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VERRIGTINGS 1970
Deel 1

Tegniese Vergadering

4 en 5 MEI 1970

Potchefstroom

Die Vereniging van Munisipale Elektriesel-
ondernemings van Suidelike Afrika



PROCEEDINGS 1970
Volume 1

Technical Meeting

4th and 5th MAY, 1970

Potchefstroom

The Association of Municipal Electricity
Undertakings of Southern Africa

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**Vereniging van Munisipale
Elektrisiteitsondernemings
van Suidelike Afrika.**

**The Association of Municipal
Electricity Undertakings
of Southern Africa.**

**KENNISGEWING VAN DIE
1970 TEGNIESE VERGADERING**

**NOTICE OF
1970 TECHNICAL MEETING**

Ons bevestig hiermee dat die 1970 Tegniese Vergadering van die Vereniging op Maandag en Dinsdag, 4 en 5 Mei 1970 in die Stadsaal, Potchefstroom gehou sal word.

We hereby confirm that the 1970 Technical Meeting of the Association will be held on Monday and Tuesday, 4th and 5th May, 1970, in the Town Hall, Potchefstroom.

DAVIDSON EN EWING (EDMS.) BPK.

DAVIDSON & EWING (PTY.) LTD.

per: R. G. Ewing,

per: R. G. Ewing,

15 Maart 1970.

Sekretarisse.

15th March, 1970.

Secretaries.

SAKELYS en PROGRAM

AGENDA and PROGRAMME

MAANDAG, 4 MEI 1970.

MONDAY, 4th MAY, 1970.

9.00 vm. Amptelike opening van die Vergadering deur sy Eddagbare die Burgemeester van Potchefstroom.

9.00 a.m. Official opening of the Meeting by His Worship the Mayor of Potchefstroom.

9.15 vm. Ledeforum.

9.15 a.m. Members' Forum.

10.30 vm. Pouse vir Verversings.

10.30 a.m. Refreshment Interval.

11.00 vm. Ledeforum.

11.00 a.m. Members' Forum.

12.45 nm. Verdaging vir Middagete.*Kyk Opmerking onder.

12.45 p.m. Luncheon Adjournment.*See note below.

2.00 nm. „Water—die rol van water in Suid-Afrika se kragvoorsiening”, deur D. C. Midgley, Professor in Hidrouliese Ingenieurswese, Universiteit van die Witwatersrand.

2.00 p.m. “Water—its role in South Africa's power supplies,” by D. C. Midgley, Prof. of Hydraulic Engineering, University of the Witwatersrand.

3.30 nm. Pouse vir Verversings.

3.30 p.m. Refreshment Interval.

4.00 nm. „'n Internasionale benadering tot die werking van armature”, deur H. Hewitt C.Eng., F. Illume S., President van die Vereniging van Verligtingsingenieurswese, Voorsitter van die Tegniese Komitee van Vereniging van Verligtingsingenieurswese.

4.00 p.m. “An international approach to luminaire performance,” by H. Hewitt, C.Eng., F.I.E.E., F. Illume S., President of the Illuminating Engineering Society, Chairman of the Illuminating Engineering Society Technical Committee.

5.00 nm: Verdaging.

5.00 p.m. Adjournment.

Aand:

Evening:

Afgevaardigdes sal die gaste wees van die agbare Burgemeester en Stadsraadlede van Potchefstroom by 'n informele Burgelike Onthaal.

Delegates will be the guests of His Worship the Mayor and Town Councillors of Potchefstroom at an informal Civic Reception.

DINSDAG, 5 MEI 1970.

- 9.00 vm. Ledeforum.
- 10.30 vm. Pouse vir Verversings.
- 11.00 vm. „Waterbewaring in Afrika vir Kragopwekking”, deur Dr. Henry Oliver.
- 12.00 Verslae.
- 12.45 nm. Verdaging vir Middagete.*Kyk opmerking onder.
- 2.00 nm. „Aspekte van Ruimte-navorsing”, deur D. Hogg, Bestuurder van die Buitenste Ruimtestasie.
- 3.00 nm. Pouse vir Verversings.
- 3.30 nm. Ledeforum.
- 5.00 nm. Verdaging.

'n Vergadering van die Uitvoerende Raad sal onmiddelik na afloop van die Tegniese Vergadering plaasvind.

*Op albei dae van die Vergadering sal buffetetes verskaf word by die Elgro Hotel wat op 'n stapafstand van 4 minute vanaf die Stadsaal geleë is. Die koste van R1.25 vir elke persoon is betaalbaar by inskrywing.

TUESDAY, 5th MAY, 1970.

- 9.00 a.m. Members' Forum. ✓
- 10.30 a.m. Refreshment Interval. ✓
- 11.00 a.m. "Conservation water in Africa for power generation" by Dr. Henry Oliver.
- 12.00 noon Reports. ✓
- 12.45 p.m. Luncheon Adjournment.*See note below. ✓
- 2.00 p.m. "Aspects of Space Research" by D. Hogg, Manager of Deep Space Station.
- 3.00 p.m. Refreshment Interval.
- 3.30 p.m. Members' Forum.
- 5.00 p.m. Adjournment.

A meeting of the Executive Council will be held immediately after the end of the Technical Meeting.

*Buffet luncheons on both days of the meeting will be provided at the Elgro Hotel, which is within four minutes walking distance from the Town Hall. The charge will be R1.25 per head, and this amount will be payable on registration.

LEDE-FORUM

VRAAG 1:

Hoë induktansie oefen 'n merkbare invloed op die spanning in bogronde lyns uit, wat op sy beurt die kragfaktor nadelig beïnvloed en 'n groot induktansie-afname meebring. Aan die ander hand trek die hoë kapasitansie van kables 'n ooreenstemmende groot kapasitansiespanning van die stelsel en die lengte van die roete. Afgesien van ander oorwegings, watter invloed oefen hierdie verskille in elektriese eienskappe 'n invloed uit op die keuses tussen bogronde en ondergrondse primêre en sekundêre verspreidingsstelsels?

