Thank you.

When we look at the graph figure 8, the area where those two curves cross, what do you call two broad bands like that on graphs? Is there any special name for them?---None that immediately springs to mind.

Where those bands cross, the hatched band and the unhatched band, if the fault occurs in that area, you are not able to say which fuse will go first, are you?---If the curves were, in fact, perfectly superimposed one on top of the other at that point, then I would say there is a 50 per cent probability that either fuse would blow for that fault. Where, in this case, the areas are not coincidental at that particular point - that is, where the low voltage fuse curve is below, if you like, or the area is below the lowest possible point of operation of the high voltage fuse - I would then say there is a higher probability of the low voltage fuse operating first.

Let me put it to you this way, then. If a fault occurs with an amperage in the area of where those two bands cross, because of manufacturing tolerances there is always a significant risk that the high voltage fuse will blow before the low voltage fuse, is that not so?---There is a possibility. Whether it is significant or not is a different question. It depends what area is covered by both elements in the particular fault.

Perhaps I should put it to you in this way. Is it fair to say that any fault of a 240 volt nature above 8 amps - I am sorry. I think 8 amps is wrong. I am trying to get the dividing line. It is about 7 amps, is it not?---Seven to eight amps.

In the area between 7 to 8 amps - - -?---The area above 7 to 8 amps?

It is really in the area, I suppose, between about 5 and 8 amps, is it?---About 4 to 8 amps.

Between 4 and 8 amps, there exists the risk that the high voltage fuse will blow before the low voltage fuse?---There exists the possibility that the high voltage fuse will blow first.

And that area of 4 to 8 amps is an area where you might expect commonly to find faults arising from the involvement of a 240 volt fault, is that not so?---For this particular installation, yes.

For this type of installation?---No, this - well, I would not go that far. This particular installation is a long way out on a 22 kV spur. It is a fair way down the s.w.e.r. spur, and it has the smallest possible I80 and the smallest possible s.w.e.r. substation. So those factors combined lead to a very low current level. I would not like to say

12.JB/LC.  
Fire.

1446.

WILSON, Rec.

10/02/2009

12-15  
11-11  
10-10

24X30

INDUSTRIAL  
FIRENZA

10/02/2009

what percentage of installations are in this state.

Do we come to this situation, then - that if one looks at faults occurring on these wires as a result of the wires themselves being brought together, with the whole of the two active wire faults, faults involving the two active wires will blow the high voltage fuse?--Correct.

And some of the faults involving the one active wire and the neutral wire will blow the high voltage fuse?--Yes, and the same applies to the remainder of the faults, which are the ones which would occur inside installations, which would be mostly active to earth.

So just looking at those matters, it makes it more probable that when a fuse blows on the pole, it will be the high voltage fuse, does it not - just looking at those sorts of faults?--That depends on the relative probability of active to active and active to neutral faults which you are assuming - - -

Assume that they are the same?--Which is an assumption I do not go along with, frankly. .

You do not?--No.

(Page 1448 follows)

12.JB/AC.  
Fire.

1447.

WILSON, Rec.

12-15  
13-13

12-15  
11-11  
10-10

FIRENZA

MR. BARNARD: Assuming they were the same, it would be more probable that the high voltage fuse would blow, would it?---  
Yes.

Are there any other sorts of faults you protect against, other than what we have discussed?

THE BOARD: I do not know if the witness follows that?---I am not quite sure what you mean.

MR. BARNARD: Quite apart from faults within the house you have referred to and active to active and neutral to active, are there any other sorts of faults you would expect to protect against?---Including the active to earth fault.

Let us take the active to earth fault, if the wire drops on to dry ground and does not come in contact with a piece of earthed metal, no fuse will blow then, will it?---Certainly the fuse will blow in that situation.

You say it will blow?---Yes.

THE BOARD: Can you imagine a situation - take Tatyoon and take Mr. Hamilton's sleeve, supposing there had been a sleeve and the sleeve had come off and suppose it is at a situation where the wires have just pucker in the wind, but neither of them have fallen, for some reason, the pole is sufficiently high and the length short enough that they have not hit anything, would that in itself blow a fuse?---  
No.

Unless they touch something, no fuse would blow?---Unless they touch something which is connected to earth. For example, in Mr. Lloyd's case, if the wire fell on top of a car and stayed there, presuming the tyres gave enough insulation from earth, the fuse would not blow.

MR. BARNARD: What is the wire falls on dry ground in summer time? ---Depending upon the characteristics of the ground, I would say in most cases that, in fact, would result in a fuse blowing.

Mr. Patterson, for one, has told us how he picked up a live wire with a pitch fork. Wires are known to lie for weeks, lying on dry ground for weeks, without blowing a fuse?---  
It could happen.

And it does happen, does it not?---Yes.

And, of course, contact with trees and low voltage wires, this is single wires, will not blow the fuse, will it?---No.

THE BOARD: A single wire contacting a low voltage would not blow a fuse?

MR. BARNARD: Yes. Really it comes down as to which is the more probable, the fault that will blow a high voltage and low voltage fuse, the fault comes down to whether it will involve neutral and active or active and active, does it not, and you will agree the active wires in those situations, in most situations, are at the bottom?---I would not say in most situations.

THE BOARD: I thought you said, or someone told us - - - ?---  
Mr. Weatherhead, if my memory serves me right, said he could not say with any certainty whether this was the situation or not.

10/02/2009

13-13  
12-15

10-10  
11-11  
12-15

IRRENZ

2930

I got the impression that somewhere, that contrary to my earlier understanding before this case, it was said that the neutral was the top wire usually and not the bottom one.

MR. BARNARD: Mr. Knoop said it was always the top wire. Mr. Weatherhead was asked by me whether they put them at the bottom?---To clarify it, we have no specific article in the regulations which states in which order the wires should be placed in the air. There is no regulation that covers that, it is largely left to the discretion of the EF who puts it up.

THE BOARD: Would not that be a useful regulation to have?---It is something we are now looking at.

MR. BARNARD: Surely, if you have the active wires at the bottom, one of the big problems of the Commission is people with long irrigation pipes - there is a case in Warrnambool at the moment - but as they move these pipes they hit the wires, do they not?---Yes.

And people with hay loads?---Yes.

They hit the wires?---Yes.

And farm machinery tends to have things on it that endanger these wires, does it not?---Yes.

THE BOARD: Young gentlemen with aerials waving from their sports cars?---It is almost a menace.

MR. BARNARD: At page 83, Mr. Weatherhead was asked:

"When you get three wires do you still have one neutral wire?---Yes.

Which wire is the neutral wire, is there any rule in relation to that?---I do not quite understand your meaning. Do you mean physically which of the three?

Is it the top, the middle or the bottom wire, or any one of the three?---I think in general terms the neutral conductor is the lower conductor, but I would not like to say that is so in every case.

If some farm machinery hit the wires it is likely to hit the bottom one first?---Yes.

Are the other two wires each 240 volts?---Yes, with respect to the neutral.

The purpose of that is there may be a high horsepower machine, a piece of apparatus which requires more than 240 volts?---Yes...."

Then he goes on to something else. Here, of course, we have the active wires at the bottom, have we not? ---Yes.

So, really, they are the ones that are more likely to be knocked together because of machinery and the hazards that exist? ---I do not agree they are more likely to be knocked together, what is likely to happen, one of those is more likely to come in contact with an earth object and cause an active to earth fault.

10/02/2009

13-13  
12-15

12-15  
11-11  
10-10

11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60  
61  
62  
63  
64  
65  
66  
67  
68  
69  
70  
71  
72  
73  
74  
75  
76  
77  
78  
79  
80  
81  
82  
83  
84  
85  
86  
87  
88  
89  
90  
91  
92  
93  
94  
95  
96  
97  
98  
99  
100

24200

THE BOARD: Assuming it is a hot day, the wires have expanded, the wind comes and they are swinging in the wind - I suppose to start with that if the two actives are not separated, they are more likely to come together than if they had been ---In those circumstances?

Yes, in those circumstances?---Yes.

I do not suppose it matters whether they are the two bottom ones or the two top ones, but when they are next to each other they are more likely to come in contact?---The conductors clashing.

MR. BARNARD: Have you some other theory as to when faults occur? ---As you said yourself, the majority of faults which occur with that sort of system are people carrying pipes and machinery or other objects that cause contact between earth and the live conductor, so most of the faults are of this type, active to earth faults, in this type of installation.

Is it so that the way the wires are set up at Lloyds, that we can expect faults, if one looks at the probability of it, to more than likely involve high voltage rather than low voltage fuses?---No, as I said in my statement, it is more likely that the most probable faults are active to earth faults, because most of our installations are such that conductor flashing should not occur.

So you only put it at more probable that it will be low voltage, because you think it is the active to earth fault you think occurs most?---Yes.

(Page 1451 follows)

10/02/2009

12-115  
13-113

10-110  
11-111  
12-115

FIRENZA

2900

MR. BARNARD: Whether or not that is so, I suppose you need to look at the particular installation, do you not?---Yes, for a particular installation, although from our point of view we have to look at statistics for all those types, statistics across the State.

THE BOARD: But the probability in relation to any particular installation must depend on the facts and circumstances of that place, such as, whether the wires are close together, far apart, taut or slack, etc.?

MR. BARNARD: If they are going across a swimming pool or across some trees, for instance, so that nothing can pass underneath them, there would be no reason for the earth wire to contact - the possibilities of that are very remote?---We try and avoid that type of installation, particularly across swimming pools because if the conductor drops into the water we are in great trouble.

THE BOARD: That is what I was saying, you would include such a situation as being an active to earth. If in fact you knew it was active to water it would be even worse?---Yes.

MR. BARNARD: As you point out, "Further, the only consequence of lack of co-ordination is that the point of disconnection of the supply is at the high voltage fuse rather than the low voltage fuse for the lower probability event"?  
---Yes.

When you say that, you are not saying it in relation to Mr. Lloyd's place; you are saying it generally, in relation to the State?---If one took the number of instances which took place over a number of years and assuming that conductors such as that were strung so that they could not or should not clash with any trees or anything else, I say it could be ascribed more to active to earth faults.

Do you know Mr. Lloyd's situation? You have seen pictures of it?  
---Yes.

There was nothing wrong, of which you are aware, with the stringing of the wires to the north of the pole, to the north of pole 11?---The stringing of the wires?

You referred to it as "stringing", did you not?---As I remember, that was through trees.

In the first span it was not through trees?---That was a relatively normal span.

I think Mr. Knoop has told us they complied with the wiring regulations but, still, clashing took place through there?---Yes.

Wires strung properly can clash, can they not?---Yes, it is possible.

It happens, does it not?---Yes.

THE BOARD: Just stepping there for a moment, it depends on what is your definition of "strung properly", I suppose. I would have thought, in one sense, very strictly if they clash, then they are not strung properly. Part of the definition of "stringing properly" ought to be that they are so strung they do not clash under any circumstances?---Certainly.

12.PA/AC.  
Fire.

1451.

WILSON, Rec.

10/02/2009

12-15  
13-13

12-15  
11-11  
10-10

12-15  
13-13  
14-14  
15-15  
16-16  
17-17  
18-18  
19-19  
20-20  
21-21  
22-22  
23-23  
24-24  
25-25  
26-26  
27-27  
28-28  
29-29  
30-30  
31-31  
32-32  
33-33  
34-34  
35-35  
36-36  
37-37  
38-38  
39-39  
40-40  
41-41  
42-42  
43-43  
44-44  
45-45  
46-46  
47-47  
48-48  
49-49  
50-50  
51-51  
52-52  
53-53  
54-54  
55-55  
56-56  
57-57  
58-58  
59-59  
60-60  
61-61  
62-62  
63-63  
64-64  
65-65  
66-66  
67-67  
68-68  
69-69  
70-70  
71-71  
72-72  
73-73  
74-74  
75-75  
76-76  
77-77  
78-78  
79-79  
80-80  
81-81  
82-82  
83-83  
84-84  
85-85  
86-86  
87-87  
88-88  
89-89  
90-90  
91-91  
92-92  
93-93  
94-94  
95-95  
96-96  
97-97  
98-98  
99-99  
100-100

24-25

I suppose what you mean is they are strung within the regulations or according to the drill that has been worked out and they do not offend any rule or rule of practice that you have - but, nevertheless, they still clash? I cannot help feeling that strictly speaking correct stringing, on part of the definition, ought to be that they would not clash in any circumstances.

MR. BARNARD: They put in spreaders.

THE BOARD: They put in spreaders? Well, I do not know, that may be a counsel of perfection.

MR. BARNARD: Have you any statistics on which you base this view of probability, depending on one fault or the other?--We do not keep details of the faults that occur in low voltage systems. There are a large number kept but - - - I am basing it on a number of technical articles, on the experience of myself and a number of others working in the Department and throughout the Commission.

It is really a matter of office gossip in that people say, "This is the most frequent reason for the occurrence"?--pi said technical discussion.

● THE BOARD: Technical discussion between engineers?--Yes.

MR. MR. BARNARD: Seriously, over the 20 or so years that those lines have been at Mr. Lloyd's property, what do you think has probably happened the most frequently - that there has been an earth to wire contact of that the wires have clashed? Which sort of fault do you think has happened the most?--I honestly do not know. One could base the statistics on which fuse has operated over the years we have taken the statistics. I think, from memory, the high voltage fuse operated either six or seven times.

THE BOARD: That is rather begging the question?--Yes. I have a friend who is nine feet tall but that does not mean he is the man of today. I am talking about the average man situation. It is difficult to produce these statistics and to use them in any particular situation.

MR. BARNARD: You cannot say one way or the other how it happened at Mr. Lloyd's place, having regard to the circumstances? --I cannot say it in relation to any single situation. You could say <sup>if</sup> the man was doing market gardening and was carrying poles through there all the time how it happened?

LUNCHEON ADJOURNMENT.

UPON RESUMING:

MR. BARNARD: I was putting to you before lunch that with regard to Mr. Lloyd's premises you could not say one way or the other that it was a matter of probability that the high voltage fuse would blow at these particular premises and you agreed with that?--Yes.

In your statement you have expressed the view on page 5 - "...the only consequence of lack of co-ordination is that the point of disconnection of the supply is at the high voltage fuse rather than the low voltage fuse for the lower probability event." When you state that, is that a matter of Commission policy or philosophy that fuse co-ordination should be designed in that way?--Yes.

12.PA/AC.  
Fire.

1452.

WILSON, Rec.

10/02/2009

12-15  
13-13

12-15  
11-11  
10-10

FIRENZA

2430

When was that policy established?-- I could not say with any certainty, It has certainly been a policy I have followed throughout my engineering career with the Commission over 15 years. It has always been a policy to design your protection to cover all possible events.

No doubt, at some stage, the Commission investigated these particular two fuses and the co-ordination between them, is that right?---Yes.

Do you know when that was first done?---I cannot say with any certainty. It would have been at the time of the development of the 25 KVA S.V.E.R. substation some time ago.

You were not involved in it?---Not at that time.

You are not aware of any file or calculations made of the investigations at that time?---No.

Are you aware of any file being in existence?---No, personally, I am not.

Are you aware of any since the development, in the first place, of any investigations or attempts to get better co-ordination? ---No, I am not.

You say the only consequence of lack of co-ordination - and you put it as the "only consequence of lack of co-ordination - - - and I would ask you to assume that the high voltage fuse does eject incandescent material which can cause fire - that would be another consequence?---Yes.

And a serious one?---Yes.

Another consequence is if the high voltage fuse goes you need an access permit, whereas, if the low voltage fuse goes, you do not, is that correct?---Yes.

Are you aware of any enquiries as to practices overseas in relation to what one does to overcome this?---No, I am not personally aware of any.

Do you know whether or not the Commission has made attempts to submit the problem of co-ordination to overseas manufacturers or experts?---No, I am not aware of any specific instances of that.

When you want a fuse in the Commission in Victoria, do you design a specification, submit it to the manufacturer and say, "Make a fuse with that current, time and characteristic", or do you look at the manufacturers' brochures and say, "We will have that one he has already developed"?---If we were searching for a new type of fuse now, firstly, we would discuss with manufacturers or representatives in Australia to ascertain the kind of fuses suitable for that type of application. We would then follow it up with, if necessary, the issue of specifications for a particular type of fuse that was available or, as you say, issue a specific or design contract with a particular manufacturer to design the new type of fuse we require.

Have those steps ever been taken, to your knowledge, in respect of the 55 amp fuse or the two amp fuse on the high voltage line?---Recently we have had discussions with manufacturers with regard to not just the 55 amp but the whole field of low voltage fuses.

12.FA/AC.  
Fire.

1453.

WILSON, Rec.

10/02/2009

13-13  
12-15

12-15  
11-11  
10-15

INSPECTION REPORT  
FIRENZ

2930



10/02/2009

When recently?--In the last three months.

Since the fires?--The discussions were commenced prior to the fires, about last November, and they have been going on over that period.

How long have you been with the Commission?--Fifteen years.

In your period with the Commission, to your knowledge, is it a fact that the Commission has done nothing to improve the co-ordination of the two fuses such as they exist at pole 11?--No, I do not know of any instances where the Commission has specifically tried to improve the situation for the 10 KVA s.w.e.r. substations.

When one wants a fuse and one goes to a manufacturer, you look at his specifications in relation to fuses, do you not? --Initially, yes.

Do you have a specification of the Stanger fuses?--I have a copy of that document which you have in front of you.

910A, is that correct?--Yes.

(Page 145 follows)

*[Faint, mostly illegible text continues on the page, appearing to be a transcript of a meeting or interview.]*

12.PA/AC.  
Fire.

145#

WILSON, Rec.

11  
12  
13

11  
12

INTERNATIONAL FIRERENZ

12

EXHIBIT 200 ..... Mr. Wilson's statement dated 2nd May 1977, and annexures thereto.

MR. BARNARD: Mr. Wilson, it is said this was not part of the additions to your statement. In fact, you have photostated part of this document?---That is correct.

Figure 11 is the photostat of part of the Stanger high voltage expulsion fuse?---Yes.

When one looks at the part you put in, the time current characteristic do you understand that as being the melting time on that graph. It says melting time in seconds, does it not?---It does.

That represents, in fact, pre-arcing time or operating time, is that so?---Pre-arcing/operating time.

The two words are interchangeable?---No, it is the time prior to arcing commencing, it is the time for the element to melt.

Do you understand this to be the pre-arcing time, as showing the pre-arcing time?---Yes.

When one sees a time current characteristic such as that which not only covers the 2 amp fuse, it covers a number of fuses produced by Stanger, does it not?---It does, it covers their full range.

To know what fuse is most suitable out of their range, one has to look at the rating selection table?---That is the manufacturer's recommendation.

If you look at that rating selection table, it sets out the kilovolts of the fuses, and the fuse's full load amps, does it not?---It does.

If one takes our particular transformer, the nearest to 12.7 is the 12 kV one, is that so?---In that table, yes.

So one would need to look at that column?---Yes.

If one looks at that particular column and takes the appropriate load current, the load current of the particular transformer that we have is rated capacity 10,000 volts and you divide that by the voltage coming to it, is that so?---That is correct.

Which works out at, I think, .79 amps, is that so?---That is right.

If we look at the manufacturer's rated selection tables, you have a choice of two fuses which are near to that?---That is correct.

So that in fact the 2 amp or the 3.15 amp fuse, on the basis of his rated selection table, might be applicable, is that so?---Yes.

Have you considered this problem before?---Yes.

Recently?---Yes.

Perhaps you might tell us, is there any reason why a 3.15 amp fuse could not be used in the clamp-on fuse?---The 3.15 ampere fuse would not see or could not clear for a fault on the low voltage side of the transformer. The 2 amp fuse will.

12.GT.KK  
Fire

1455

WILSON, Rec.

10/02/2009

13-13  
12-15

12-15  
11-11  
10-10

INSTRUMENTAL PHOTOGRAPHY  
FIRENZA

2400

Firstly, is the discrimination between the 3.15 amp fuse and the fuse at the isolating substation adequate?---Yes.

And the 3.15 amp fuse would be adequate to protect the transformer? ---No, it would not be adequate to cover faults in the low voltage winding of the transformer. I think I said in my statement that faults in the low voltage winding of the transformer would involve currents of 6 amperes, 6 ampere current would not blow a 3.15 ampere fuse.

In fact, would 7 ampere currents blow it?---Approximately, which is the minimum value of fault current, I think, from those figures. Yes, approximately 7 amperes.

When did you work this out?---My staff have had it worked out for some considerable time. I went through the calculations myself some weeks ago.

When you say for some considerable time, for what period of time?--- I think the documents went back to the late 1960's which would have been the last time.

Why did you do that at that time?---That time was the time the decision was made to go for the 55 amp low voltage fuse.

Why was there a reconsideration of the amperes at that time?--- To ensure the decision made to change the fusing factor associated with the 45 or 55 amp fuse did not alter the situation with regard to co-ordination in the substations.

Why, then, was the decision made to change from the 45 to the 55?--- Because we use a standard low voltage fuse on all installations through the State, 55 amperes, and the impetus for change from 45 to 55 was because of the growth of bigger individual units in homes throughout the State, air-conditioners, bigger stoves and such installations.

You would agree with me, would you not, that in fact class K fuses are capable of being produced in a wide range of amperages or covering a wide range?---Yes.

If you had a slightly increased amperage on this 2 amp fuse it would enable the low voltage fuse to go first, would it not?--- Yes.

Is it your belief there is no real reason why a fuse of the type presently used in the 2 amp fuse, of that spring type, could not be designed so that it did produce a curve that covered the 6 amps on the transformer and yet enabled the low voltage fuse to go first?---I cannot answer that categorically yes, without going through the calculations, and consulting with the manufacturers as to their ability to produce that fuse. I cannot say categorically, but it would appear possible.

The fact is, enquiries have not been made with the manufacturers?--- To my knowledge, no enquiries have been made.

THE BOARD: What is the inference to be drawn from that?

MR. BARNARD: The inference to be drawn from this is, and the witness could perhaps agree, if you have a better co-ordination between these fuses, the fuse that will usually then go is the low voltage fuse which cannot expel material and cannot cause fires.

12.GT.KK  
Fire

1456/1457

WILSON, Rec.

10/02/2009

11-12  
12-13  
13-14

11-12  
12-13

INDUSTRIAL REVIEWS  
FIRENZA

24X30

THE BOARD: Thank you. Yes, I understand.

MR. BARNARD: That is the purpose of it, is it not?---Yes.

You spoke of your duties in protection. I see that the figures, I think, that you quoted of the fuses used within the State, or the installations which carry these fuses in the State, are 100,000; you order 16,000 a year, but only 10,000 of these are used by way of replacements?---That is correct.

Of course, it is the behaviour of this electrical gear which informs the electrical supplier how its supply is operating and how efficiently it is operating, is that not so?---That is one criterion they could use, yes.

It is not only one that you can use; it is one that should be used, too, is it not?---I am not quite sure what - - -

What I am putting to you is this. If a lot of fuses are going on a particular line, it is perhaps an indication to you that the maintenance is poor on that line, is that not so?---That is an indication, yes.

Or, to put it another way, if the wires are coming off poles in a particular area, the fuses will usually be going, will they not?---Yes.

So that one of the accepted tests by an electrical supplier is to keep a check on how the protective gear is reacting? ---Yes, although we, in fact, go steps further than that, in that every time a fuse operates, we attempt to determine the cause, and the cause is, in fact, categorised within our reporting system, such that we have a breakdown of the faults on, for example, the 22 kV system that are caused by various types of initiating mechanisms, such as birds, animals, lightning, etc.

Is this throughout the State?---These statistics are collected throughout the State, yes.

So that if we go to the Hamilton office, we can say that all of the faults that have occurred that have blown the high voltage fuses will be recorded, and you will have taken statistics out of these records to indicate whether possoms are the big trouble or whether there is something else that is the prime cause of interruption to supply, is that so?---Yes, such things are recorded on the S.I.F. forms that have been referred to previously.

But that they are recorded on the S.I.F. forms is one thing. They have to be put into the statistics in some way, do they not?---Correct.

That is done, is it, from Hamilton?---I am not sure whether it is done from Hamilton or whether it is done in the regional office - in that case, at Colac - but it is certainly done at this stage, prior to reaching my department, and it is published in the SEC's annual report, in fact.

THE BOARD: But you would not be able to get much of value from your statistics unless the basic recording system is efficient?---Yes.

In other words, if half your linesmen never bother to record what the cause of the thing is, your statistics are not going to be too good, are they?---That is correct.

12.JB/LC.  
Fire.

1458.

WILSON, Rec.

10/02/2009

11  
12  
13

11  
12  
13

INDUSTRIAL REVIEW  
COMMISSION

24/00

Are you satisfied that these recordings are made? From what we have heard, the S.I.F.S are not worth a great deal from the point of view of records?---From the point of view of records, but from the point of view of statistical evidence I am satisfied that they give us an indication of the causes of our major faults.

MR. MARKS: He is talking only about what they do know, is he not, rather than - - -?

THE BOARD: Yes, I agree with that. I suppose it might be a sort of little Gallup poll of their own: they have identified so many faults, and they can get some statistics from that. But they would be a great deal better if they had the lot.

MR. MARKS: Yes. I thought if it is a question of whether it is possums or not, they would have some records of possums doing it. I think that is all I am saying.

THE BOARD: That could be. Certainly if they have some records, they will be able to say there are some caused by possums, some by gentlemen with boats with aluminium masts, and various other things, but statistics are not very good if you cannot say there were 53 possums as against four aluminium masts. That is the sort of thing that I was meaning.

THE WITNESS: My understanding would be that the statistics are adequate to extract information at that level from them.

MR. BARNARD: Can we assume then that if, for example, there is interference by trees against wires, say, on s.w.e.r. lines, they can in some instances blow a fuse?---Yes.

And the linesman comes along and he finds the fuse at the isolating substation blown, and he goes right along the line and he reports trees against s.w.e.r. lines, is that right? That would be recorded in your data, if this were found? ---That should be recorded in the data.

I suppose that is a problem that has presented itself a lot in the statistics, is it?---I would not be able to quote the exact number, but I think trees are involved in a reasonable percentage of our faults.

And has that been over some period of time?---Yes.

So that there your protection system has given you warning of the problem of trees, is that so?---Yes.

And, of course, you would expect that the problem of trees, in fact, would be obviated by regular maintenance by linesmen and tree clearing crews organised at a local level, is that so? ---Yes.

When you see in your statistics that trees are a problem, what do you do then? I suppose you draw the conclusion the job is not being done at the lower level, do you?---I would presume the management could draw that conclusion if the statistics were increasing.

Who does draw that conclusion?---If the conclusion were to be drawn, it would be drawn by the management of the Commission, presumably. The regional people report to the Assistant General Manager, Marketing and Development. It is his responsibility for their function.

12.JB/AC.  
Fire.

1459.

WILSON, Rec.

10/02/2009

11  
12  
13

11  
12

INDUSTRIAL REVIEW  
FIRENZ

17

2430

10/02/2009

The statistics come to you at first, or your department, do they?

THE BOARD: I have a feeling that they are not coming to you at all. That was a matter of interest?---No, in this area we get only the summaries. The regional people do the detailed work.

MR. BARNARD: So you would not regard it as your responsibility, if you saw that trees were a problem, or an increasing problem, to say, "Look, something is going wrong down the line of command. We'll correct it"?---No, that is not my specific responsibility.

You expect the regional manager to do it, do you?---Yes, it would be his responsibility.

If trees still keep appearing in the statistics, what do you do then? Who takes action about that? It means that at regional level the job is not being done. Who takes action then?---The Regional Manager reports to the Assistant General Manager, Marketing and Distribution.

He reports to them, but if the Regional Manager is not seeing it is done and you see it is still appearing there in the statistics, who steps in then?---My department would have a role to play in pointing it out to the management.

Have they done anything along those lines?---Not that I know of specifically.

Have they really been looking for it?---We have certainly been aware of an increased incidence of trees involved with the lines. We have also been aware of an increasing community pressure not to cut trees. One accepts the conflict involved in those two premises.

The decision about the trees is not yours, is it? You pass that on to management, is that so?---Certainly.

Has the increasing problem in relation to trees been passed on to management?---I certainly have not passed it on to management.

Has your department, or have those under you, your division?---No, it certainly has not emanated from my division.

The consequence then is that there is really no check, or there has been no proper check, on how the regional areas have been performing their task, is that correct?---I do not think I could be quoted as being a representative sample of my department. I am only one division of four, for a start. The actual function of tree clearing and that sort of thing falls purely within another area of responsibility.

Which division is that?---Field practice division.

And they would have the same statistics as you have, would they? ---They also receive a copy of the annual report, yes.

I might just ask you about those tests at Oakleigh. You mentioned there that there was a set-up for a fault current of 50 amps, is that so?---No, a fault current of approximately 550 amperes on the low voltage system.

On the low voltage side, which are transferred back on the high voltage side to what sort of fault current?---Between 20

12.JB/AC. and 25 amperes. 1460. WILSON, Rec.  
Fire.

13-13  
12-15

12-15  
11-11

FIRENZ

10/02/2009

That is, multiplying it by either 480 over 12,700 or 240 over 12,700, is that right, depending on which sort of fault it was?---Yes.

Is the fault current the same regardless of which wires are being used?---No. If we had an active to active fault it would produce different fault currents from the active to neutral.

What was the active to active fault current?---You are stretching my memory. 24 point something amperes. We do have records on fault currents - the oscillographs - records of the currents produced in those tests.

When you say 23.4, or whatever you said - 24.3 - that means on the fault table of the current passing through the high voltage fuse, is that so?---Correct.

So what you are saying is that it approximated to the sort of current which was causing the high voltage fuses to operate in the afternoon demonstration at Fishermen's Bend, is that correct?---That is correct, yes.

Of course, if you had changed the fault current on the active to neutral in the demonstration at Oakleigh, we might have got a different result with regard to whether the high voltage fuse or the low voltage fuse blew?---I do not think so. We did two or three tests of active to neutral, in which case, in all cases, the low voltage fuse blew. Had we done 100 such tests I would assume something like 70 would have been low voltage fuses.

I shall perhaps put it to you another way. If the fault current were changed, or you moved the substation away from the pole, or something like that, you might have got a different result, is that so?---I do not think it would have substantially altered the result, no.

But you think that with the 100 tests, it would be 70 to 30, or something like that?---Of that order, yes.

In your report you mention that in forming your conclusions you relied on some evidence of a metallurgist examining the wires, is that so?---I did not say who. I said, "Subsequent inspection of the low voltage conductors supplying the Lloyds' property have revealed recent burn marks consistent with low voltage conductor clashing."

That was not your inspection, was it?---No.

Whose inspection was it?---It was in the evidence, read into the Clenthompson fire situation. I have trouble remembering exactly whose inspection it was.

You are not referring to any specific burn marks, then?---No.

You yourself are not aware, then, of the situation of those burn marks?---No.

(Page 1462 follows)

MR. BARNARD : You are not aware on which wires they appeared?--No.

So you are not able to draw any conclusions from these burn marks?  
Only the conclusions I have drawn in the document.

Do I understand you to be saying that regardless of whether those burn marks were on neutral and active or active and active you concluded that those burn marks are the likely causes of the blowing of the high voltage fuse?---Yes.

And, of course, would you agree that one would not have wanted to have known what happened at the Lloyds' property on 12th February this year, to have known this sort of thing could happen?---Certainly.

It is a matter of any electrical engineer sitting down and looking at the system, making a few calculations, looking particularly at the time current characteristics of the fuses, and he knows that is a very real probability, that if wires clash, the high voltage fuse will operate?---Yes.

The Board asked you this morning about the placement of the wires; do I understand your view to be that there is nothing wrong with placing the neutral wire in the centre?---I do not remember expressing that precise view.

I am not suggesting you did, but is that your view?---I can see nothing wrong with placing the neutral in the centre.

Do you know why it is placed on top, in fact?---I have no opinion as to why it should be placed there.

There has been some discussion as to the risks associated with lightning, I think that was at some stage a reason for placing it on top, could that have been so?---In my professional opinion, that is completely meaningless.

MR. MARKS: Who suggested it was to do with lightning?

MR. BARNARD: I am not suggesting it; in literature it has been suggested?---That is confused with the fact that on very high voltage lines on the towers we do provide not a neutral, but an earth conductor.

Is it not a matter of significance with low voltage wires, if the central or neutral wire was placed in the centre, the chances of clashing between active and active would be almost eliminated, would they not?---They would certainly be substantially reduced.

And, accordingly, if the neutral wire was placed in the centre, the chances of the high voltage fuse operating instead of the low voltage fuse operating as a result of conductors contacting one another would be substantially reduced?---It would be reduced, I would not say substantially because, again, I reaffirm on an overall picture of the State, most of our faults are not active to active, but active to earth faults.

You agree it would be reduced?---Yes.

And likewise, risk of fire would be reduced?---Yes.

If one could not overcome co-ordination or fuse problems, would not that be one step which would at least improve the situation?  
---It is one step we could be taking, yes.

12.YE.KK  
Fire

1462

WILSON, Rec.