Word ingelei deur H. T. Turner.

VRAAG 2:

Daar word dikwels moeilikheid ondervind om by 'n vooraf-neergelede instandhoudingsprogram te hou wanneer relê's met afhanklike vasgestelde tydsvertraging nagegaan word, vanweë die vraag na dienste elders of inwerkingstellingstoets vir nuwe toerusting. Dit val ook te betwyfel of dit nodig is om hierdie relê's op die roete te toets, aangesien hulle moontlik net so betroubaar as kwh-dienstemeters is.

Is daar enige metode of skema vir die inspeksie en toetsing van relê's wat deur nie-deskundige personeel uitgevoer kan word gelyktydig met bogronde uitklynktoets en sonder om die bedekkings van die relê's af te haal?

Word ingelei deur H. T. Turner.

VRAAG 3:

Die prys van woonerwen in dorpsgebiede is tans 'n baie akute vraagstuk en het gelei tot die aanstelling van 'n kommissie van ondersoek deur die betrokke minister.

Ten regte of ten onregte word die koste van die aanbring van noodsaaklike dienste soms aangevoer as die rede vir die beweerde hoë pryse van die erwe.

Wat word beskou as die mees regverdige manier om die voorsiening en aanbring van elektrisiteit in woongebiede te finansier?

Kan 'n aanvaarbare standaard-formule vir die Republiek uitgewerk word?

Word ingelei deur G. C. Theron.

VRAAG 4:

Baie ingenieurs is traag om die gebruik van L.S. ondergrondse kabel met aluminium geleiers in die samstelling met konsentriese neutrale geleier te aanvaar selfs in stelsels met menivuldige aarding vir beskerming en ten spyte van die ekonomiese voordele.

Is dit as gevolg van konserwatisme, 'n oorbeklem-

MEMBER'S FORUM

QUESTION 1:

The effect of high inductance on overhead line voltage is appreciable with disadvantageous effects on power factor coupled with a high inductance drop. The high capacitance of cables on the other hand draws a correspondingly large capacitance (leading) current, and kVA of which is roughly proportional to the system voltage and route length. To what extent do these differences in electrical characteristics, apart from any other considerations, influence the choice between overhead and underground primary and secondary transmission system?

To be introduced by H. T. Turner.

QUESTION 2:

It is frequently found difficult to adhere to a laid down maintenance programme when checking with inverse-definite-minimum-time delay relays because of the demand for services elsewhere or commissioning tests on new equipment.

Also it is questionable if the routine testing of i.d.m.t. relays is necessary on the ground that their reliability in service might well equal that of kWh service meters.

Is there any method or scheme of relay inspection and testing which could be done by non-specialist staff concurrently with o.l. trip testing and without having to remove the relay covers?

To be introduced by H. T. Turner.

QUESTION 3:

The cost of erven in residential townships is a very topical subject at present and has caused the responsible minister to appoint a commission of enquiry.

Rightly or wrongly the cost of services is sometimes blamed for the alleged high prices of the erven.

What is considered to be the most equitable manner to finance the provision and installation of electricity in residential townships?

Can an acceptable standard formula for the Republic be evolved?

To be introduced by G. C. Theron.

QUESTION 4:

Many Engineers are reluctant to accept the use of I.V. underground cable with aluminium conductors in concentric neutral construction even on P.M.E. systems and in spite of the economic advantages.

Is this due to conservatism, an overstressing of

toning van die moontlike wegvretingsprobleme of 'n gebrek aan kennis van die nuwe vervaardigings-metodis wat bedoel is om die moontlikheid van die wegvretting van die aluminium wat die konsentriese neutrale geleier vorm, te verminder.

Word ingelei deur G. C. Theron.

VRAAG 5 :

Termiese vs. blok-aanvraag-metertelling.

Word ingelei deur E. de C. Pretorius.

VRAAG 6 :

Die vertolking van sekere klousules van die Fabriekswet, soos deur Mnr. Wannenburg by die Umtali-konvensie uitengesit, met inbegrip van 'n verwysing na die omsendbrief van die Departement Arbeid.

Word ingelei deur C. Lombard.

VRAAG 7 :

Kabels in die dakruimte—faktore vir stroom-aanslag.

Word ingelei deur E. de C. Pretorius.

VRAAG 8 :

Die ekonomie van tariewe vir nywerheidsvoorsiening wanneer daar by grootmaat aangekoop word.

Word ingelei deur F. Turnbull.

VRAAG 9 :

Super-spanningskemas vir klein ondernemings—keuse van soort spanning.

Word ingelei deur E. de C. Pretorius.

VRAAG 10 :

Kruisgebonde poli-etileenkabel.

Word ingelei deur Mnr. Austen (Austeven Enterprises).

VRAAG 11 :

Is die tydperk wat deur Munisipaliteite aan tenderaars toegelaat word vir die indiening van tenders altyd billik?

Word ingelei deur 'n verteenwoordiger van die Vereniging van Kabelvervaardigers.

VRAAG 12 :

Met die oog op die toenemende ernstigheid van die arbeidstekort, watter stappe kan of behoort daar deur die Vereniging, as 'n landswyse liggaam, gedoen te word om die werwing van professionele en tegniese

the possible corrosion problems or a lack of knowledge of new construction methods to minimise the possibility of corrosion of the aluminium forming the concentric neutral conductor?

To be introduced by G. C. Theron.

QUESTION 5 :

Thermal vs. Block Demand metering.

To be introduced by E. de C. Pretorius.

QUESTION 6 :

Interpretation of certain sections of the Factories Act given by Mr. Wannenburg at the Umtali Convention including reference to Department of Labour Circular.

To be introduced by C. Lombard.

QUESTION 7 :

Cables in roof space—factors for current rating.