10/02/2009

11-11  
12-15  
13-13

11-11  
12-15

INDUSTRIAL PHOTO  
FIRENZA

29200



THE BOARD: That would work, would it not, whether you had them in what gunsmiths call an over and under position or whether you had them all horizontal - I mean the three wires?---Yes.

It would still be an advantage to have your neutral separating the two actives?---I think the other thing that needs to be borne in mind is that there is a substantial proportion of installations from these particular s.w.e.r. substations that are only two wire. Three wire is not, in my estimation, the majority.

MR. BARNARD: That is something that troubled me. Here we have three lines of wires going off at Pole 11?---Yes.

Let me put it this way, I suppose the bottom wire of two lots, one active wire from each of the two lots and the only other active wire of the third lot, you have three active wires passing through one fuse, is that not so?---Yes.

And that active fuse is designed to take the load coming through those three active wires going to the woolshed and a house and a house?---It certainly could cope with it.

Is it designed to take that sort of load?---It is designed to take the maximum load one would get on a load of that type.

THE BOARD: That is its function, whether it is designed to do so is another matter?---Yes.

MR. BARNARD: If, in fact, you said there can be only one active wire off this pole, could you then have a fuse of lower operating capacity?---One could have, but we would not have because we use a standard fuse throughout the State.

So, in fact, one solution to better co-ordination here would be if you have a different design low voltage fuse and, in fact, installed separate low voltage fuses for each active wire going off that pole, is that not so?---Yes, although, to put that into context, we have one million customers and if one was to design individually each installation, as you are proposing, it is a fair sort of task.

That is one matter of context, the other matter of context is the risks that may ensue from the set-up, as it were, such as the risk of fire and the claims which may arise out of that, is that not so?---That is so.

And those matters must be weighed one against the other, must they not?---That is correct.

So, really, by various devices the lack of co-ordination in special situations or in rural situations could, at extra expense, be avoided, could it not?---Yes.

The tests at Fishermens Bend, we have seen the oscillographs and I think they speak for themselves, but there is, of course, no evidence on the transcript of what it looked like, but it is true, and I think you indicated at the time, the clamp-on fuses, as they were operated in test No. 4, did expel incandescent material?---That is correct.

And those incandescent particles reached the ground?---Yes.

And they were capable of being picked up?---Yes, that is correct.

And I think you indicated that those particles, when they hit the tray, which is zinc covered steel, is that right?---Yes.

10/02/2009

13-13  
12-15

10-10  
11-11  
12-15

INDUSTRIAL REVOLUTION  
FIBRE

2430

They picked up zinc on to the particles themselves in some cases?  
---I think it was Mr. Weatherhead indicated that to you,  
but that is correct.

They pick up the galvanised?---Yes.

And that occurs because of the heat of the particles?---Yes.

Incidentally, the third test was, to put it one way, the best test  
in that section 4, test No. (c), the most spectacular; in  
other words, it seemed to eject more particles, is that  
right?---Yes, that would be right.

Do you remember that?---Yes.

Was it your impression that, in fact, one of the particles bounced  
as it hit, in that third test?---No, but I can remember the  
opinion being expressed.

Have you ever seen that happen?---Yes.

You could only see it happen because the particle is still blowing,  
is that not right?---Yes, that is correct.

You tendered the Australian Standard this morning?---Yes.

In that Australian Standard one of the organisations represented on  
the committee entrusted with the preparation of that  
standard is said to be the Electricity Supply Association  
of Australia?---That is correct.

And a member of that Electricity Supply Association of Australia  
is the State Electricity Commission of Victoria?---That is  
correct.

And the State Electricity Commission of Victoria was represented  
in the preparation of that standard?---Yes.

And you yourself referred to the note appearing on page 14 under  
"Behaviour on test and in service" the note referring to  
the ejection of incandescent particles causing fires - you  
referred to that?---The statement says the possibility of  
ejection.

The possibility; this is something which you, at the time of the  
preparation of this standard in 1971, would have accepted  
as accurate, is that so?---That is correct, yes.

And it is your own personal view that the operation of these fuses  
can cause fires?---Yes.

And that depends upon the tinder available for the incandescent  
material to light, and the humidity and things of that sort?  
---And the operation of the fuse.

At the sort of amperages which do normally operate in the  
situation of Pole 11, it does eject particles?---Yes.

Were you present when Mr. Russell Chirnside gave evidence?---No.

I think I should say he gave evidence of observing one of these  
fuses operating on an April morning which he described as  
a day like the day he gave his evidence, at about 7.20 in  
the morning, he was walking to his wool shed and the machines  
which were then starting or it was implied were starting,  
the starting of the machines could cause a load that would  
blow a fuse, is that not so?---It is possible. I would not  
like to say categorically without knowing the situation.

10/02/2009

12-15  
13-13

12-15  
11-11  
10-10

INSURANCE FIRE  
FIREN

2430

Some of them are quite big actors, are they not?---I am not a shearer.

And he described it as a day and it was a day that was sunny and cloudy, but at 7.20 in the morning, and he described a fire as having started?---Yes.

It is no surprise to you that a fire could start at this time of the year and in those circumstances?---No.

As a matter of engineering knowledge, for what period of time, so far as you are aware, has this electrical engineering knowledge, has this feature of expulsion fuses been known? ---Certainly since the early 1960's.

The Commission has carried out tests of the behaviour of these fuses prior to yesterday, I assume, or prior to February 1977, is that so?---That is correct.

And have you yourself been engaged in any of those tests?---No.

You have seen the records of such tests, have you?---Yes.

When, from those records, do you believe those tests were carried out?---The late 1960's.

The late 1960's?---Yes.

Do you believe the effect of those tests to be the same as you yourself have carried out in the last few weeks?---To all intents and purposes, they are similar.

And was the reason those tests were carried out in the late 1960's because of a claim against the Commission alleging fire because of the operation of the expulsion fuse?---Yes, the operation of an EDO fuse.

That is with a fire catcher?---Prior to the development of a fire catcher.

The conclusion one would draw would be the same as in relation to the clamp-on fuse, is that not so?---Yes.

Have you investigated the records of the Commission as to evidence of fires which in the past have been caused by the operation of EDO fuses without fire catchers or clamp-on fuses?---I have seen such records, yes.

Have you any idea of the number of fires which have occurred?---Not off the top of my head.

But there has been evidence of them?---There have been a number of them, yes.

Those records are in the Commission's possession at the present time? ---I think, even better, they are about to be tendered to the Inquiry.

Much better. I suppose also, in addition to the records of evidence of fires, there have been complaints of this having happened, or do the records show that as well?---I am not sure whether they show it in detail, but, somewhat obviously, the Commission has been involved in complaints of this nature.

It amounts to this, that the Commission has known for some time of the risk associated with the operation of these fuses, is that so?---That is correct.

12.YE.KK  
Fire

1465  
(Page 1465 follows)

WILSON, Rec.

6002/20/01

12-15  
11-11  
10-10

120x25

12-15  
13-13

INDUSTRIAL DIVISION  
FIRENZ

And is it a fact, then, that one of the main reasons for putting on the fire choke on the EDO fuses and also replacing clamp fuses with EDO fuses, with a fire choke, is to avoid the risk of fires?--The first presumption is correct. The reason for putting a fire choke on the EDO was as a result of the influence of the EDOs causing fires.

(Page 1466 follows)

10/02/2009

12-15  
13-13

12-15  
11-11  
10-10

12.YE.KK  
Fire

1465A

WILSON, Rec.

FIRE  
INDUSTRIAL  
INSURANCE  
CORPORATION

120-25

24300

THE WITNESS (Continuing): The major reason for the replacement of the clamp-on device with the EDO fuse is that of an operational requirement.

THE BOARD: You were going on to say something about an access permit?---Because the clamp-on fuse requires an access permit.

That has been stated a number of times and, I confess, I do not see the implication of it. Why is that a good thing - is it so that the linesmen can work without having to obtain an access permit?---Yes. With the current clamp-on fuse, the linesman needs to have an access permit prior to the replacement of the fuse element. With the EDO he can replace the fuse element without the permit.

MR. BARNARD: The reason is not clear to me, Mr. Wilson?---The reason is that the S.E.C. has a Safety Committee which reviews its activities quite frequently. With the EDO fuse, the fuse tube and element are removed by the live line stick, as you saw yesterday, and the "hands-on" part of the operation - putting the fuse into the holder - is carried out completely isolated from any electrical mechanism. At no stage is it at all possible for the operator to come in contact with live apparatus. With the clamp-on fuse, normally the connection from the transformer to the base of the fuse is such that he has to actually attach the fuse by hand to that tail, while holding the fuse tube. It is not, as you saw yesterday when he was able to remove it by means of a live line stick. This means there is a possibility, remote though it may be, that some small generator device in the consumer's installation could be back-fed through the high voltage and he could be subject to a serious accident.

THE BOARD: That is why he has to get the permit?---The permit is basically designed to enable him to work in the vicinity of apparatus which could be made alive. It is a safety document.

MR. BARNARD: It could be made alive, not from the high voltage system but from some other source?---Yes, correct.

I am being kind to you, Mr. Wilson, in saying or asking was there another reason for replacing them? What I am asking you is is it the fact that the Commission entirely disregards the risk of fires flowing from clamp-on fuses, or was that one of the reasons for its seeking to replace them with EDO fuses with a fire choke?---Yes, that must have had an influence at the time on the decision when it was taken.

Who compiles the programmes for replacing these fuses? Is it left entirely to the district managers or is it planned from above?---I cannot remember the terms of the document that authorised the replacement or that said something about the directions to replace but it would have been as the opportunity arose, which means it was not a five year, three year or one year programme. It was to be replaced as and when the opportunity arose.

It really comes to this, does it not - we have had evidence here, for example, of a tree touching a wire on the 8th January at Tattycoun, a fire starting there and burning for eight miles: you have mentioned evidence of clamp-on fuses having caused fires or having been alleged to have caused fires in the past. Who is it at the Commission who takes these things into account and sees that managers, linesmen

10/02/2009

11-11  
12-15  
13-13

11-11  
12-15

INDUSTRIAL RESEARCH  
FIRENZA

24200

or regional managers of divisions, whoever, take steps to obviate this sort of thing happening? Whose responsibility is it?---I can delegate responsibility for the Commission's activities from the Commissioner to the Managers and General Managers - right through the whole chain of command. I find it difficult to answer precisely your question.

Is there anybody who has to look into safety so far as the public is concerned of the Commission's equipment?---The chief electrical inspector is one such body who certainly looks after the electrical safety regulations. As regards public hazard, it is the lines department's responsibility and in that, I must assume, it is my own division of the department to which I belong. They have to look into such matters as the distribution centre. That is the line responsibility of my department.

That is really distribution?---The distribution engineering department.

You yourself are not directly involved in that? I think you told us that?---Obviously, my division would have an input to that.

You do not yourself engage in supervising regional or district managers?---They are above my level and they report directly to the Assistant General Manager.

The small 55 amp fuse is a high rupturing capacity fuse?---Yes.

These are made over a wide range of amperages, is that right?---Yes.

I think you told us they have a silver element, they operate, it disappears in the powder content, the p reclaim container?---That is correct.

Those fuses are very accurate in operation, are they not?---They are subject to about the same tolerances as the others. This co-ordination curve will show that they are plus or minus 10 per cent.

They can be made into a very high operation?---I think, plus or minus 10 per cent is about the accuracy to which they can be made.

Do you regard any of those you have described as high rupturing capacity, these liquid filled or powder filled?---Powder filled, boric acids and general purpose - - -

I am not suggesting to you in fact where the two amp Stanger fuse is used you can get a high rupturing capacity fuse to fulfill that position?---Some of those fuses could be used in that position.

And that would provide better co-ordination with the low voltage fuses?---On the contrary, it would provide worse co-ordination. These fuses are much faster in their operation.

You have the same type of fuse?---Yes.

In other words, you could have HRC fuses, could you not, with a low and high voltage?---That, of itself, does not ensure co-ordination.

But it assists with the time current characteristics, it assists in co-ordinating time current characteristics?---No, as I

12.P./AC.  
Fire.

1467.

WILSON, Rec.

10/02/2009

11-11  
12-15  
13-13

11-11  
12-15

IRBENZ

2430

stated in my submission, all three fuses, the powder filled, the boric acid and the liquid filled, operate much faster or faster than the EMO, thereby providing a co-ordination problem, even for the active/neutral.

Have you in fact attempted to investigate such fuses, for example, the Westinghouse Switch Gear group in the United States?  
---Yes.

Have you used their fuses?---We have their fuses in parts of the State.

Have you used the two amp fuses?---Not in the rural areas, because of their inability to co-ordinate.

You referred to figure 14 which showed the magnetising inrush?---Yes.

How did you calculate the position of that line showing the magnetising inrush current?---It was calculated on the basis of a paper which was written, and the name escapes me at the moment - an American paper written some years ago which is authoritatively used and has been used by engineers for some years.

It is a rule of thumb, is it not? It is easy to calculate twelve times .79 in this case?---That particular thing was calculated at three points. I cannot recall the precise figures but I can obtain them if you wish.

I have left the paper at home. Is it Boyd and Smith's paper?---That is an earlier version. There are, as well, some later ones.

The calculation is not absolutely reliable, is it?---I know of no cases where it has been unreliable.

You have not experienced any cases?---No.

Technically, it is regarded as a possibility that magnetising inrush current in a situation such as pole 11 could cause the operation of the high voltage fuse?---Not in my opinion.

You say it is technically not possible?---No.

You have referred to your reasons as to what happened at pole 11 on the Glenfraser spur. You yourself have not been up there, is that right?---No, I have not.

Could the witness be shown the police photographs and the aerial exhibits?

THE BOARD: Those are Exhibits 20 and 21. (Handed to witness).

MR. BARNARD: Do you see the way the pole is set up there?---Yes.

Do you see the position of the transformer?---Yes.

Do you see the position where the lead from the transformer is affixed to the stirrup on the high voltage wire?---Yes.

So that the lead crosses from one side of the pole to the other side of the pole?---Yes.

That, generally, is an unsatisfactory arrangement, is it not?---It is not one I would do myself.

Usually, you try and have the transformer on the same side of the pole on which the lead is going .?---Correct.

12.P4/AC.  
Fire.

1468/1469.

WILSON, Rec.

10/02/2009

11-11  
12-15  
13-13

11-11  
12-15

INDUSTRIAL REVIEWS  
FIRENZA

24300

MR. BARNARD: To reduce the chance of contact between the pole and the lead or, alternatively, between any animal, bird, stick or anything contacting the lead and joining it to something that might cause a fault?--Yes, although looking at this photograph, I do not think he had much alternative. If the fuse was on the other line, which was the only alternative place, the wire would have been just as clear or just as close to the pole, whichever way you put it.

Your impression is that it is in between the two, is it?--That is my impression from that photograph, certainly.

Perhaps you could look at Exhibit 15 which does not show the wire so clearly. Can you see some photographs of the positioning there?--Yes.

What I am asking you is, quite clearly it is a situation that would be better arranged with the lead not crossing the pole, would it not?--I am not sure the lead actually does cross the pole, looking at these photographs.

If it does cross the pole, if the position is that the transformer is on the west and it joins a wire going away to the north-east, that would be an arrangement which is not entirely satisfactory, is that so?--That is not entirely satisfactory.

And it makes this pole one which is more liable to enable faults to take place because of the contact between the transformer lead and other objects, is that so, whether it is caused by birds, possums, or anything else?--That is possible, yes.

THE BOARD: That is interesting, but in fact no such thing happened, did it?

MR. BARNARD: We do not know.

(To witness): It is one of the possibilities, something may have occurred there. That could have caused the fuse to blow?--Any earth contact with that high voltage conductor would cause the fuse to blow, yes.

That is something that could have happened about which we are unable to say unless you find the object that caused it, is that not so?--Yes, that is so.

I was asking you about the number of fuses. In fact, you told us 10,000 fuses have been replaced in 106,000 situations through the State per annum in broad terms?--Yes.

The evidence we have, I think, indicates that in 1966/67 in the Hamilton district 517 2-amp fuses went out at the store?--Yes

And we are told in that district the number of EDOs and clamp-on fuses, including 2, 3, and 5 amp fuses, is a total of 2,477?--Yes.

We have no figure as to what the number of fuses that have only 2 amps in them is, we have no figures for that, but it is clearly less than 2,477. If one relates the 517 to 2,477 we are talking of a percentage on that basis in excess of 20, whereas the figures you gave represent 9.5 per cent?--Yes.

If those sorts of figures are coming in, would that not be a matter of some concern?--Putting myself in the Regional Manager's position, which I am not, one would first have to ascertain

10/02/2009

11-11  
12-15  
13-13

11-11  
12-15

11-11  
12-15  
13-13

12-15



16 18

what the 517 were used for. About that time there was quite an expansion in the Hamilton district, and I would assume most of those in fact would have been used for new installations.

THE BOARD: Did not the witness say something about that?

MR. BARNARD: I thought it was the maintenance, the 1976/77 period it was. The increase was going on subsequently, was it not. It is at page 373.

THE BOARD: Who was it, Mr. Kinder?

MR. BARNARD: No, the man from Stawell, Mr. Boyle.  
(To witness): In any event, if there was that rate of replacement it would be an alarming figure?---It would be a high figure, certainly.

Does it vary greatly throughout the State?---Yes, but not - if you are assuming that 50 per cent of those users operated in one district in one year, that would be an alarming figure.

Of course, this may well represent 56 because 2,477 fuses would only probably be half the 2 amp fuses?---That is why I am assuming most of these were new installations.

Who makes a check on this, the Regional Manager, does he?---It is within his line of responsibility.

Of course, any question of the philosophy of tree cutting, does that come within your division at all?---Sorry, Mr. Barnard.

You have been overseas, have you not?---Yes.

You have studied power supplies overseas?---I have worked with electricity supply authorities overseas, yes.

In the United States at all?---No, not the United States; Canada, U.K., Switzerland and Germany.

In Canada, I suppose, they have trees there, do they?---Yes.

In fact, were you aware of whether they had codes and practices for tree cutting?---None of the authorities I worked with - I was not aware of any specific code or practice.

Were you aware that in the United States for the last 40 years they have faced this sort of problem and have codes of practice? ---I am aware of some of the codes of practice which have been applied in America, yes.

You are aware of that, are you?---Yes.

How long have you been aware of that?---Probably since the Fire Inquiry commenced, that I personally became aware of it.

Are you aware, in fact, they have had published codes from as long ago as the 1930s?---No, I was not aware of that.

Can you tell us the areas which you have become aware of?--- Southern California is one that comes to mind. Pacific Gas and Electricity which is in the same geographic area.

If somebody is going to set standards for the Commission in relation to tree-cutting, for example, and set codes of practice and publish those codes, just like you publish a code for fuses, who would do it in the Commission. Is it again just not

10/02/2009

11-11  
12-15  
13-13

11-11  
12-15

INDUSTRIAL REVOLUTION  
HYBRID

29X30

your division?---It would fall within the ambit of the department for which I work, Distribution and Engineering.

But not your division of it?---No.

In your statement on page 9, when you referred to the oil circuit recloser, I think you said there was no record of operation of the oil circuit operation, is that so?---I said there was no record of operation of the circuit breaker.

That is the one further up the line?---That is the one at Hamilton.

The oil circuit recloser does the same thing, does it not, it goes off and on?---Yes.

And it does have a record?---No, we do not keep records of each operation. We take a monthly check.

THE BOARD: It records the number of times?---Yes, it is checked on approximately a monthly basis.

MR. BARNARD: The fact is that may have a record only you cannot tell checking it out afterwards?---That is correct.

Also in your statement at page 10 you said, in regard to the flash, and I think it is the flash of the fuse going off, not lightning, and you compared that to the clash of low voltage conductors?---Yes.

What was seen at Oakleigh yesterday was, I suppose, a typical sort of flash from the clashing of low voltage conductors, is that so?---Yes.

Not the sort of flash you would see in a house 100 yards away if you were looking the other way, is it?---Possibly not. I am not competent to say.

The fact is, on the other hand the high voltage fault will create a greater flash, will it not?---Not necessarily, no.

Not necessarily, but usually?---Where it is associated with higher current it would cause higher flash, yes.

And that could more often happen on the high voltage side?---The high voltage clashing does not occur as often as the low voltage conductor, no.

I am not talking about the frequency of the occurrence, I am saying if it does clash, for example, high voltage conductors clashing, it will make normally a greater flash of light?---Yes.

Likewise, if there is any interference on the lead from the high voltage s.w.e.r. line to the transformer, that could make a very substantial flash of light?---I do not think it would be substantially greater at all. There you have a single point contact. Conductor clashing, you are talking of a different type of contact between conductors.

THE BOARD: Mr. Lloyd Junior told us in his evidence it was a hot day, they had a lot of lines down, and he was at a window on the far side of the house and there was a flash which, whether it lit up the house is perhaps an exaggeration, but a flash enough to draw his attention. Assuming that to be right, what would your theory be as to what caused that flash. It would not be the fuse blowing?---No, in the absence of any other - - -

12.GT.KK  
Fire

1472

WILSON, Rec.

10/02/2009

11-11  
12-15  
13-13

11-11  
12-15

FIBREZ

2930

It must be the clashing conductors?---Yes.

Finally, is it a fact when you have a fuse on the load side as opposed to the supply side of a lightning arrester, there are circumstances in which the blowing of that fuse can cause the operation of the lightning arrester?

(Page 1424 follows)

10/02/2009

12.GT.KK  
Fire

1423

WILSON, Rec.

INSURANCE  
FIRE

2430

THE BOARD: I am sorry. Do you mind saying that again?

MR. BARNARD: When you have a fuse on the load side, as opposed to the supply side, of a lightning arrester, there are circumstances in which the blowing of that fuse can cause the explosion of the lightning arrester?---Yes. That is a different question, is it not? The first time you said that the blowing on the lightning arrester can cause the fuse operation.

No, I am sorry. I meant the other way, the fuse causing the blowing of the lightning arrester?---Yes.

And there is a thing called arcing voltage, is that so?---Yes.

And particularly with certain types of fuses, or with defective fuses - in other words, fuses that do not separate quickly enough - arcing takes place?---Yes.

And that arcing causes a voltage which flows through the lightning arrester to escape and is liable to explode the arrester, is that so?---The cessation of that arcing causes the voltage surge.

Yes, and this is a well recognised cause of the explosion or fracturing of lightning arresters, is it not?---It is one of the possible causes, yes.

Yes. I will suggest to you that one way you can do it is by putting a wrong type of fuse in a 12.7 kV system. Is that not so?---If the fuse malfunctions in the 12.7 kV system, yes, that is possible.

Of course, the fuse has to blow from another cause down on the load side, does it not?---Yes.

THE BOARD: Who else wants to question Mr. Wilson, so that we have some idea about tomorrow?

MR. LLOYD: I will be very little time, about quarter of an hour.

MR. DUNNE: I assume that Mr. Wilson is the appropriate person to question about the Wallindac fuse situation, and I will be doing that, but not at great length. I will be questioning him about that, and also, very very shortly, about the operation of the fuses in the Beac fire. There will be only a few questions on that.

MR. MARKS: There is also some evidence Mr. Wilson has to give about the lightning arresters.

MR. DUNNE: In relation to the surge arresters, I have, since hearing Mr. Wilson's evidence on Monday, arranged for some sort of technical assistance in that regard, and perhaps it might be better - certainly, from my point of view - if I had that report in before he gave any further evidence.

THE BOARD: Yes, very well.

(THE WITNESS WITHDREW)

THE BOARD ADJOURNED UNTIL 10.30 A.M., ON FRIDAY, 13TH MAY, 1977.

12.JB/AC.  
Fire.

1474.

WILSON, Rec.

10/02/2009

11-11  
12-15  
13-13

11-11  
12-15

INSURANCE REVIEW  
FIRENZ

2430

(Thirtieth Day)

TRANSCRIPT OF PROCEEDINGS

before a

BOARD OF INQUIRY

into

THE OCCURRENCE OF BUSH AND GRASS FIRES IN VICTORIA

held at

MELBOURNE

on

FRIDAY, 13TH MAY, 1977.

BEFORE:

SIR EDWARD HAMILTON ESLER BARBER, Q.C.

Mr. R. A. Sebire,  
Secretary.

MR. J. K. NIXON (instructed by the Crown Solicitor) was present to assist the Board.

MR. K. MARKS, Q.C., with MR. A. W. McDONALD (instructed by D.R. Dooley) appeared on behalf of the State Electricity Commission of Victoria.

MR. E. D. LLOYD, Q.C., with MR. D. M. BYRNE (instructed by Moule, Hamilton and Derham) appeared on behalf of the Country Fire Authority.

MR. J. E. BARNARD, Q.C., with MR. A. R. CASTAN (instructed by Melville Orton and Lewis) appeared on behalf of the Strathmore Fire Committee.

MR. J. DUNNE (Byrne, Jones and Torney) appeared on behalf of a Committee representing all of the victims of the Beeac fire, and Gala Pty. Ltd. and F.C. Harkin, and Messrs. E. Hinchcliffe, S. Dean and F.B. Gallagher, and the victims of the Cressy fire.

13.AC.  
Fire.

10/02/2009

11-11  
12-15  
13-13

11-11  
12-15

INDUSTRIAL REVIEWS  
FIRENZA

24300

ANTHONY THOMAS WILSON, recalled and further examined:

MR. DUNNE: Mr. Wilson, the tests on the EDO fuses were carried out at a fault current of 23 amps?---Yes, approximately.

I think you said that that was somewhere near the worst condition?  
---Somewhere near the worst condition for production of incandescent particles.

But above that what would happen?---More of the particles would be vaporised.

THE BOARD: I am not sure that I follow that. You mean, that if the conditions were such as to minimise the amount of sparks  
- - -?---Maximise the amount of sparks.

MR. DUNNE: In your report at page 6, there is this paragraph:  
"Field practice and tests have indicated that for applications of this fuse in areas where the fault level was below about 700 amperes, the fuse expelled incandescent material that could reach the ground, as pointed out in the Australian Standard AS 1033. Above 700 amperes, the expelled material appears to be in the form of a metallic vapour which does not reach the ground in particle form." Does that mean that above 700 amperes it is all vapour and no particles at all?---Yes.

And that from 23 amperes up to 700 amperes you get progressively less particles and more vapour?---Yes.

Are you familiar with the apparent cause of the fuse operating on pole 66 at Wallinduc?---No, I am not familiar with the cause. I am aware the fuse did operate.

The apparent cause was a branch of a tree going on to a power line and taking the power line down on to a fence without breaking.

THE BOARD: It did not break the line but the line contacted a barbed wire fence and that, in turn, caused the fuse to blow?---Yes.

MR. DUNNE: Given that, are you able to say what sort of fault current we might be talking about?---No, I would not be able to say offhand because it depends on the position of that fuse in the system and the impedance between that fuse and the fault, including the fault impedance. I would not be able to give an answer without having an opportunity to calculate.

Is it likely that it was nearer 23 amps than 2700 amps?---I am not even prepared to say that.

You are aware that on pole 66 at Wallinduc the fuse cap on top of the fuse holder was not in position when the fuse operated?---Yes.

Do you agree that the likely effects of the absence of this cap would be, first of all, the button cap with the screw tap attached to it was likely to be expelled out with gravity when the arm fell?---Yes, I read that at the time.

And that molten particles of the fuse wire would be expelled out of the top of the fuseholder?---Yes.

As a result of observations out at Fishermen's Bend, would you agree that the particles expelled out of the bottom of the fuseholder seemed to be expelled with considerably less force when the cap is in position?---I made a comment in relation to that at Fishermen's Bend.

13. PA/AC.  
Fire.

1475.

WILSON, Rec.

10/02/2009

11-11  
12-11  
13-11

11-11  
12-11

FIRENS

1475

You used the word "float"?---Yes.

That would make the particles coming out of the bottom more likely to be caught by wind thereby missing the fire choke?---Yes.

I think we saw examples of that at Fishermen's Bend where particles were not caught by the fire choke?---Yes.

It is obvious that particles coming out of the top will not go anywhere near the fire choke?---That is right.

I think you agreed with Mr. Barnard yesterday that these particles coming out of the bottom are usually hot enough to light grass?---Yes.

That was the situation at Wallinduc that we are talking about, with the screw cap missing?---Yes.

The button cap, if I can call it that, that we saw at Fishermen's Bend on Wednesday, when Dr. Penman picked up that, it burnt his hand - he had a blister on his thumb as a result of that?---The burn mark was on his palm.

Was it?---Yes.

Would you agree it would have taken a good 30 seconds or so for him to get to the cap?---Yes, it would have been in that order.

Could you give us any idea as to what the temperature of the cap might have been upon operation of the fuse?---Tests we have carried out, using thermo cables, have indicated it would not exceed 200 degrees Centigrade.

By thermal couples, you mean you have a thermometer attached in some way?---Yes, to indicate the temperature.

THE BOARD: 200 Centigrades is what in relation to Fahrenheit?  
---About 375 degrees Fahrenheit.

MR. DUNNE: About 392 degrees Fahrenheit.  
(To witness): You said when you gave evidence earlier in relation to the Cressy fire it now appears that inadequate instruction has been given to SEC employees about the importance of the screw cap?---I said there had been no specific emphasis given to the importance of the cap being in position, from a fire preventive point of view.

The linemen are still instructed to put on the cap without being told of the possible fire consequences?---Yes.

So that the absence of the cap was contrary to instructions given by linemen?

MR. NIXON: He cannot answer that.

MR. DUNNE: It should be contrary to the instructions if instructions were given and they were not carried out.

THE BOARD: I suppose, in the course of training, someone shows the linemen how to put fuses together and that demonstration would include screwing on the cap?---That is correct.

And the only thing that emerges, as I understand the previous cross-examination about this is that nobody emphasised particularly - "For Heaven's sake, never fail to put on that cap or it will blow". I do not suppose that anyone

13.PA/A.C.  
Fire.

1476.  
(Page 1476. follows)

WILSON, Rec.

10/02/2009

11-11  
12-15  
13-13

11-11  
12-15

INSPECTOR GENERAL  
FIRE

29-30

thought it was necessary to tell them that?---No.

So it is inconsistent with their training to leave the cap off but it is difficult to say it was contrary to. Perhaps it is only a matter of semantics but that seems to me to be the position.

(Page 1477 follows)

10/02/2009

Q Now I'm particularly interested in 13. When the engine  
is in any one of the various positions, have you ever operated  
without having your own positive evidence of whether  
during 13 the only way of fault is left on the  
display and that is that there is time on the display  
side of that fuel would have shown that fuel is available?

A I think I have not got any evidence of any abnormal fault causing  
that fuel to be used.

Q So there are explanations of a possible malfunctioning fuel  
system which would explain this, but that  
there will only show as a result of a fault on that  
particular display, on the low side of that fuel along  
that particular northern indicator?

A I think I can say that, and I don't want your question  
to imply that I'm saying that there is a possibility of  
the northern indicator, that's what I'm saying. I'm  
saying that I don't know if there still has been  
evidence of low fuel on the northern indicator. But  
if you say about that, I don't know if I'm wrong, but  
you are saying that the indicator didn't show  
that the fuel was low on the indicator?

13. PA/AC.  
Fire.

1476A.

WILSON, Rec.

INDUSTRIAL POWER  
FIRRENZ

11-11  
12-15

2930



MR. DUNNE: I want to ask you some questions about the fuse aspects of the Beac fire.

THE BOARD: That is the clashing conductor?

MR. DUNNE: Yes. Mr. Wilson, are you familiar with the circumstances of that fire?---I have studied the file this morning, our own file; I have not read the transcript.

Perhaps if I could summarise what I think the facts are, and if anyone wants to disagree, they may do so. We have three parallel to the ground and parallel to each other conductors, the two outer conductors, the north and south being at 240 volts and the centre conductor being neutral or earth potential?---That is correct.

The evidence given by the linesman, I think it was Mr. Mulder, was that the fuse on the transformer applicable to the northern conductor had operated?---Yes.

But there was no evidence of any arcing or burn marks on the northern conductor?---Yes.

And the fuse applicable to the southern conductor had not operated?---Yes.

But there was evidence of burn marks on the neutral and southern conductors?---Yes.

What I am particularly interested in is, firstly, the explanation as to why the northern conductor fuse might have operated without there being any visible evidence of clashing?---Clashing is not the only sort of fault we have on the system, any fault on that circuit or line on the supply side of that fuse could have caused that fuse to operate.

I think we have not got any evidence of any observed fault causing that fuse to operate?---Yes.

Is there any explanation of a possible non-observable fault?---I cannot answer that question categorically, but that fuse will only blow as a result of a fault on that particular circuit, on the low side of that fuse along that particular northern conductor.

I think it was Mr. Mulder who agreed, and I want your expert opinion on what he said, that there is a possibility of the northern and central conductors coming together sufficiently to blow the fuse and there still not being evidence of burn marks on the northern conductor. What do you say about that?---Correct me if I am wrong, but you are proposing that the conductors clashed without leaving any visible mark on the conductor?

Either clashed or came near enough together to cause arcing and operation of the fuse?---On low voltage circuits it requires contact between conductors to draw an arc. That contact, to my knowledge, will leave a mark on the conductor.