To be introduced by E. de C. Pretorius.

QUESTION 8 :

Economics of Industrial Supply Tariffs when purchasing in bulk.

To be introduced by F. Turnbull.

QUESTION 9 :

Supertension schemes for small undertakings—choice of voltage.

To be introduced by E. de C. Pretorius.

QUESTION 10 :

Cross-linked Polythene cables.

To be introduced by Mr. Austen (of Austeven Enterprises).

QUESTION 11 :

Is the time granted by Municipalities for tenders to submit tenders for electric cables always reasonable?

To be introduced by a representative of the Cable Makers Association.

QUESTION 12 :

With the increasing gravity of the labour shortage situation, what steps can or should be taken by the Association, as a National body, to encourage the recruitment of professional and technical staff

personeel vir die plaaslike bestuursdiens aan te moedig?

Word ingelei deur K. G. Robson.

VRAAG 13:

Word daar aan driefasige, enklfasige of geen skakelgeriewe voorkeur by die hoogspanningsvoergieriewe in miniatuur-substasies?

Word ingelei deur K. G. Robson.

VRAAG 14:

Munisipale elektrisiteitsondernemings ondervind ernstige probleme met betrekking tot stygende koste, voortdurende eise wat aan die beskikbare kapitaalbronne gestel word en die intensiewe ontwikkeling van private dorpsgebiede binne munisipale gebiede. Behoort die Vereniging nie 'n studiegroep in die lewe te roep nie, om ondersoek in te stel na die probleme van private dorpsontwikkeling, met spesiale verwysing na die wyd-uiteenlopende beleidsrigtinge en opvattinge in verband met die finansiële verantwoordelikhede van die dorpsontwikkelaars?

Word ingelei deur K. G. Robson.

into the Local Government service?

To be introduced by K. G. Robson.

QUESTION 13:

Are three phase switching, single phase switching or no switching facilities recommended on the High Voltage feeders in Miniature substations?

To be introduced by K. G. Robson.

QUESTION 14:

Municipal Electricity Undertakings are facing serious problems of rising costs, continuing demands on available capital resources and the intensive development of private townships within Municipal areas. Should not the Association set up a study group to examine the problems of private township development, with special reference to the present differing policies and opinions on the financial responsibilities of the township developers?

To be introduced by K. G. Robson.

JAARVERSLAG VAN DIE KOMITEE VIR AANBEVELINGS INSAKE NUWE ELEKTRIESE WARE

Twee vergaderings is gedurende die jaar gehou en drie-en-twintig nuwe artikels is oorweeg. Alle aanbevelings is deur middel van die nuus-bulletins aan lede oorgedra.

Mnr. A. A. Middlecote en J. V. Grant het die plekke van Mnr. F. J. Prins en N. W. W. Bennett as verteenwoordigers van die S.A. Buro vir Standarde op die Komitee ingeneem. Mnr. Grant is die persoon wat verantwoordelik is vir die administrasie van die Komitee vir die Bedradingsregulasies nadat dit deur die Buro oorgeneem is.

Daar word oorweeging geskenk aan die stroom-belyning van die prosedures en funksies van die Aanbevelingskomitee, wat deur die meer direkte inskakeling van die Buro aangehelp sal word.

Die onskatbare waarde van die hulp van die verteenwoordigers van die verskillende instansies wat op die Komitee dien, word met groot dank erken.

R. W. BARTON,
Sameroeper.

VERSLAG VAN DIE KOMITEE INSAKE VOORSIENINGSREGTE

Gebeurtenisse gedurende die afgelope jaar dui daarop dat die bou van enige munisipale kragentrale in die toekoms uiters onwaarskynlik sal wees en dat EVKOM uiteindelik die enigste owerheid in die land sal wees wat elektrisiteit sal opwek. Dit sal in ooreenstemming wees met die aanbevelings van die Borckenhagen-kommissie, die verklarings van die verantwoordelike Kabinetministers en die toespraak van die Voorsitter van EVKOM by die Konvensie wat gedurende Mei 1963 te Margate gehou is. Al hierdie owerhede is ook die mening toegedaan dat die reg om elektrisiteit aan verbruikers in sy gebied te verskaf, sover doenlik aan die plaaslike owerheid oorgelaat behoort te word.

Die Uitvoerende Raad is van mening dat dit slegs realisties sal wees om die situasie te aanvaar soos hy is en om sy toekomstige poging daarop toe te spits om te verseker dat enige voorgestelde wysiging van die Elektrisiteitswet, EVKOM se toekomstige tariewe en die regte van Munisipaliteite om elektrisiteit by kleinmaat aan sy verbruikers te verkoop, so voordelig as moontlik is. Die Vereniging handhaf sy skakeling met die Verenigde Munisipale Bestuur in hierdie verband.

R. W. BARTON,
Sameroeper.

ANNUAL REPORT OF THE RECOMMENDATIONS COMMITTEE FOR NEW ELECTRICAL COMMODITIES

Two meetings were held during the year and twenty-three new commodities were considered. Members were advised of all recommendations through the medium of the news bulletins.

Messrs. A. A. Middlecote and J. V. Grant took the place of Messrs. F. J. Prins and N. W. W. Bennett as representatives of the S.A. Bureau of Standards on the Committee, Mr. Grant being the person responsible for the Wiring Regulations Committee as taken over by the Bureau.

Consideration is being given to the streamlining of the procedures and functions of the Recommendation Committee aided by more direct involvement with the Bureau.

The invaluable assistance of the representatives of the various bodies who serve on the Committee is acknowledged with appreciation.

R. W. BARTON,
Convenor.

REPORT OF THE RIGHTS OF SUPPLY SUB-COMMITTEE

Events during the past year indicate that the construction of any municipal generating station in the future is extremely unlikely and that ESCOM will eventually become the sole generation authority in the Republic. This would be in accordance with the recommendations of the Borckenhagen Commission, the statements of the responsible Ministers of State and the address given by the Chairman of ESCOM to the Convention held in Margate in May, 1963. All of these authorities also considered that as far as possible the right to distribute electricity to consumers in their areas should be left to the local authorities.