But it is possible, without very, very close examination, that that mark might not be visible from an EPV, for example?---I do not agree with that. I think if one inspected that conductor thoroughly, one would find the mark appropriate to opening.

THE BOARD: I found it very difficult to see those marks, even when they were big, from down on the ground. I was not in an

13.YE.KK  
Fire

1477

WILSON, Rec.

10/02/2009

11-11  
12-15  
13-13

11-11  
12-15

MINISTERIA REVIEW  
FIRE

17-11

2430

EPV. What you are saying is that in the absence of any evidence that in the high wind something blew over it, in order for that fuse to blow there must have been some contact with the neutral?---That conductor must have been in some way in contact with the neutral or earth by some other means and left a mark.

Which would require close scrutiny before you could pick it up?---  
It could require close scrutiny to find the mark.

We had evidence that the lines were, to use a beautiful expression "out of sag", I think, and if the situation was such as to enable the red and the neutral to clash, one would expect it is a pretty high probability that the blue and the neutral clashed?---Yes.

The next step, I suppose, is easier, if that is why the blue fuse operated, if there is clear evidence that the red and the neutral, in fact, were in contact?---Yes.

As to why did not the red fuse blow, the answer you gave the other day is it could happen, when you were dealing with low voltage, and the fuse not blow?---I think you saw in the demonstrations at Chadstone the other day that the conductors in some instances required several clashes before the fuse actually blew.

MR. DUNNE: And, in fact, if you are having clashes minutes apart, say, a fuse need never blow?---It is possible.

THE BOARD: That explains something that was a mystery to me when we were dealing with that fire.

MR. DUNNE: I have no further questions.

MR. LLOYD: Mr. Wilson, could you tell me how it is that you, in your position, got selected to carry out the role you have carried out in the course of this Inquiry? I appreciate there would have been a lot of people jostling for the job, but why did it come to you?---May I clear up one point, we were not jostling for the position, rather the reverse.

THE BOARD: But you were selected for martyrdom? What we are asking is why?---That is because my direct line of responsibility involves such pieces of apparatus as surge diverters, fuses and the like, that were involved directly in evidence being given to this Inquiry.

MR. LLOYD:  
You were a senior engineer?---Yes.

Having to do with the sorts of equipment which are relevant to this Inquiry, is that right?---Yes.

There is some early correspondence which refers to a Mr. Morgan, who is the Commission's engineer for meters and fuses. Is there, to your knowledge, an engineer for meters and fuses in the SEC structure now?---There are approximately 17,000 employees, I am not familiar with all of them and I do not know any Mr. Morgan or any position such as meters and fuses.

There is also a reference in the material to a man known - the name does not matter - as the line danger engineer of the SEC?---  
There is no such position to my knowledge.

THE BOARD: You are saying it is in correspondence, do you mean in correspondence from the SEC or something your client has?

13.YE.KK  
Fire

1478  
(Page 1478 follows)

WILSON, Rec.

6002/2009  
10/02/2009

11-11  
12-11  
13-11

11-11  
12-11

FIRENZ  
INSURANCE & FINANCE

2400

MR. LLOYD: Its common form is in correspondence from the CFA to the rural fire brigades or regional officers, purporting to repeat the substance of information verbally given by various officers of the SEC, but most of it is some time ago.

Mr. Wilson, I will not take time trying to trace with you what might have been the sort of organisational structure of the SEC from time to time, because that is something that changes, is that right?---Yes.

MR. MARKS: We will be calling some evidence about this. There is a long statement and a handbook which you can all look at.

MR. LLOYD: You did mention there was in existence a safety committee, still, of the SEC?---There is a safety engineer, there are a number of safety committees at various levels in the organisation, dealing with various topics.

(Page 1479 follows)

10/02/2009

13.YE.KK  
Fire

1476A

WILSON, Rec.

11-11  
12-15  
13-13  
T  
H  
Y  
R  
E  
N  
Z  
I  
N  
S  
T  
R  
U  
C  
T  
I  
O  
N  
A  
L  
E  
V  
I  
D  
E  
N  
C  
E

11-11  
12-15

2430

MR. LLOYD: Is it the situation to your knowledge that as part of its operation the S.E.C., through one officer or officers or another, does maintain a continuing record of fires which occurred in association with S.E.C. installations?---Yes.

That is brought into existence as a result of the activities of the S.E.C.'s own staff?---That is correct.

Might I ask you something about this question of sparks. What is the approximate temperature of a spark, Mr. Wilson?---I am not competent to answer that question, I am afraid. It is a long time since I looked at that particular area.

You are familiar, are you, with the operation of an ordinary cigarette lighter?---I am a smoker.

Which has a metal ratchet working on, I think, a synthetic flint these days?---Yes.

And it projects sparks either onto gas or highly inflammable liquid in order to produce fire?---Yes.

Would it be like that with the particles constituting the sparks which cause fire in that way would the particles very much smaller than the particles we saw at Fishermen's Bend the other day? ---Yes, I suppose it would be fair to say that.

They are, of course, in touch with much more volatile and more flammable substances than pastures, are they not?---Yes.

If we can go back in technology a bit, do you recall anything of the operation of the tinder box, the forerunner of the match and the cigarette lighter?---No. I am aware of the terminology tinder box.

It worked by rubbing a flint, I think a natural flint, down a metal ratchet and produced a spark which lay in intensely dry material, either vegetable matter or cloth called tinder which had been charged so that it contained some carbon and its quality was that it was dry. What next happened was that you could produce a spark which was glowing faintly, you would blow it and eventually produce flame. That is probably the mechanism or what happens when a spark comes from a fuse as a result of clashing and lands in pasture and results in a fire?---Unless there is any other explanation, I am prepared to accept that.

You think that is a probable mechanism?---It seems a possible mechanism. I am no expert in starting fires.

Would you tell us this: the criteria adopted in stringing lines from poles, are they at all aimed at preventing fires arising from clashing wires, or are they aimed solely at the efficiency of operation of the wires?---Again, you are getting into an area outside my personal experience and expertise. I would presume certainly they are designed to avoid clashing from electrical system and liability, whether the formal viewpoint of starting fires has come into it I could not say.

Do you know yourself in laying down those criteria what assumptions have been made as to the temperature and wind conditions that may be encountered, or are likely to be encountered, or probably would be encountered? ---No, I do not know the specific conditions.

13. GT. JH.  
Fires.

1479.

WILSON, REC.

10/02/2009

11-11  
12-15  
13-13

11-11  
12-15

INDUSTRIAL ENGINEERING  
FIRENZA

24300

If by sparks one way or another coming from the S.E.C.'s installations fires can be caused, but all the information available indicates that it will only happen one time in a thousand, would you as an engineer on those facts be prepared to say that it was unlikely that a fire would be so caused, one thousand to one against, would you equate that as unlikely as an engineer?---I would certainly equate it as unlikely.

In the situation which can cause a fire, even though it is one thousand to one against, if it occurs in 40,000 cases at a particular time, then as a matter of probability you are going to have 40 fires even though the thing is unlikely, is that not right?---By mathematics - - -

Whether or not the thing is unlikely and if it is likely, how likely to cause a fire, I suppose can be answered by experience in the field and partly by experimentation, is that right?--- That is correct.

Indeed, the tests you mounted for the Inquiry and which we were able to see were experiments of that sort?---Which you were able to see?

Which you showed us?---Yes.

Mr. Wilson, there is no one in Victoria, is there, who has the sort of facilities which you have at Fishermen's Bend for mounting those sorts of tests?---I do not know of any other laboratory of that size or magnitude in Victoria.

No universit would have equipment of that scale and appropriateness for carrying out these sorts of tests?---I am not sure of that. Monash University's facilities may be capable of carrying out those things.

In any event, there would be a vast number of factors associated with the safe supply of electric power which only the S.E.C. would have the equipment to test?---In Victoria, yes.

THE BOARD: There is an extensive testing laboratory at the A.N.U. in Canberra, is there not?---The only laboratory I know of in Australia that is equivalent to the Fishermen's Bend laboratory is in Sydney and it is much more capable, in fact, than ours of carrying out the tests.

MR. LLOYD: Is that the equivalent of the S.E.C.?---Sydney County Council. In fact they hire this facility out to manufacturers for testing such devices as fuses, etc. At Fishermen's Bend we cannot get currents above 70 amperes at that voltage.

Am I correct in saying that in relation to the question of how hot a particular component would be in the tests we observed a couple of days ago, you made as a generalisation a statement that they very seldom came out so hot that they were uncomfortable to handle?---Yes.

Of course, you believed that when you said it?---Yes.

But the third one surprised you somewhat, did it not?---Dealing in one in a thousand, perhaps it can always surprise.

You would have made your generalisation, as I say to you, quite honestly on the basis of ten or fifteen tests of that sort?--- Of that order.

13. GT.JH.  
Fires.

1380.

WILSON, REC.

10/02/2009

11-11  
12-11  
13-11

11-11  
12-11

INDUSTRIAL REVIEWS  
FIREN

24300

10/02/2009

You would not be able to predict the frequency with which one comes out surprisingly hot on the basis of fifteen tests. It might be one in fifteen or one in a hundred?---No way.

Nor any way of predicting how hot they would be?---Not without a large number of tests.

You have given us the number of fuses which are in existence throughout the State of Victoria of this type and it is above 100,000, is it not?---That is correct.

Can you give us any estimate of the number of situations in which power lines might, in high temperatures and high wind conditions, clash and produce sparks which could cause fire?---There would be no way I could estimate that.

It would be a huge number?---I would not be prepared to say anything about the magnitude of number.

I suppose by now you share the almost universal expertise which we have acquired as to the number of situations in which trees might fall on lines and cause fires?---I have seen photographs of this.

(Page 1482 follows).

13. CI. JH.  
Fires.

1481.

WILSON, REC.

11-11  
12-11  
13-11

10-11  
11-11  
12-11

FIRENZ

THE BOARD: Reverting to questions about sparks - just remembering that on these matters I am both innocent and ignorant - I suppose any spark, however produced, involves some incandescent material, does it?---I would presume so, yes.

I was thinking of the sparklers that we used to have at children's parties. I do not know whether they still do. You lit a little stick, and there were sparks everywhere.

MR. LLOYD: They are the only fireworks that are still legal.

THE BOARD: That is quite right, yes. I suppose even in that type of thing, in order to make a spark at all you must have some sort of particle?---Yes. To see a spark, it has to be luminous; it has to be such that it is glowing or giving off light.

MR. NIXON: You told Mr. Barnard yesterday that you believed there was a document in existence recommending, I think, to regional managers that clamp-on fuses should be replaced, as the opportunity arose, with EDO fuses with a fire choke, is that right?---I believe so, yes.

Have you seen that document?---No, I have not seen that document.

But it is Commission practice, so far as you believe, that the clamp on fuses are to be replaced, as the opportunity arises, with the safer type of fuse, the EDO fuse with the fire choke?---Yes.

Can you give any reason why the fuse at pole 11 was not replaced with an EDO fuse with a fire choke after the 12th February? ---No, I cannot give any reason.

I can assure you it has a clamp on fuse there, or did when we went on the view. In any event, it would have been an ideal time, would it not, to replace that type of fuse, with men out there?---Again, that is a difficult question to answer without knowing the priorities of work in that particular area at the time. As I stated, we have some 16,000 of these clamps around the State, and I am not aware of the priority lists or if there is a priority list.

That is the next thing I was going to ask you, because quite obviously some areas of the State of Victoria are far more likely to ignite in the summer period than others?---Yes.

And it would be the desirable practice, would it not, to replace those clamp on fuses with the EDO fuses with the fire choke in the fire risk areas first?---Yes.

You do not know whether there is any plan or not to do that?---There is no promulgated plan as yet. It is under consideration certainly.

Who would be the person who would give consideration to that type of thing?---That will come from my own department.

But nothing has been done yet?---Nothing has been issued as yet, no.

Are you a member of that Safety Committee to which you referred? ---No.

Is any member of your department a member of the Safety Committee? ---Yes.

Which member? What is his position?---Field Practices Engineer.

13. JB/LC.  
Fire.

1482.

WILSON, Rec.

10/02/2009

11  
12  
13

11  
12

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50

24

Has that Safety Committee, to your knowledge, been more concerned in the past with the protection of the Commission's assets rather than safety precautions to prevent fire?  
---Its primary concern is the protection of individuals, in particular, our own personnel and the community in general, followed by the protection of the Commission's assets.

I understand that there have been some recent tests indicating what happens with particles which come from clashing conductors. Is that right?---I understand there have been some tests carried out.

Since these fires occurred on 12th February?---Correct.

Before these tests were conducted after these fires of the 12th February, did the Commission conduct any tests as to the effect of clashing of conductors?---There have been some previous tests done with clashing conductors, yes.

When?---The ones that I personally know about would have been in the late 1960s.

Were there any tests conducted after the fires of the 8th January 1969 with regard to clashing conductors and what can happen?---I could not say with any certainty, no.

Would there be reports available within the SEC if there were such tests?---Yes.

It is the Field Practices Division which is responsible for recommendations for tree cutting and tree lopping, is it?  
---Probably the Chief Engineer. I am not prepared to allocate responsibility, but in my assessment it would be in their area of expertise.

Who is the head of that department?---That Division?

That Division?---Mr. Keith Pockney. Both of us report to Mr. Weatherhead. One could remove the level of responsibility one, of course, and say Mr. Weatherhead was ultimately responsible for all the activities involved in this area.

THE BOARD: The "buck" stops here?---Correct.

MR. NIXON: Do you know whether after the fires of the 8th January 1969 recommendations were made to various regions of the SEC with regard to tree cutting?---I am not personally aware of this, no.

So we have to ask either Mr. Weatherhead or Mr. Pockney?---I think that would be a better source of accurate information.

With regard to Mr. Lloyd's property, you believe there was a clash of the low voltage conductors?---Yes.

The high voltage fuse on the substation on pole 11 operated?---Yes.

It is possible, is it not, that incandescent particles could be ejected from that fuse?---Yes.

And it is possible that those particles could cause a fire?---Yes.

MR. MARKS: Is it also possible that the particles from the conductors themselves, reaching the ground, could cause the fire?---Yes.

13.JB/AG.  
Fire.

1483.

WILSON, Rec.

10/02/2009

11  
12  
13

11  
12

FIRENZ

17



You were asked yesterday a number of questions about co-ordination of fuses?---Yes.

And you were asked whether on the s.w.e.r. line there it might have been better to have a 3.15 amp fuse?---Yes.

You were asked on the basis of this specification sent out by the Stanger people?---Yes.

I do not think that the total document has ever been tendered, Mr. Chairman. Mr. Barnard cross-examined from it. It is the Stanger specification on high voltage expulsion fuse links.

THE BOARD: No, it has not been put in.

EXHIBIT 20L.....Stanger 910. specification on high voltage expulsion fuse links.

MR. MARKS: It is a portion of that document that you incorporated in your statement by reference to figure 11, is that right?---Yes, figure 11.

There is a statement on the front of this to which I draw attention, Mr. Chairman, if I may read it and then ask the witness if it has any significance. It is headed "Selection of the Rated Current of the fuse link". "Tables are given in this leaflet for single and three phase transformers, giving recommended fuse link ratings. It must be emphasised that these ratings are a general guide only, due to the many variables that occur in practice. The following will affect the required fuse rating, particularly in the case of distribution transformers. (a) Overload conditions are often allowed to persist, and therefore this overload condition, if permissible, will determine the normal full load current as far as the fuse link is concerned. (b) Knowledge of the current transients will allow selection of a fusing with a time lag long enough to allow these transients to pass without unwarranted interruption of the circuit." Does the word "transient" refer to faults which occur over a short space of time?---That would be referring to either inrush currents on transformers or the transients associated with surge diverter normal operation.

"(c) Care should be taken not to install a fuse link that has so high a rating that it fails to blow on occurrence of a fault." A 3.2 fuse has a higher rating, I take it, than a 2 amp fuse, within the meaning of that phrase, has it?---That is correct, yes.

"This can particularly apply when the fuse on the HV side of a transformer is required to clear earth faults on the LV side. The impedance of the earthing of the transformer becomes very important. (d) Co-ordination with other protection devices, if any, including other earths and relay protection"?---Yes.

Does that note on the front have any relevance to the questions asked and your answers given yesterday in relation to the schedule?---Yes, it has three points of relevance directly. Looking at the table on the back from which Mr. Barnard drew the rating of 3.15 amps related to a 12 kV system and a 10 kV transformer, firstly, the 12 kV system refers to the system's highest voltage of 12 kV, and, in fact, refers to an 11 kV system - 11 kV, not s.w.e.r. system, 11 kV normal three part system.

13.JB/AG.  
Fire.

1484.

WILSON, Rec.

10/02/2009

13-13  
12-15  
11-11

12-15  
11-11  
10-10

FIRENZ

17-17

2430

This is the table at the top on the back part of the leaflet, is that right?---That is correct, yes.

And, in fact, this was not an 11 kV system at Glenthompson?---At Glenthompson it is a 12.7 kV system, the high voltage for which is 14 kV.

Do you have somewhere 11 kV systems?---There are 11 kV systems in the metropolitan area of Melbourne. The second factor that is relevant is that the transformer impedance of our 10 kVA s.w.e.r. transformers and the earthing impedance associated with it give rise to low fault currents reflected through the transformer - for active to neutral faults on the low voltage side of the transformer, some 6 amperes, as I indicated in my statement. The fuse, as well as having to clear for the minimum fault, the minimum current - - -

Which fuse?---The high voltage fuse - has to clear for the minimum current associated with a fault on the low voltage side of the transformer. Further, it is very desirable - not essential - in cases of HV fuses that are the first fuse back in the system from the low voltage system, that these fuses seize as far as they can into the low voltage system, from the point of view of public safety - that is, should someone contact the active conductors on the low voltage side of the transformer; should the low voltage fuses of that transformer fail to operate, it is desirable that the high voltage fuse can operate for as many as possible of these faults.

This is the wicket keeping aspect, is it?---The wicket keeping exercise. Therefore it is desirable that this fuse be as low a rating as possible.

(Page 1486 follows)

13.JB/MC.  
Fire.

1485.

WILSON, Rec.

10/02/2009

11-11  
12-15  
13-13

11-11  
12-15

11-11  
12-15  
13-13

11-11  
12-15

MR. MARKS: Does it follow from what you are saying that the seal on the back here is not directly related to the 12.7 system on this s.w.e.r.?---No, it is not related.

I think at another stage of cross-examination it was suggested you might get what could be described as "better" co-ordination by altering the average of the high voltage fuse at somewhere around 3.1?---Yes.

What do you say as to that in relation to the practicalities?---The 2 amp fuse is, as I have suggested, the lowest fuse we can put into that circuit and discriminate against load current. It is capable of clearing faults on the low voltage side of the transformer. If you raise it slightly you can see still faults in the primary zone but you would reduce the distance in the low voltage system off which the fuse could operate successfully. Further, by increasing the size of that fuse one loses discrimination or co-ordination between that fuse and the fuse on the isolating substation.

What is the effect of what you are saying, as to whether you would yourself consider altering the rating of the 2 amp fuse on the high voltage?---It would require a detailed investigation to see if it were possible.

Would it also require investigation of the rating of your fuses back further, for instance, at the isolating substations?---It would certainly mean an investigation into the co-ordination between that fuse and the fuse on the isolating transformer. I doubt whether we would be able to retain the 5 amp fuse there. We would have to raise the level of that fuse which may create different problems in protecting its primary zone and this would go back through the system.

Assuming there was no problem arising from the HV fuse as it is constituted, assume it was safe from the point of view of fire hazard, would it make any difference whether that blew or whether the low voltage fuse blew?---The only practical out-working of that would be slightly more man hours spent on replacing the high voltage fuse and taking out an access permit to do so rather than replacing the fuse.

Does the high voltage fuse cut off supply to any other consumer?---No, not in that case.

Because it is on the side of the pole it is on, and it being on a "D"?---It is on a "D" line.

So when that fuse blew, the supply would not be disconnected to any other property?---No.

On page 1456/1457 you were asked, "Firstly, is the discrimination between the 3.15 amp fuse and the fuse at the isolating substation adequate?" Your answer was, "Yes". Do you remember that question?---No, I do not remember the specific question.

You remember that you had questions put to you, and it was suggested you should have had a 3.15 amp fuse in accordance with the table?---Yes.

I think Mr. Barnard then said, "Would putting the fuse on affect the discrimination?" Perhaps I should read it again: "Firstly, is the discrimination between the 3.15 amp fuse and the fuse at the isolating substation adequate", and you said, "Yes"?---I do not believe it is adequate, but the discrimination between the 2 amp and the 5 amp at the isolating substation

6002/2009

11-11  
12-15  
13-13

11-11  
12-15

INDUSTRIAL PROPERTY  
FIRENZA

2930

is certainly adequate. I would have to check whether the co-ordination is adequate between the 3.15 and the 5 amps but I should not think it would be because they are far too close, considering where the high voltage line is.

You said, "No, it would not be adequate to cover faults in the low voltage winding of the transformer"?---That is right, it would not be adequate for that purpose.

In your opinion, does the Stanger Table on the last page of the leaflet which is Exhibit 207 apply or is it meant to apply to a s.w.e.r. system?---No, specifically because in s.w.e.r. systems the earthing of the transformer is much less positive a contact than a normal system where the other phases provide an effective return path for the current.

Could the witness look at the coloured photograph in Exhibit 15, that is, of the pole? (Handed to witness) You were asked about the position of the transformer on the pole. I think you acceded to the suggestion that it is not the preferable position from our point of view. Do you remember that?--- It is not the preferable position from the point of view of the relative locations of the fuse, the transformer bushing and the pole as intimated, I think, to Mr. Barnard.

Given the setup of the other wires and the guy, where would you put it?---Where it is.

I shall take up the suggestion from Mr. Barnard to which you may as well give an answer: Can the locations of the guys be moved? ---Not readily. The guy wire is providing support for the pole against the strain provided by the two conductors which, in fact, meet at an angle at that point.

Has the location of the guy some relationship to the pole?---One has that sort of situation - the guy is there to provide support.

THE BOARD: It has to be there?---Yes.

MR. MARKS: Given that setup, where would you put the transformer on the pole?---Where it is. It is desirable to keep the bushing of the transformer as far away from earthed objects such as guys, as possible.

What did you mean when you said that you did not like the setup?--- It is not an ideal setup in that this set of circumstances leads to the lead between the high voltage fuse and the transformer bushing passing apparently across the face of the pole. It is more desirable, if you can do it, to have that as direct a connection as possible.

More theoretically desirable? Is there a way you can do it there? ---I do not think so, not without relocating the pole and/or the line.

In the setting up of the low voltage system, who determines where the pole goes, the layout of the low voltage system?---Generally the surveyor - - - the low voltage system?

Yes?---In this particular case, that would be the registered electrical contractor who put in the service.

He may have been stuck there with the pole; the s.w.e.r. line may have been there first?---I am not sure which came first but assuming the s.w.e.r. line did come first, he is left with little option as to where to put everything else.

10/02/2009

11-11  
12-15  
13-13

11-11  
12-15

INDUSTRIAL ANALYSIS  
FIRENZA

2930

I think the evidence is that the s.w.e.r line was put through in 1955 and the electricity came later. I suppose, if that is the case, you would have attached your electricity system on to it, is that right?---Yes.

Have you made some investigation since yesterday to determine where, in the low voltage system, if there are three lines the neutral, and normal is?---Yes, I had discussions this morning with our chief electrical inspector and the acting chief engineer of electrical distribution, a man of many years of field experience in this area. Both of those gentlemen confirmed that in most cases the neutral is in fact on the top. This is done for two reasons, one, it is done this way as a standard so that any person attending that installation can be sure, or as sure as he can be, that the top conductor is neutral. Neither could remember any electrical installation that was connected otherwise. The second reason is a safety reason, to do with public safety. That is, should the neutral conductor break and fall, if it is on the top it will most likely fall into the active conductor, thereby causing a fault, the fuse to operate, and the system to be disconnected. If the neutral is on the bottom, it can fall to the ground, no fault current will flow and the installation thereby is acting without a neutral which can be extremely unsafe as far as electrical safety is concerned from the installation. This is, however, not laid down specifically in any regulation.

You were asked yesterday about the comment on the proposition it would be better to have a separate fuse for each low voltage service line?---I cannot remember that specific question.

It was not in that form but what was put to you was there were in fact three active wires going through the one low voltage fuse box on the pole?---Yes.

It was suggested that co-ordination with the high voltage fuse might be better achieved if there was a separate fuse box for each fuse provided by the system. You remember the service lines go off in three directions, to the house, to the cottage and --- ?---Yes.

I think it was suggested at page 1453 that you would have better co-ordination if you had a different design low voltage fuse and in fact installed a separate low voltage fuse for each wire going off the pole. Can you tell us what you understood by that question?---I understood by that question that we would be involved in designing or installing a fuse for each particular installation throughout the State.

Of a different rating?---Yes, and further that we would be involved in returning to that installation each time a new appliance of any magnitude had been connected in that installation.

At the present time you have a 55 amp fuse to protect all three, is that correct?---That is correct.

(Page 1489 follows)

13.PA.KK  
Fire

1488

WILSON, rec.

10/02/2009

11-11  
12-15  
13-13

11-11  
12-15

INDUSTRIAL REVIEWS  
FIRENZ

24200

MR. MARKS: Can you tell us whether - apart from the problems of inconvenience in having three fuses - there are any other disadvantages from doing that or whether there would be any advantages over your present practise of having one fuse of a defined rating to cover the low-voltage system?---The obvious advantages are that one would be able to separately protect each circuit and, presumably, a fault on one circuit - a fault, for example, to Mr. Lloyd senior's circuit, would not result in loss of supply to the other two points.

Yes, but in order to do it, would it require some investigation as to the use to which each service was going to be put?--- Precisely. In fact, it would be most unlikely that the fuse blows and the supply to both residences would be less than 55 amperes.

Would it also require some knowledge or forecasting as to the way in which it may be used, as to the appliances which may be used on services at some future time?---That is the probability, that is why we stick with the 55 amp. fuses, because we consider with the sorts of appliances available now and the numbers available in above average homes, the 55 amp fuse is capable of carrying that sort of load level.

It allows a degree of flexibility, I suppose?---Yes, it allows a degree of flexibility. Certainly it is capable of seeing the faults that we desire it to disconnect for and it is also capable of carrying the maximum load currents we have in the system. The only area where this is not so is since the development of under-floor heating. We are currently looking at the development of a 70 ampere fuse. A 55 amp fuse would not be big enough to cover the loading in these types of installations.

They are not so common in the country areas, are they?---They are becoming more common now.

In rural areas?---Yes. There is one more point that perhaps should be mentioned - the way we, if you like, get away with a single 55 ampere fuse in this type of installation is that we rely on what we call diversity and that is that it is most unlikely that both Mrs. Lloyds will be switching on the same appliances at the same time. Therefore, with three installations connected to that fuse, the load is statistically separated across the day. It is unlikely that everything is going to be used at once, so we are able to establish a 55 ampere fuse for that type of installation.

If, in fact, they did happen to turn on the same appliances at the same time - is that likely?---It depends on the appliances I suppose, not being aware of the appliances they have and how they are used, but even if they exceeded the 55 amperes, there is a margin of tolerance built into the fuse, such that it can carry up to 90 amperes for one hour without blowing.

Is the situation that that 99 amps is designed to cover most household appliances if used together?---Yes.

Like half a dozen radiators?---I would have to do a calculation on that.

13. YE. JH.  
Fires.

1489.

WILSON, REC.

10/02/2009

11-11  
12-15  
13-13

11-11  
12-15

11-11  
12-15  
13-13

14-14

But radiators are notoriously heavy, are they not?---Just a 1 kilowatt radiator draws approximately 4 amperes.

You were asked about giving certain figures about the fuse use in the Hamilton area?---Yes.

And according to Mr. Barnard's calculator - which is very dangerous and I am sure inaccurate - that something maybe over 20% in one period were replaced?---Yes.

First of all, can you tell us whether any inference can be drawn about that?---To put it another way, Mr. Barnard appeared to be drawing an inference and this meant that the maintenance and operational work done in the Hamilton area was below standard. It is very difficult to draw that inference from the figures for one particular area, or, indeed, to compare it between two regions of Victoria. That particular area of Victoria is an area of higher lightning intensity than the rest of the State - not all of the State, but most of the State, perhaps. Therefore, one could expect more operations, and in particularly bad lightning years many more operations, on fuses and other devices in that one year. We are in the statistical business here of trying to use one sample.

Do you know what the average replacement for the system as a whole in Victoria is?---I have mentioned 10,000 per year out of 106,000 installations, which Mr. Barnard has calculated as 9.5% per annum.

Are you able to say how that compares with other systems - New Zealand, New South Wales, South Australia, Western Australia, Canada?---I am not able to say and I do not think the figure could have any relevance at all, because the system types and constructions are different. There are areas of different lightning intensities, different types of faults and different methods of approach to the whole supply system.

In N.S.W. there are 30-odd county councils doing distribution work. Comparing these figures for these county councils with the State of Victoria is very misleading.

There has been reference made here to the Australian Standards Association on a number of occasions?---Yes.

I think it will appear that that organisation has worked out wiring regulations for the low voltage systems?---Yes.

Which are now incorporated in Victoria by the new wiring regulations of 1976?---Yes.

Do you know how long they took to agree on the standards?---I am not personally aware; I know it was a very long time. Most of the standards that are brought out involve many years of negotiation between the manufacturers and supply authorities and between the supply authorities themselves, indeed, as to what standard we will all be prepared to accept.

Is the position that the Standards Association of Australia was seized with the task of laying down universal standards for the whole of Australia, if it could?---Yes.

By which each State would put into effect the standards agreed upon?---Yes.

13.YE.JH.  
Fire

1490.

WILSON, REC.

10/02/2009

11-11  
12-15  
13-13

11-11  
12-15

FIRENZ

2930

And that the Australian Standards Association had representatives on it from all the supply authorities throughout Australia?--- I do not know that it is from all the authorities, it is a representative from the Electricity Supply Association of Australia, which is a body purporting to represent all supply authorities in Australia, of which there are some hundreds.

I am instructed that there will be later evidence that this took 12 years.

THE BOARD: That does not surprise me?---After 12 years, in the Victorian promulgation of those Australian standards, we have, indeed, insisted on some additional clauses that are pertinent to Victoria only.

MR. MARKS: The wiring regulations make some amendments to that, do they not?---There are some specific requirements that are different for Victoria, yes.

That is all the re-examination of Mr. Wilson. There are other matters arising out of some questions which Mr. Lloyd asked, whether he could point to any instances of flashovers from burning off. Mr. Wilson has done some research on that. Mr. Nixon has not had a chance to look at some documents he was asking for. Is it desired to have this in one piece? I could leave it until Monday morning.

MR. NIXON: That was the course I suggested yesterday, that I examine these files when the S.E.C. produced them, and I will be seeking an order that they do produce them in due course. The most convenient way perhaps would be to produce the files and deal with the matter on Monday.

MR. MARKS: Then I will not ask anything further on that. This is a fresh matter, if I may, by leave, mention it. Mr. Wilson, you have done some investigation as to the cost of undergrounding low-voltage cables?---Yes. We did present some evidence through Mr. Weatherhead, I think, of a very rough estimate of the cost of undergrounding of the rural distribution system - that is lines only - that it would be some \$3,500 million.

We have had it, I think. That includes high voltage?---Yes, but not the transformers, just lines only.

Does the S.E.C. now have a transformer that it can put underground?--- We have a pad mounted substation which we can put underground.

THE BOARD: We saw that at Chadstone, did we not?---Yes, it is called a kiosk substation.

MR. MARKS: If you put the lines underground, you would have to use those things?---No, one could run the cables up the poles into transformers, but it would seem odd to have things poking up all over the countryside if you had gone to the trouble of putting the rest of it underground.

You would, then, have to have poles which are only for transformers?--- Yes.

But if you add to the cost of the cables you mentioned, the cost of those types of transformers, we would have another reasonably sized sum, would we not?---I am just doing the sum. We have approximately 30,000 substations throughout the State. Approximately half of those would be in rural areas as

13.YE.JH.  
Fires.

1491.

WILSON, REC.

10/02/2009

11-11  
12-15  
13-13

11-11  
12-15

INDUSTRIAL REVIEWS  
FIRENZA

24X30



opposed to urban areas. Of the 70,000, approximately half that is 35,000 - would be in rural areas opposed to urban areas. The cost of each kiosk substation is of the order of \$15,000.

\$15,000?---Yes.

You have to multiply that by 35 - 35 by 15?---It is near enough to \$600 million I think.

I will recall Mr. Wilson on Monday.

MR. NIXON: Arising out of the reference to underground lines, is it possible, Mr. Wilson, to have a system where the lines would be underground for a while, then, as they are now, above ground?---Yes, there are such systems. We even do this in terms of a mixed or hybrid system, whereby we bring the high voltage in overhead and provide a low voltage reticulation under ground.

What I have in mind is the conductors beside one of these bands of trees that might extend for, say, two miles? ---Yes.

In the Western district, the sugar gums - would it be possible to put the conductors underground?---It is certainly possible, but at much greater expense and I would estimate it would be cheaper to re-locate the line than to put it under ground.