The executive is of the opinion that it would be realistic to accept this situation and to concentrate endeavours towards ensuring that any contemplated alterations to the Electricity Act, the future tariffs of ESCOM, and the rights of municipalities in retailing to their citizens, are as advantageous as possible. The association is maintaining liaison with the United Municipal Executive in this regard.

R. W. BARTON,
Convenor.

VERSLAG OOR DIE WÊRELDKONFERENSIE INSAKE ENERGIE

Die jaarvergadering van die Suid-Afrikaanse Nasionale Komitee van die Wêreldkonferensie insake Energie is op 12 Februarie 1970 in die EVKOM-sentrum, Johannesburg onder voorsitterskap van Dr. R. L. Straszacker gehou. Onder die talryke sake van belang wat behandel is, is die volgende:

1. Opname van Energiebronne:

Die Komitee was van mening dat daar 'n dringende behoefte bestaan vir 'n geko-ördineerde benadering tot die daarstelling van 'n beleid insake energie vir Suid-Afrika. 'n Noodsaaklike voorvereiste hiervoor is 'n opname van energiebronne en stappe in hierdie rigting word reeds gedoen.

2. Vredesdigse Gebruik van Kern-energie:

Die Komitee het gedurende 1969 daarin geslaag om 'n film te leen met die titel „Project Gasbuggy” en wat handel oor die vredesdigse gebruik van kern-plofstowwe. Hierdie film is aan verskillende gehore van wetenskaplikes en ingenieurs vertoon en het aansienlike belangstelling gaande gemaak. Daar word verneem dat die S.A. Nasionale Komitee insake Groot Damme belang stel in die aanwending van hierdie metode in verband met uitgrawings en grondwerke.

3. Verkoop van Notule:

Die notule van die Sewende Voltallige Vergadering van die Wêreldkonferensie insake Energie, wat gedurende Augustus 1968 in Moskou gehou is, is nou beskikbaar in negentien gebinde volumes teen 80 V.S.A.-dollars per stel, plus posgeld. Tweehonderd-drie-en-sewentig referate van sewe-en-dertig lande en vier internasionale organisasies is daarby ingesluit. Die referate handel oor brandstof- en energiebronne en die probleme verbonde aan die doeltreffende gebruik daarvan; die energie-balans; termiese, water- en atoomkragentrales; nuwe bronne en metodes van die opwekking van elektrisiteit, en tegniese en ekonomiese probleme van vervoer en gebruik van energie. 'n Afskrif van die notule is in die besit van die Elektrisiteitsvoorsieningskommissie in Johannesburg en kan met die vriendelike toestemming van die Kommissie deur lede van die V.M.E.O. geraadpleeg word.

VERGADERING VAN DIE INTERNASIONALE UITVOERENDE RAAD, 1969

Hierdie vergadering is in Junie 1969 in Ankara, Turkye, gehou. Die S.A. Nasionale Komitee is verteenwoordig deur die Voorsitter, Dr. R. L. Straszacker, en die Ere-sekretaris, Mnr. H. J. de Villiers. Die Voorsitter rapporteer dat die vernaamste waarde van die vergadering geleë is in die veelvuldige informele same-sprekinge wat ander afgevaardigdes gevoer is, wat 'n

REPORT ON WORLD ENERGY CONFERENCE

The annual meeting of the South African National Committee of the World Energy Conference was held at Escom Centre, Johannesburg, on the 12th February, 1970, under the chairmanship of Dr. R. L. Straszacker. The following were among the many items of interest dealt with:

1.—Survey of Energy Resources:

The Committee felt that there was an urgent need for a co-ordinated approach to the forming of an energy policy for South Africa. A first essential towards this would be a survey of energy resources and steps are being taken in this direction.

2.—Peaceful use of Nuclear Energy:

During 1969, the Committee obtained on loan a film entitled “Project Gasbuggy” dealing with the peaceful uses of nuclear explosives. This was shown to several audiences of scientists and engineers and aroused considerable interest. It is understood that the S.A. National Committee on large Dams is interested regarding application of the method to excavations and earthworks.

3.—Sale of Transactions:

The Transactions of the seventh plenary meeting of the World Energy Conference held in Moscow during August 1968 are available in nineteen bound volumes at 80 U.S. dollars per set plus postage. Two hundred and seventy-three papers from thirty-seven countries and four international organisations are included, dealing with fuel and energy resources and problems of their efficient utilization; energy balance; thermal, hydro and atomic stations; new sources and methods of producing electricity; and technical and economic problems of transport and utilization of energy. A copy of the Transactions is kept by the Electricity Supply Commission in Johannesburg. A.M. E.U. members may peruse this by courtesy of the Commission.

MEETING OF THE INTERNATIONAL EXECUTIVE COUNCIL, 1969

This meeting was held in June, 1969 in Ankara, Turkey.

The S.A. National Committee was represented by the Chairman, Dr. R. L. Straszacker and the Honorary Secretary, Mr. H. J. de Villiers. The Chairman reported that in his opinion the main value of the meeting lay in the many informal talks held with

waardevolle wisseling van inligting omtrent wat in die verskillende lande aan die gang is, tot gevolg gehad het. Hy noem die volgende voorbeelde: Volgens die Japane afgevaardigde is die Japanners besig om in Afrika te soek na uraan-neerslae wat hulle kan ontgin en aan 'n verrykingsinstallasie wat hulle in Japan wil oprig, kan verskaf. Die doel hiervan is om hulle onafhanklik te maak van Noord-Amerikaanse uraan. In verband met die volgende Konferensie, wat in 1971 in Boekarest gehou sal word, was die Roemeense afgevaardigdes gretig om die vergadering in hul land te laat plaasvind, dog hulle kon nie sê of Suid-Afrika uitgenooi sal word nie, aangesien dit 'n politieke besluit is wat deur die Regering geneem word en nie deur die Gasheer Komitee nie. Die Verenigde State se afgevaardigde het 'n beskrywing gegee van 'n steenkoolbrandende kragentrale wat tans daar gebou word en wat vier stalle van 800 megawatt elk sal hê. Die steenkool sal voorsien word vanaf 'n myn 350 myl daarvandaan en sal vervoer word deur bloktreine wat uit trokke van 120 ton sal bestaan. In die Verenigde State doen die nutsmaatskappye hul eie navorsing in verband met atoomkragentrales, wat die enigste oplossing vir die toekoms blyk te wees. In Ghana word vier hidro-stelle van 128 megawatt elk, wat uit Japan afkomstig is, tans by die Volta-sentrale geïnstalleer. In Swede word daar gebou aan 'n kragentrale met twee stalle van 800 megawatt elk. 'n Hele aantal lande stel belang in die oprigting van installasies vir die verryking van uraan, aangesien die verrykte produk ekonomiese voordele bo die natuurlike produk inhou. Die vergadering is afgesluit met 'n bespreking van die kragposisie in Turkye. Die verslag wat deur daardie land ingedien is, was baie goed voorberei en het 'n wetenskaplike vraagvoorspelling tot by die jaar 2000 ingesluit. Alhoewel Turkye oordie algemeen nog agterlik is, is dit besig om vinnig te ontwikkel. Die Suid-Afrikaanse afgevaardigdes is baie vriendlik by die vergadering ontvang en daar was geen tekens van politieke verskille nie. Die notule is vir raadpleging beskikbaar en handel hoofsaaklik oor die administratiewe sake van die Wêreldkongres insake Energie.

Ad hoc-komitees:

Daar is twee ad hoc-komitees aangestel—die een om die probleem van uitlaatgasse en lugbesoedeling deur kragopwekkingsinstallasies, en die ander een om die probleem van die grootskaalse vervoer van hitte oor lang afstande, te bestudeer.

VERGADERING VAN DIE INTERNASIONALE UITVOERENDE RAAD, 1970

Hierdie vergadering word vanaf 9 tot 12 Mei in Rio de Janeiro, Brasilië, gehou. Dr. R. L. Straszacker en Mnr. H. J. de Villiers sal die S.A. Nasionale komitee verteenwoordig.

other delegates, resulting in a valuable interchange of information on what was happening in the various countries. For example:— According to their delegate the Japanese were searching in Africa for uranium deposits which they could mine and supply to an enrichment plant which they intended to construct in Japan. This was to make them independent of North American uranium. With regard to the next Conference to be held in Bucharest in 1971, the Rumanian delegate was anxious to have the meeting in their country but could not say whether South Africa would be invited, as this was always a political decision which was made by the Government and not the host Committee. The delegate from the United States described a coal-fired power station at present under construction there having four 800 megawatt sets. Coal was to be supplied from a mine 350 miles away by block trains each one mile long and comprising 120-ton trucks. In the U.S. the electric utility companies are doing their own research for atomic stations which seems to be the only way in the future. In Ghana four 128 megawatt hydro sets from Japan are being installed at the Volta Station. In Sweden a power station with two 800 megawatt sets is under construction. A number of countries are interested in setting up plants for enriching uranium, since the enriched product has an economic advantage over the natural product. The meeting ended with a discussion on the power position in Turkey. The report produced by this country was very well done and included scientific load forecasting up to the year 2000. Turkey, although generally backward, is developing rapidly. The South African delegates were very well received at the meeting, no politics at all being evident. The minutes are available for perusal, these being concerned mainly with administrative matters of the World Energy Conference.

Ad hoc Committees:

Two ad hoc committees have been appointed, one to study the problem of exhausts and pollution from energy production plants, and the other the problem of large-scale transportation of heat over long distances.

MEETING OF THE INTERNATIONAL EXECUTIVE COUNCIL 1970

This meeting will be held in Rio de Janeiro, Brazil, from the 9th to the 12th May, 1970. Dr. R. L. Straszacker and Mr. H. J. de Villiers will represent the S.A. National Committee.

Agste Voltallige Vergadering — 1971 :

Hierdie vergadering word gedurende Junie 1971 in Boekarest gehou. Die algemene tema daarvan sal wees: „Die bevordering van die gebruik van energie, met spesiale verwysing na komplekse gebruike”, wat weer aan 'n groot aantal spesialiste die gebruiklike geleentheid sal bied om 'n oorsigtelike beeld te gee en te kry van die jongste inligting omtrent die mees onlangse vordering met betrekking tot die bevordering van die gebruik van energie oor die algemeen en om by hierdie geleentheid spesiale aandag te verleen aan bereiking van hierdie doel deur middel van komplekse produksie- en verbruiksmetodes.

Daar is 'n maksimum van vier referate aan die S.A. Nasionale Komitee toegesê, waarvan een deur die Atoomkragraad en 'n tweede deur die Elektrisiteitsvoorsieningskommissie voorberei word. Die Komitee probeer tans om nog twee referate te verkry. Daar is egter in hierdie stadium nog geen waarborg dat ons afvaardiging visums sal kan bekom om die vergadering in Boekarest by te woon nie.

Jaarverslag 1968:

Die Jaarverslag van die Wêreldkongres insake Energie vir 1968 is beskikbaar vir diegene wat daarin belangstel.

Verhoging van Ledegelde:

Die ledegelde wat tans deur die S.A. Nasionale Komitee aan die W.K.E. betaalbaar is, beloop £133 (R229.48). Dit sal waarskynlik in die nuwe jaar na £569 verhoog word, aangesien die sekretariele uitgawes wat voorheen deur die Komitee van die Verenigde Koninkryk gedra is, nou oor al die lede versprei gaan word. Daar moet dus kennis geneem word van die feit dat, alhoewel die jaargeld deur die V.M.E.O. aan die S.A. Nasionale Komitee betaalbaar, hierdie jaar nog R40.00 sal bly, dit daarna noodwendig verhoog sal moet word.