THE BOARD: Another factor - someone mentioned the other day - and it arose out of the suggestion that, after all, the Telecommunications people put a lot of their lines underground - but another factor that was mentioned was the danger factor. I understand that the telephone lines get cut by enthusiasts with jackhammers and other things a number of times a year. Cutting a telephone line is one thing, cutting one of your cables would be another thing. In other words, they would need to be fairly deep, I suppose.

(Page 1494 follows)

13.YE.JH.  
Fires.

1492/1493.

WILSON, REC.

10/02/2009

11-11  
12-15  
13-13

11-11  
12-15

INSTRUMENTAL PHOTOGRAPHY  
FIRENZE

2430

THE WITNESS: I cannot remember the exact distance, but the P.M.C. is certainly a lot shallower than we are. There have been several investigations into joint use of trenches which have shown that by the time we cut the trench to the additional depth, we might as well cut our own trench anyway, plus the problem that Telecom is less than enthusiastic about joining us in the trench. If we flash over into their equipment, they have a significant problem. It is also relevant that in American experience of some 15 years of underground distribution, it was first thought that underground distribution would be a lot more reliable. It has not proved to be the case because, as you say, people with picks and shovels, etc. - about the same frequency of motor cars contacting overhead poles.

MR. NIXON: What is your view as to turning off the power on a day such as was experienced on 12th February?---There are two aspects of it that I consider to be against the situation. I can see the obvious advantage in that it absolutely reduces any possible involvement of the SEC in future inquiries of this kind. There are two major disadvantages. One is to ascertain a criterion of which day one switches it off. It would perhaps be within the CFA or whichever authority currently determines the level of acuteness of fire danger. This is a problem as far as the community is concerned in regard to the amount of time it would be switched off, and the fact that such things as food storage, communication - the community is so dependent on electricity these days it would be difficult to understand them doing without it on specific days, and this may be some significant time during the summer.

THE BOARD: If it is a hot day, people would have refrigerators and other things going, and there are hospitals and places like that to consider?---I was going to extend the argument. There are water pumps, irrigation pumps, hospitals, I dare not extend further. Sewage treatment is a good one. For example, the loss of Mildura for more than 24 hours at one stage - Mildura or Swan Hill - resulted in sewage in the streets. These problems would have to be considered.

The other major problem, I do not think our system is set up such that it is easy to cut off a designated area without going right back to the zone substation in which case one would be cutting off a substantially larger geographic area than is necessary or desirable. I hesitate to think of the possible ramifications with regard to unions and other things we might be involved in through the responsibility we would be giving them in this area.

Taking the western district, you would need to switch off at Hamilton, would you?---If you have my submission there, I was looking at the thing called a key plan, if you wanted to switch off all that supply in the box labelled DT you will notice you have to switch at Canvendish, Hamilton, Penshurst, and down as far as Caramut. If one were redesigning the system for this specific objective, one could do it.

MR. NIXON: Let us say the electricity was turned off, and during part of the time the power was off a tree brought down a conductor and broke the conductor. What would be the effect when the power was turned on again. What is a possible effect?---We would certainly have a fault of some instance.

13.GT/LC.  
Fire.

1494.

WILSON, Rec.

10/02/2009

11-11  
12-15  
13-13

11-11  
12-15

MINISTRIA POLITICA  
FIRENZA

2430

THE BOARD: You might well have a fire?---Very well. It is a general principle with power systems that one keeps them alive at all possible times, because once it is turned off you have no assurance of its status. A pole could have been knocked over by a car, a tree could be across the line, somebody knowing the power was off could be adjusting his powerlines, all these sorts of hazards apart from the consequence of fire. The mere supply problems of having an area isolated and returning supply can be quite grave.

What is your view of farmers cutting trees near high tension conductors, cutting or lopping?---I would prefer you to ask that question of the subsequent witnesses who would be expert in that field. My personal view is that it is a hazardous situation close to high voltage conductors, people without appropriate expertise.

Finally, is there any division within the Commission which gives consideration to the re-routing of existing lines?---Normally that would be at the discretion of the regional or district office, to in fact carry out works associated with re-routing of lines. It would only be referred to my department where the expenditure is above \$20,000 involved in the project.

Your department does not give directions in regard to re-routing of lines?---We vet expenditures above \$20,000. We are not involved directly in such negotiations. For example, where we are reconstructing a 66 line in Mildura where the easement touches on part of parklands and negotiations between parkland authorities and our people involve my own department. We get involved in external negotiations of that type.

Is it your view that in the future far more consideration will have to be given by the SEC to re-routing existing lines? ---I think that is an inevitable consequence of the sort of evidence we have heard in this Inquiry, yes.

I take it you would agree with me it is not practical to request a farmer to cut a whole plantation of trees with conductors running parallel to the trees in this particular instance, perhaps for three or four miles at a time. It would be far better, would it not, to re-route the line?---Provided an alternative route is available which does not get you in the same situation.

THE BOARD: I think what Mr. Nixon has in mind is the sort of thing you see throughout the district, the plantation may be three or four rows of trees running for miles along the inside of the farmer's fence, but there may be in some cases difficulties in bringing your conductors out to the roads for various reasons but it is possible to put them on the paddock side?---I realise it is probably more desirable to keep the trees and put the lines back into the paddocks or back across the paddocks. There are two or three other problems associated with it. Firstly, one has to negotiate with the landowners for easements which is always a painful process.

Have you not got any powers of acquisition for easement?---We have powers of acquisition, but in terms of public relations, we attempt to negotiate until the day of reckoning. The other problem is one of patrolling. It is very easy for us to patrol lines along main roads.

13.GT/AC.  
Fire.

1495.

WILSON, Rec.

10/02/2009

11-11  
12-15  
13-13

11-11  
12-15

INFORMATION  
FIRENZ

2430

One merely drives along the road to patrol and access to the line is obvious and easy. Once the line diverges from the road and goes across the paddock, one has the invariable problem of getting in there to patrol the line, possibly leaving gates open and all the associated problems of harmony with the community. So in general we have tried to keep distribution assets, that is those we need to patrol more frequently, on the roadside. There have been other bodies who, from an environmental impact point of view, have suggested that the visual harmony of the public motoring on Sundays, we should also remove ourselves from the vicinity of the roads.

MR. NIXON: Is there any prohibition of having S.E.C. poles and conductors on the same side of the road as the Telecom communications?---I am not sure I would call it prohibitive. If we are on the same side as the P.M.G. there are severe problems for the P.M.G. adequately protecting their assets and, more importantly, their personnel from currents that go past into the earth, drop conductors on top of their equipment. P.M.G. assets provide an excellent return path for our current.

THE BOARD: I thought the mere presence of your high voltage lines at any rate played some sort of havoc with the telephones? ---There is also the problem of interference, but that is less of a problem than the direct one.

MR. NIXON: I put to you the other day a suggestion that in South Australia a bitumen patch was placed underneath some of the poles there. I think you agreed with that, or you believed that might have been the situation. I understand you have checked with the South Australian Electrical Commission. What was the result of that check?---I was in touch with the management of the Electricity Trust of New South Wales, and Mr. Dougall Brown, my equivalent number in that organisation, assures me there has never been any directive to do that, there are no installations he knows of of that type. He feels the only possible area that may have caused the confusion was their pad mounted substations, that is the ones associated with underground reticulation, their equivalent to our kiosk, on top of which they place a layer of bitumen before mounting the substation. He assured me they have no pads down, nor do they have any specific direction regarding clearing around those installations.

What do you think of the idea of clearing around the installation with a substation on it, either by poisoning the grass or the weeds with something like Vorox or some other poison, or alternatively having a bitumen area?---It certainly merits investigation, but one would firstly have to define the precise area to be covered considering all the wind conditions and length of dispersion of the various types of sparks etc. that could emanate from our installation. I do not think it is quite as simple as it looks. You can certainly reduce the hazard considerably. I would not be prepared to say it is the thing to do until one investigated it on a proper basis.

(Page 1498 follows)

13.GT/10.  
Fire.

1496/1497.

WILSON, Rec.

10/02/2009

11-11  
12-15  
13-13

11-11  
12-15

INDUSTRIAL ENGINEERING  
FIRENZA

24300

THE BOARD: I cannot help feeling it would need to be a fairly substantial circle, would it not - a fair diameter? We have the story of the gentleman from - was it Beac? - when the conductors were clashing, and sparks, or whatever it is, were falling on the road and ricocheting off into the grass? ---One of my engineers was trite enough to suggest that we could concrete the State and paint it green.

MR. LLOYD: May I ask one question by leave, Mr. Chairman?

THE BOARD: Yes, Mr. Lloyd.

MR. LLOYD: Someone - I think, from the SEC - told me that the development of the present EDO with choke, the experimental work on it and the putting of it into production, costs something of the order of \$1 million. Do you believe that to be right?---I do not have any figures I could quote to you for it, I am sorry.

MR. MARKS: May I add one question, Mr. Chairman?

THE BOARD: Yes, Mr. Marks.

MR. MARKS: In South Australia do they use fire chokes on EDOs?--- No, they use clamp-ons directly, in the same way we do.

(THE WITNESS WITHDREW)

MR. NIXON: Before I call the next witness, I call for and, if necessary, seek an order in relation to these documents and material from the SEC: first of all, all the statistics from reports received on fires allegedly caused electrically or by SEC installations in rural areas of Victoria since 1959. I call for any reports made by a Mr. Ellis, who has been referred to in evidence as a metallurgist employed by the SEC, as to any observations made by him on the property of Mr. Lloyd at Glenhompson; any examination of the EDO type fuses in the Wallindue or Cressy fires, and in relation to an examination of the steel conductor, or portion of the steel conductor, in the Tatyoon/Streatham fire. I call next for a report made by an engineer, whom I believe to be a Mr. Pleasance, he being employed by the SEC, in relation to examination of particles from conductor clashes as a possible source of bushfire ignition. I call next for all reports and records retained by the SEC as to fires alleged to have been associated with the malfunction of surge diverters, causing the diverter to fracture. I call next for all records or recommendations by the field practices division of the SEC with regard to tree cutting, tree lopping, since the 8th January 1969. I call for the document or documents in the possession of the SEC recommending the replacement of the clamp-on type fuse with the EDO fuse and fire choke, and finally I call for the records and results of any tests conducted between the 8th January 1969 and the 12th February 1977 by the SEC with regard to conductors clashing.

THE BOARD: That is an order of some magnitude. All of it, however, seems relevant. The only thing that troubles me a little is the first one, going back to 1959. That may be extremely difficult to comply with.

MR. MARKS: I understand that the files to that time are not in existence - that is to say, beyond 1967, I think, or some period like that - but that the statistics are, so that we can comply with the order if you so order it, Mr. Chairman.

13.JB.KK  
Fire

1498

WILSON, rec.  
DISCUSSION

10/02/2009

11-11  
12-15  
13-13

11-11  
12-15

INSTRUMENTAL  
FIRENZA

2430

6002/20/01

THE BOARD: Other than that, which worried me somewhat, subject to any objection on your part - well, there can be not much objection in the way of privilege; there is not much you can do about it, except, I suppose, the only real basis of objection is either that you do not have the document or that to acquire it - I suppose it might be possible to argue in some cases that to search and find the document would take trouble out of all proportion to its value. I suppose that is a position you can take up if you fail to obey the order. Short of that, it seems to me that what Mr. Nixon asks for I should order you to produce, and I do so.

I may say that this Inquiry, in contra-distinction to some others with which I have been associated, has been conducted with a certain spirit of amiability between the various parties. While nobody is giving away an inch for his client's interests, everybody has behaved in a reasonable and gentlemanly manner. The result is perhaps that we have become a little lax, in that Mr. Nixon has just called for things and, without any formal order from me, they have in general been produced, and I had rather assumed that without my saying so in so many words, anything that Mr. Nixon has asked for is, in fact, equivalent to an order from me to produce it. It might perhaps have been better if at all stages I had made that clear. In the case of a request of this magnitude, I think I should formally order that the SEC produce the documents sought.

MR. MARKS: Mr. Chairman, perhaps by way of retaliation - not against Mr. Nixon, but against Mr. Lloyd - we did ask for the production - I am sure he will not need an order from you to produce it; he has been very obliging with documents in the past - of a minute book relating to region 5, I think, of meetings of the regional and local advisory committees in that region. I think it was region 5. It was when Mr. Penna, I think, was in the box, and it related to that other document which he so kindly produced at our request, about an agreement reached in 1969 between the Commission and the Chairman of the CFA.

THE BOARD: It is no reflection on either Mr. Lloyd, those instructing him or his client, but I think we should treat everybody alike, and I will order those matters to be produced.

MR. LLOYD: I thought we had given them and received them back.

MR. McDONALD: No.

THE BOARD: You may find that they have already been shown to someone.

MR. MARKS: No, Mr. Lloyd is talking about a different minute book. You remember there was evidence given by the gentleman through whom we produced notice about our letter of February 1969; he said that thereafter he always mentioned at meetings the contents of the agreement or arrangement after the 1969 fires. You, Mr. Lloyd, complained, because, you said, it goes back seven years, and I said it would probably all be in one book. It is the minute books which reflect what he says at the meetings.

MR. LLOYD: Mr. Penna's region?

MR. MARKS: I think it was Mr. Penna's region.

MR. LLOYD: Are you sure?

13.JB.KK  
Fire

14-99

DISCUSSION

10/02/2009

MR. MARKS: It could be only Penna or Morrall.

MR. LLOYD: Mr. Penna produced the letter. Mr. Morrall was the man who said he mentioned it at meetings. Region 5 or 6? Which one?

MR. MARKS: Yes, there was another one. It may have been Mr. Heddington. I will look it up and let you know.

THE BOARD: Subject to the document being properly identified, I order its production.

MR. LLOYD: We have not the material in the plenitude that Mr. Nixon mentioned, but as to the material that Mr. Marks mentioned this morning as being the figures of SEC associated fires and a book about them, might we have that over the weekend?

THE BOARD: Are those documents available?

MR. MARKS: We hope to have them for Mr. Lloyd over the weekend. There may have been a misunderstanding. The book I was talking about is a handbook on the organisation of the SEC. There is no other book. Perhaps if I may discuss that with you, Mr. Chairman, we have in preparation a screed that sets out - it may be longer than necessary - the organisation of the SEC, which is unusual, in the sense that we have about five assistant managers, who are divided up into divisions, and it is complicated. I thought I would, subject to the convenience of the Board, arrange for the screed to be prepared and tendered, and for a gentleman to answer any questions on it. It will be probably the man who prepared it. Similarly, I proposed, if it were convenient, to bring along the gentleman who prepares, in compliance with that order, the document that sets out the statistics as to fires. It means he will be recently familiar with the fires, having compiled it, and he may answer any questions about specific matters as to how frequent the fires are, and so on.

KK.

THE BOARD: That sounds perfectly useful. The only thing is that when the document is available, it might save time if Mr. Nixon, certainly - and I suppose both Mr. Lloyd and Mr. Barnard, if he is involved in it - could have a look at it before the gentleman is called. It might save time in the long run.

MR. MARKS: Yes. I will hand to you, in compliance with your order, Mr. Chairman, the statistics relating to fires involving the allegation that the SEC was involved, since 8th January 1959. There are copies for my learned friends.

THE BOARD: That is a remarkable achievement.

MR. MARKS: It has required quite a lot of work and time.

THE BOARD: I am sure it did.

MR. MARKS: There are breakdowns and sub-breakdowns in which you may be interested.

EXHIBIT 202.....Statistics of fires allegedly involving the SEC from 8th January 1959 to 30th March 1977.

THE BOARD: What is the significance of January 1959?

13.JE/AC.  
Fire.

1500.  
(Page 1500A follows)

DISCUSSION.

11-11  
12-15  
13-13

11-11  
12-15

13-13  
14-14  
15-15  
16-16  
17-17  
18-18  
19-19  
20-20  
21-21  
22-22  
23-23  
24-24  
25-25  
26-26  
27-27  
28-28  
29-29  
30-30  
31-31  
32-32  
33-33  
34-34  
35-35  
36-36  
37-37  
38-38  
39-39  
40-40  
41-41  
42-42  
43-43  
44-44  
45-45  
46-46  
47-47  
48-48  
49-49  
50-50  
51-51  
52-52  
53-53  
54-54  
55-55  
56-56  
57-57  
58-58  
59-59  
60-60  
61-61  
62-62  
63-63  
64-64  
65-65  
66-66  
67-67  
68-68  
69-69  
70-70  
71-71  
72-72  
73-73  
74-74  
75-75  
76-76  
77-77  
78-78  
79-79  
80-80  
81-81  
82-82  
83-83  
84-84  
85-85  
86-86  
87-87  
88-88  
89-89  
90-90  
91-91  
92-92  
93-93  
94-94  
95-95  
96-96  
97-97  
98-98  
99-99  
100-100

24-24

MR. MARKS: I think it is the furthest back they can go. It may not be. I think at one stage he prepared them for 1969, and then we said, "Go back another ten years, if you can." But I believe that is about as far back as he is able to go.

I also, in compliance with your order, now hand to Mr. Nixon the files in relation to the alleged eight failures of lightning arresters that are referred to on that list. It may not be necessary to have it as an exhibit, because there are some papers in there which strictly are irrelevant, but I have not extracted any papers from what I was given.

THE BOARD: If you would be kind enough to give that to Mr. Nixon, he can have a look at it, and we can make it an exhibit if necessary when he has perused it.

(Page 1501 follows)

10/02/2009

13.JB/AC.  
Fire.

1500A.

DISCUSSION.

11-11  
12-15  
13-13

11-11  
12-15

FIREBENZ

2430



REGINALD EDWARD JAMES, recalled and further examined.

THE BOARD: Sgt. Philpott points out he has not in fact in his possession Exhibit 200 Mr. Wilson's statement with the enclosures. I have my own personal copy with which I do not intend to part but at some stage the sergeant should be given a copy with all the enclosures.

MR. MARKS: I would point out Mr. James is being recalled on the basis of his statement, on which he was not cross-examined before, in respect to the test at Tatyoon. Mr. James was present as was Mr. Ellis when the test was done and his report on that matter, in accordance with your direction, Mr. Chairman will be forwarded this day but for the convenience of my friends, Mr. Ellis can give evidence about the metallurgical side and Mr. James is concerned with the electrical side. Mr. Ellis will be called on Monday.

THE BOARD: You are going to deal with this witness now?

MR. NIXON: Mr. James' statement is at page 748 and onwards of the transcript. Perhaps it would be convenient if I were to re-read it. (Mr. James' statement read out in full by Mr. Nixon).

Then Mr. James went on to describe the film as it was being shown.

MR. BERNARD: Mr. James, have you had much experience in carrying out experiments?---Of that particular type?

That sort of experience?--- No.

You would accept that carrying out an experiment only twice does not give you an adequate indication of the factors involved in an event such as that?---The more tests that are carried out the more conclusive they are.

When men are taking down fuses from high voltage wires they use wooden poles?---Yes.

Those wooden poles are poor conductors so there is no risk with them, is that so?---Yes.

On the other hand, if you have a nice, green stick it can be a reasonably good conductor?---Reasonably.

If one is carrying out a test such as you carried out the important thing is to get the sort of wood or tree that in fact does fall on a line, is it not?---Yes.

You had these pieces of sugar gum sent to you, did you?---Yes.

Did you have one or two pieces?---I had two samples.

We have had one produced in the Board here?---Yes.

Was that the first piece or the second?---It was the second.

Were those pieces part of the same tree or separate pieces when you saw them?---When I saw them they were separate pieces.

You would agree they were green timber?---Yes, green timber.

And full of sap?---Yes, that would be so.

13.P A. JH.  
Fires.

1501.

JAMES, REC.

6002/20/01

11-11  
12-15  
13-13

11-11  
12-15

INSURANCE & INVESTMENT  
FIREBENZ

2430

10/02/2009

You would assume from looking at them as a matter of timber being a conductor that they represented good conductors?--  
Yes.

Of course, that involves a very different situation to a dead or almost dead tree falling on a conductor does it not?---  
Yes, a different condition but I am not saying how much.

If the tree is completely dead in dry weather it may not conduct at all, is that so?--It may not.

It can be in the same position as the pole with which the man takes down the fuses?---No, it would not be in that condition.

Why not?---We specially treat them.

Do you dry them out?---We dry them out and impregnate them with wax.

Do you suggest a tree that had been dead for a number of years in dry country would conduct at all?

THE BOARD: This tree had not been dead for a number of years in dry country. It still had green leaves on it.

MR. BARNARD: Yes, but a substantial part of the tree was dead.

THE BOARD: It was not a dead limb, not if this was the one we saw.

MR. BARNARD: I am putting this to you: Mr. James, you would agree you could get a branch that would not conduct at all? --I do not agree 100% with you - it will conduct to some degree.

To the degree you would get arcing?---Yes, in some cases it would conduct.

What you did was not to reproduce the situation as it was at Tatyoon, is that right?---No.

You would not agree?---No.

You suggest that by using a green piece of sugar gum that reproduced the Tatyoon situation?---Yes, fairly closely.

Did you see the piece of timber from Tatyoon?---Yes.

THE BOARD: Perhaps we could see it, I cannot remember the precise condition. (Two pieces of timber produced).

MR. BARNARD: If you turn to the other end of this and then look at your own, would you agree that there is much more of the tree from Tatyoon, the one on your right that is dead than the exhibit that you tested?---I agree.

So its ability to conduct would be different?---Yes, it would be different.

(Page 1504 follows)

13. P.A. J.H.  
Fires.

1502/1503.

J. MBS, REC.

11-11  
12-15  
13-13

11-11  
12-15

FIRENS

2430

MR. BARNARD: That is the first thing and, accordingly, if you have a piece of wood, which is a different conductor, a different sort of current will flow, is that not so?  
---That is right.

How will it affect the current that will flow, in your view?  
---Obviously, with the same voltage, with the drier wood there will be less current flow than with the green wood.

And the process would take very much longer, the process of a fire starting?---It would take something longer, yes.

Are you able to tell us how much longer?---No.

The next thing is in carrying out your test, I do not understand - was there an earth in your test?---Yes, there was a return path from the tree, which is an earth potential.

But there was not a true earth there, was there, in the sense of the use of the earth itself?---We did not use the earth as a conductor, we used the wire which was connected to it.

So, in fact, there was a good contact between the wood itself, of the bough, and the earth, so to speak, or the earth potential?---Yes.

When a tree falls, it is usually broken off somewhere, is that not so?---Possibly, yes.

And you would expect some part of it to be perhaps hanging on to the stumps still, as it is resting across the wire, is that so?---At Tatyoon, I do not know.

If it was still attached to the tree, you would expect only a small piece still hanging on, is that not so?---Yes, a relatively small piece.

And that itself, you would expect to be a poor conductor, too, would you not?---It is all relative, what you mean by poor and bad.

But it could be a very poor conductor, the piece that was left hanging on?---It could be quite good.

And, of course, the other situation is, if the tree or the part of the tree which broke off, if the bottom fell to the ground, it would be standing on dry earth, is that not so?---Yes, standing on the earth.

And at that time of year that would provide, again, a poor contact with the earth?---Relatively poor, yes.

What would be the effect of that on the flow of current?---It would tend to limit the flow of current.

And if you limit the flow of current, is the position then that any burning process, if it was to take place, would take very much longer?---Yes, that would be so.

And may it be that the flow of current might be limited by the dryness of the earth, that no burning process would take place?---Yes, that could be possible.

In carrying out your tests, did you make any allowance for any farm load, that is normal load of current on the line?  
---No, we did not make any allowance for that.

13. YE/AC.  
Fire.

1504.

JAMES, Rec.

10/02/2009

11-11  
12-15  
13-13

11-11  
12-15

13-13  
14-14  
15-15  
16-16  
17-17  
18-18  
19-19  
20-20  
21-21  
22-22  
23-23  
24-24  
25-25  
26-26  
27-27  
28-28  
29-29  
30-30  
31-31  
32-32  
33-33  
34-34  
35-35  
36-36  
37-37  
38-38  
39-39  
40-40  
41-41  
42-42  
43-43  
44-44  
45-45  
46-46  
47-47  
48-48  
49-49  
50-50

24-24

There were other persons down the line from where the bough fell?  
---That is so.

So to get an accurate test, you would have to take into account the flow of the current to those properties?---Yes.

Of what order would that flow be?---It would be lucky of be one amp, half an amp.

But you made an allowance for that?---No, it does not come into the question of the burning timber.

It may not come into the burning timber, but it does come into what is flowing through the fuse conductor at the most protection, does it not?---Yes.

And that is a very important thing, is it not, as to whether your protection system picks up faults or interference with the  
- - ?---Yes.

What reactants or what load were the reactants given in your set up?---We set the reactants to give a figure of 7.5 amps flow without any limit in position.

You set it at 7.5, yes, and so, in fact, a current of greater than 7.5 could not have flowed through the system, is that so?  
--- That is right.

Did you have any protection system in the test apparatus you set up?---Not similar to as is in the field supply down at Fishermens Bend, where there was some protection.

You did not put in an appropriate fuse, as would have been in the setup at Tatyoon?---No.

So by you limiting the current to 7.5, of course, there was no such limiting device in the field at Tatyoon, was there?  
---That is right.

And your test, if it had been carried out at Tatyoon, with that piece of timber and the sort of earthing you provided, may have caused much greater current to flow?---Possibly, yes.

And, of course, if a greater current, in fact, flowed, that may have caused a blowing of a fuse?---Yes.

When I say a fuse, the sort of fuse which is fitted in the system at Tatyoon?---Yes, it may have.

And, of course, where the current would be higher would be in the latter stages before the wire breaks, is that so, before the conductor breaks?---Would you say that again?

Where the current would be highest would be in the latter stages?  
---During the currency of the test?

Yes?---No, it would remain fairly constant.

So, in fact, it could exceed the 7.5 at any stage through the test, is that the position?---No, it could not.

I withdraw that. It could exceed the 7.5 if the reactants were not set to limit it to that at any stage through the test, is that so?---I am not quite with you. If we did not have the reactants, it would have been a different current.

13. ME/AC.  
Fire.

1505.  
(Page 1505A follows)

JAMES, Rec.

6002/20/01

11-11  
12-15  
13-13

11-11  
12-15

INDUSTRIAL FIRE  
FIRENZA

2430

10/02/2009

Yes, and that current might exceed 7.5, either early in the carrying out of the test, or later in the carrying out of the test?---It could have, yes.

What I am concerned with asking you is this, that in a number of circumstances where a tree falls on a conductor, if the tree is sufficiently sappy, a fuse could go before any burning of the tree occurs, or any burning of the conductor, breaking of the conductor, occurs?---Yes.

And you yourself, as a result of your tests, are not able to tell us in what circumstances the fuse will go first and save any risk of fire occurring?---No.

Have any tests along those lines ever been carried out?---Not to my knowledge.

Are you aware of any tests of this sort ever having been carried out before by the Commission?---Not to my knowledge.

Of course, I put it to you another way - if the tree is dead and therefore a poor conductor, as excessive or as great a current, or the current which flows will not be as great as flows with a very sappy tree, is that so?---Yes.

On the other hand, if any burning or breaking of the conductor was to take place, it may take a very long period?---Yes.

And if you have an excess current, even though for a long period, that also can cause the fuse to blow?---Yes.

Do you yourself know anything of the fuse protecting the Hamilton property at Tatyoon and of its capacity?---It was a five amp, I understand.

(Page 1506 follows)

11-11  
12-15  
13-13

11-11  
12-15

13-13  
14-14  
15-15  
16-16  
17-17  
18-18  
19-19  
20-20  
21-21  
22-22  
23-23  
24-24  
25-25  
26-26  
27-27  
28-28  
29-29  
30-30  
31-31  
32-32  
33-33  
34-34  
35-35  
36-36  
37-37  
38-38  
39-39  
40-40  
41-41  
42-42  
43-43  
44-44  
45-45  
46-46  
47-47  
48-48  
49-49  
50-50

24-25

10/02/2009

MR. BARNARD: Do you understand any reason for it being so set at 5 amps?---Other than that is the obvious figure which we have heard from our previous witnesses.

You do not know why it is set at that?---It is set at that to give us the discrimination necessary for other fuses in the circuit and adequate protection.

You do not know that was necessary at Tatyoon to have 5 amps discrimination?---I have not done any calculation.

You would agree if possible it would be desirable to select your fuse in a situation like that so that it would operate to protect against conductors burning through limbs or interference of that sort?---It would be desirable, yes.

So far as you know, no tests have ever been carried out to indicate how a fuse should be selected to protect against a conductor being interfered with by a limb, so far as you know?---No.

Of course, a fuse is not the only device that one can use to protect against an excess of current, is it?---No.

You would agree that where a limb does fall or come in contact with a conductor, the sort of current that flows if it is going to start any burning or any melting of the conductor is going to be an excessive current?---What do you mean by excessive?

A current that would be in excess of the normal load you would expect to be along that conductor?---Yes.

If one were to measure that current and have a device to cut the current off when that excessive load came on, one could avoid the result of fire, is that not so?---If you were quick enough, yes.

If the device was quick enough, is that not so?---Yes.

Of course, excessive currents can be measured by magnetic devices, can they not?---Yes.

Has there been any investigation by the Commission as to turn-off devices when currents of this sort flow?---This is normal fault current you are speaking of?

Yes, I am speaking of fault current?---We have our auto-reclosers, oil circuit breakers.

There can be much simpler devices than that, can there not?---Such as?

I am asking you, can there be simpler devices than an oil circuit recloser?---To detect fault current?

Yes?---The fuse is one.

But it is simpler with the magnetic type?---It does not come readily to mind.

What I am putting to you, putting aside cost and putting aside inconvenience, there would be no difficulty in measuring fault currents of this sort and turning off the power as soon as the fault current occurred?---It could be done.

THE BOARD: You mean somebody physically doing it?

MR. BARNARD: No, I am suggesting an automatic device.  
(To witness): The problem is that causes inconvenience and loss of supply to people, does it not?---Yes.

Of course, that inconvenience and loss of supply might be justified on the few high fire danger days of the summer, might it not?---It might be justified, I would not say it was or was not.

Do you know whether the Commission has ever investigated the means of turning off the supply in the event of fault currents of this sort occurring in fire danger periods?---I am afraid I am missing what you are getting at.

I am enquiring whether to your knowledge the Commission has ever looked into the question of a device to turn off supply on days of high fire danger or high fire risk, by means of a device when a fault current of this order flows?---Other than our normal protection setup which caters for all faults, it does not have to be a tree falling on the line.

And this is not concerned with turning off the supply unless the fault continues to repeat itself. The oil circuit recloser does not turn off supply permanently unless there is a repetition of the supply?---It checks to see if the fault is still there.

An oil circuit recloser would not pick up a supply of the sort that occurred at Tatyoon?---That would depend on where it is physically located in relation to the fault.

You are saying it would turn - - - ?---No, I did not say that. I said it depends where you put your oil circuit recloser.

THE BOARD: How far away?---Yes.

MR. BARNARD: Can you explain to me what your position is, you are in the Distribution Division, is that so?---That is correct, Distribution Department.

What division are you in?---Part of the Field Practices Division.

What is the work of the Field Practices Division?---The whole division?

The whole division?---It consists of a construction section, radio section, our methods section, and I cannot think of any other sections that are involved at this stage. Training section.

What sort of people are you training?---Linesmen.

What are the methods?---Studying line construction methods, and methods of carrying out work.

Your division would be concerned, for example, when one is erecting a line in the first place, the surveying and design of where the line is to go and how it is to go in relation to trees and things of that nature?---We do not get involved in very much detail in design stages in the selection of the route, we are more involved in the construction technique. We do advise the line design people on problems we are encountering.

You do not select or design the route or lay down standards for the route?---We contribute to the laying down of standards for the route, but we do not get involved with all route selection.

Do you lay down standards for the distance away from trees or the gap that is to be cut through trees?---We do.

13.GT.KK  
Fire

1507

JAMES, rec.

10/02/2009

11-11  
12-15  
13-13

10-10  
11-11  
12-15

100-25  
129-25  
FIRENZ

17-1

24-30

Is that the responsibility of your division?---Yes, as a general policy statement.

How long have you been working with that division?---Since 1968.

No doubt there has been a code of standards in the placement of lines in relation to trees?---Yes, we have a policy.

There is no doubt a number of people working in your division?---Yes.

Is this policy set out in writing?---When I say our policy on the route selection in relation to trees, first of all we say that the line should go on the road in the first case. If there is too much tree cutting, then we say it should go in an easement if it is agreeable to the farmer.

When you say too much, no doubt there is some standard, whether it is 40 feet or 80 feet from trees?---Our standard at this stage, it is more not so much where the line goes in relation to trees, it is tree trimming in relation to the line.

(THE WITNESS WITHDREW)

THE BOARD ADJOURNED UNTIL 10.30 A.M. ON MONDAY,  
THE 16TH MAY, 1977.

10/02/2009

11-11  
12-15  
13-13

12-15  
11-11  
10-10

13.GT.KK  
Fire

1508

JAMES, rec.

INDUSTRIAL REVIEWS  
FIRRENZ

6 17 1

2430