R. W. BARTON,
Verteenwoordiger.

VERSLAG OOR DIE 1969-KONGRES VAN DIE SUID-AFRIKAANSE NASIONALE KOMITEE INSAKE VERLIGTING.

Die sestiende Algemene Jaarvergadering en Kongres van die Suid-Afrikaanse Nasionale Komitee insake Verligting is vanaf 11 tot 13 Junie 1969 te Milnerpark, Johannesburg, gehou.

Eenhonderd-en-agt persone het die verrigtinge bygewoon, waaronder vyf-en-veertig afgevaardigdes van plaaslike besture, sowel as verteenwoordigers van die W.N.N.R., die S.A.B.S., die S.A.I.E.I., die S.A.S.

Eighth Plenary Meeting—1971 :

This meeting will be held in Bucharest in June, 1971. The general theme will be:—“Improving the utilisation of energy, with special reference to complex uses,” which offers a large number of specialists, the customary opportunity of reviewing the latest information concerning the most recent progress in improving the utilisation of energy in general while devoting special attention on this occasion to the achievement of this objective by complex methods of production and consumption.

The S.A. National Committee has been allocated a maximum of four papers, one of which is being prepared by the Atomic Energy Board and a second by the Electricity Supply Commission. The Committee is attempting to obtain a further two papers. There is however, at this stage no guarantee that our delegation will be granted visas to attend the meeting in Bucharest.

Annual Report 1968 :

The annual report of the World Energy Conference for 1968 is available to those interested.

Increase in Subscription :

The annual subscription at present payable to the W.E.C. by the S.A. National Committee amounts to £133 (R229.48). This is likely to be increased to £569 in the coming year, since secretarial expenses previously met by the United Kingdom Committee are in future to be spread over the entire membership. Notice is therefore given that while the annual subscription due by the A.M.E.U. to the S.A. National Committee will remain unchanged at R40.00 for the current year, an increase thereafter is unavoidable.

R. W. BARTON,
Representative.

REPORT ON SOUTH AFRICAN NATIONAL COMMITTEE ON ILLUMINATION CONGRESS 1969

The sixteenth Annual General Meeting and Congress of the South African National Committee on Illumination was held at Milner Park, Johannesburg from the 11th—13th June, 1969.

One hundred and eight persons attended. These included forty five delegates from local authorities as well as representatives from the C.S.I.R., S.A.B.S., S.A.I.E.E., S.A.R. & H., Department of Labour, S.A.

en H., die Departement Arbeid, die S.A. Weermag, die Universiteit van Natal, die Universiteit van Stellenbosch, die Kamer van Mynwese, die Automobiel-assosiasie, die S.A. Padveiligheidsraad, die Witwatersrand Tegniese Kollege en vervaardigers van verligtingstoerusting.

Tydens die verkiesing van die Uitvoerende Komitee vir die volgende jaar is twee lede van die V.M.E.O. in die persone van Mnr. E. de C. Pretorius en R. M. O. Simpson, as lede aangewys.

Presidentsrede :

In sy Presidentsrede het Mnr. S. J. Richards nadruk geleë op die feit dat daar 'n geweldige groot hoeveelheid tegniese inligting omtrent verligting beskikbaar is wat nie na behore toegepas word in die oplossing van alledaagse probleme nie. Dit skyn asof die oplossing in die eerste plek geleë is in opvoeding en opleidingsproesse teneinde 'n meer ontvanklike benadering tot die aanvaarding en die gebruik van tegniese inligting in die daaglikse werkverrigting te kweek, en in die tweede plek in die ontwikkeling van veel nouer voeling, veral by wyse van herhaalde persoonlike kontak tussen organisasies en persone wat by voorligtingswerk betrokke is en diene wat die inligting behoort te gebruik.

Mnr. Richards gaan voort deur te sê dat feitlik al die navorsing wat op die gebied van verligting in die land gedoen word, deur lede van die S.A.N.K.V. uitgevoer word. Gemeet teen die mannekrag en fondse wat betrokke is, is die navorsingspoging betreklik klein, dog in baie gevalle het die hoë standaard van Suid-Afrikaanse navorsing groot lof van navorsers en belanghebbende partye in oorsese lande ingeoos.

Gedurende die afgelope jaar het lede van die S.A.N.K.V. 'n aktiewe rol gespeel in die internasionale komitees van die I.E.K. wat met die volgende sake handel :—

Fotometrie (E.1.2.), Kolorometrie (E.1.3.1.), Kleurweergawe (E.1.3.2.), Visuele prestasie (E.1.4.2.), Bronne van ultra-violet en infra-rooi-uitstraling (E.2.1.2.), Eienskappe van verligtingsmateriale (E.2.2.), Binnenshuis verligtingmetodes (E.3.1.2.), Dagligaarbootsing (E.3.2.), Openbare verligting (E.3.3.1.), Motorhoofligte en seinligte (E.3.3.5.), Buitenshuis verligtingmetodes (E.3.3.6.).

Referate :

Daar is nege referate gelewer wat in verband staan met die kongresstema, nl. „Die Verligting van Strate en Hoofpaie.”

1. „Verligtingsneigings en -bronne vir verkeersweë”, deur Prof. J. B. de Boer, van die Universiteit van Eindhoven.

In hierdie referaat is gesaghebbende en aktuele inligting verskaf, veral in verband met hoofpaie en

Army, University of Natal, University of Stellenbosch, Institute of S.A. Architects, the Chamber of Mines, the Automobile Association, The S.A. Road Safety Council, the Witwatersrand Technical College and manufacturers of lighting equipment.

At the election of the Executive Committee for the ensuing year two A.M.E.U. Members were appointed in the persons of Messrs. E. de C. Pretorius and R.M.O. Simpson.

Presidential Address :

In his Presidential Address Mr. S. J. Richards stressed that a vast amount of technological information on lighting is already available which is not being used to the extent it should in solving day-to-day problems. The solution appears to be firstly in education and training processes so as to inculcate a more receptive attitude towards the acceptance and use of technical information in daily work, and secondly in contact, between organisations and persons engaged in informative work and those who should use the information.

Mr. Richards went on to say that practically all the research that is being conducted in South Africa in the field of lighting and illumination is being carried out by members of S.A.N.C.I. In terms of manpower and funds the research effort is relatively small but in many instances research workers and interested parties in overseas countries have praised the high standard of South African research.

During the past year S.A.N.C.I. members have been active on the international C.I.E. Committees dealing with the following subjects :

Photometry (E.1.2.), Colorimetry (E.1.3.1.), Colour rendering (E.1.3.2.), Visual Performance (E.1.4.2.), Sources of ultra-violet and infra-red radiation (E.2.1.2.), Characteristics of lighting materials (E.2.2.), Daylighting (E.3.2.), Public lighting (E.3.3.1.), Automobile headlights and signal lights (E.3.3.5.), Exterior lighting practice (E.3.3.6.).

Papers :

Nine papers were presented, the theme of the Congress being “Street and highway lighting.”

1. “Trends in lighting and light sources for traffic roads” by Professor J. B. de Boer, of the University of Eindhoven.

Authoritative and up-to the minute information was presented, particularly with regard to motorways

stadstrate wat swaar verkeer dra. Nadat daar stappe gedoen is om skittering en eenvormigheid uit te skakel, is dit slegs luminasie wat bepaal of 'n mens struikelblokke kan raak sien. Die vereiste minimum is twee kandelas per vierkante meter. Verligting by wye van hoë pale verminder skittering, dog verskaf nie optiese leiding nie—daar moet van ander metodes gebruik gemaak word, soos byvoorbeeld kettingverligting vir plattelandse klawerblaarkruisings. Verligting by wye van hoë pale is by uitnemendheid geskik vir groot, komplekse wisselaars, waarvan daar een met veertien ewewydige verkeerslane vertoon is. Laevlak-balustradeverligting is slegs vir 'n maksimum van twee verkeerslane geskik.

2. „Suid-Afrikaanse-vervaardigde Toerusting vir Buitenshuise Verligting,” deur Mnr. J. Grundy en A. von Wyngaard.

Gedurende 1967 is die outeurs van hierdie referaat deur 'n sekere onderneming met die taak belas om ondersoek in te stel na toerusting vir buitenshuise verligting wat in die vorige jare in die Republiek vervaardig is en om dan die nodige fasiliteite vir die ontwerp, ontwikkeling en gehaltebeheer van sodanige toerusting te verskaf. Die outeurs het 'n uiteensetting gegee van sommige van die leemtes wat hulle teëgekóm het en het 'n beskrywing gegee van die stappe wat hulle gedoen het om geskikte reëlings te tref vir die vervaardiging van bevredigende verligtingstoerusting vir gebruik in die Republiek en ook vir uitvoer.

Daar is 'n kort oorsig gegee van huidige en toekomstige ligbronne en van sommige van die grondstowwe, bv. yster, staal, aluminium, glas en plastiekstowwe. Daar is oorweging verleen aan die vereiste verspreiding van lig, optiese rangskikkings, en die ontwerp en konstruksie van toebehore vir buitenshuise verligting. Daar is tot die gevolgtrekking gekóm dat dit wenslik is dat sulke verligtingsapparate plaaslik vervaardig behoort te word om aan Suid-Afrikaanse behoeftes te voldoen.

3. „Die ontwerp van die Verligting van Stedelike Motorpaaie”, deur Mnr. M. J. F. Dempster.

Die outeur het sy onderwerp op 'n praktiese wyse benader en het aandag geskenk aan standaardse en gebruikskodes, luminasie en verligting, die beoordeling van die pad-oppervlakte, die beperkinge van silhoeët-visie, skittering, verligtingsmetodes, insluitende borswering-, intermediere en hoë-mas-verligting en aksiale swaartelyn-rangskikkings.

In verband met ontwerp, is daar aan ligbronne, monterhoogtes, rangskikking en spasiering, pad-oppervlakte, die gehalte van verligting en die ekonomiese aspekte, aandag geskenk. Ten slotte het die outeur daarop gewys dat die betreklik beperkte ontdekking van die verligting van motorpaaie, selfs in oerse lande, sowel as die verskeidenheid van die oplossings wat aan die hand gedoen is, daarop dui

and urban roads carrying high density traffic. Having taken care of glare and uniformity, luminance alone determines whether one can see obstacles. The minimum required is two candelas per square metre. High mast lighting limits glare but does not provide optical guidance—other means should be provided, such as catenary lighting for rural cloverleaf crossings. High mast lighting is eminently suitable for large complex interchanges, one example shown having fourteen parallel lanes. Low level balustrade lighting is only suitable for a maximum of two traffic lanes.

2. “Exterior lighting equipment of South African manufacture” by Messrs. J. Grundy and A. von Wyngaard.

In 1967 the authors were commissioned by a certain undertaking to investigate exterior lighting equipment manufactured in previous years in the Republic and then to provide the necessary design, development, and quality control facilities of such equipment. The authors outlined some of the deficiencies they encountered and described the steps taken to establish suitable arrangements for producing satisfactory lighting equipment for use in the Republic and also for export.

Present and immediate future light sources and some of the raw materials e.g. iron, steel, aluminium, glass and plastics were briefly reviewed. The required light distribution, optical arrays, design and construction of exterior fittings were considered. The conclusions drew attention to the desirability for such lighting equipment to be made locally for South African conditions.

3. “The design of urban motorway lighting” by Mr. M. J. F. Dempster.

The author dealt in a practical manner with his subject, covering standards and codes of practice, luminance and illumination, the assessment of the road surface, the limitations of silhouette vision, glare, methods of lighting, including parapet, intermediate and high mast lighting and axial median arrangements.

In dealing with design, light sources, mounting height, arrangement and spacing, road surfaces, quality of lighting and economics were dealt with. The author concluded that the relatively limited experience of motorway lighting, even overseas, and the variety of solutions adopted shows that there is still a great

dat daar nog baie is om te leer en dat die ideale oplossing of ontwerp nog nie bestaan nie.

4. „Die Verligting van die Voorstede” deur Mr. R. S. Yates.

Voorstedelike strate maak die oorgrote meederheid van die strate in enige dorp uit. Van baie van die kleiner dorpieke kan gesê word dat, met die uitsondering van een of twee deurstrate, die hele dorp se strate as voorstedelik geklassifiseer kan word. Met hierdie stelling as uitgangspunt, bou die outeur voort op die tema dat daar veel meer aandag aan die verligting van hierdie gebiede gewy behoort te word as wat tot dusver die geval was. Daar is 'n beskrywing gegee van die verskillende konvensionele metodes, soos bv. tungstenlampe van 200 watt of twee fluoresserende lampe van 20 watt elk in ope armature, sowel as van sekere nie-konvensionele idees. Talle statistieke en tabelle is gebruik om die effektiwiteit of andersins, sowel as die ekonomiese aspekte, van die verskillende skemas te illustreer. Die ekonomiese aspekte van instandhoudingsprosedures is ook in besonderhede behandel, terwyl daar ook aandag gegee is aan sake soos die estetiese, vandalisme en die verligting van Bantodorp. Daar is tot die slotsom gegaar dat daar 'n behoefte bestaan aan verdere navorsing na meer geskikte grootste van ligbronne met hoë doeltreffendheid en goeie kleurweergawe; armature met goeie optiese beheer wat die ligstroom na die gebiede sal stuur waar dit benodig word en nie na gebiede waar dit 'n oorlas vir die inwoners sal wees nie, sowel as die doeltreffende gebruik van al hierdie dinge. In hierdie veld lê daar die grootste potensiele verbruik van lig en ligverskaffingstoerusting.

5. „Hoë-mas-verligting” deur Mr. N. P. Gripper.

By die konvensionele tipe straatverligtingsinstallasie word pale van tussen 8 en 12 meter (25 tot 40 voet) hoog gebruik. Daar word nou in toenemende mate gebruik gemaak van stelsels met hoë maste van 20 tot 40 meter (50 tot 120 voet) hoog. Die belangrikste voordele hiervan is 'n beter estetiese voorkoms, geen verwarring van ligbronne op verskillende vlakke nie, verminderde skittering, eenvoudiger beplanning en installasie, minder pale wat as struikelblokke vir die verkeer kan dien en die vereenvoudiging van die instandhouding weg van die vloei van die verkeer af. Die outeur behandel voorts sake soos die ontwerp en die fotometriese eienskappe van armature en lampe, sowel as die beplanning van die skema. Daar word melding gemaak van verskillende toepassings van die skema, soos by komplekse pad-aansluitings en sakesentrums. Die stelsel is nou vir selfs die kleinste plaaslike bestuur of gebruiker ekonomies aanvaarbaar en nuwe ontwikkelinge, waarby daar van nuwe ligbronne en nuwe armature gebruik gemaak word, kan verwag word.

deal to be learnt and that no ideal solutions or designs exist.

4. “Lighting the suburbs” by Mr. R. S. Yates.

Suburban streets constitute the vast majority of streets in any town. For many of the smaller towns it could be said that excepting for one or two through streets, all the rest could be classified as suburban. From this premise the author develops the theme that far more attention than is usual should be paid to lighting in these areas. The various conventional methods, e.g. 200 watt tungsten lamps, or 2 x 20 watt fluorescent lamps in open luminaries, are described as well as some unconventional ideas. Numerous statistics and tables are used to illustrate the effectiveness or otherwise, and the economics, of various schemes. The economics of maintenance procedures is dealt with in some detail. Aesthetics, vandalism and the lighting of Bantu townships are also considered. The conclusion is reached that further research is needed into more suitable sizes of light sources of high efficiency and good colour rendering; luminaires with good optical control to direct the flux where it is required and not into areas which will create a nuisance to residents; and into the efficient use of these. This field is by far the greatest potential user of light and lighting equipment.

5. “High mast lighting” by Mr. N. P. Gripper.

The conventional type of street lighting installation uses columns of between 8 and 12 metres (25 to 40 feet) in height. High mast systems are becoming common with a height of 20 to 40 metres (60 to 120 feet), the most important advantages being improved aesthetic appearance, no confusion of light sources at various levels, reduced glare, simplified planning and installation, fewer poles as traffic hazards, and simplified maintenance away from traffic flow. The author deals with lantern design and photometric properties, lamps, and planning the scheme. Various applications are mentioned, such as complex road junctions and city centres. The system has been made economically acceptable to even the smallest authority or user and continuing development using new light sources and new lanterns is expected.

**6. „Hoë-mas-verligtingstrukture en dienstoerusting”
deur mnr. A. E. Grutzmacher.**

Daar is 'n beskrywing gegee van die strukture wat vir hoë-mas-verligting gebruik word, vanaf die vroegste traliewerktorings tot by die moderne, stroombelynde maste van plaatstaal, gewoonlik in 'n spits toelopende seskantige vorm. Daar is aandag geskenk aan die probleem van windbelasting, sowel as aan metodes van die vashegting van lig-armature en elektriese toerusting, die meganiese aspekte van apparate vir die optrek en neerlaat van toerusting, insluitende die gebruik van katrolle, behandeling teen verwerping, die verf van pale en die kwessie van fondamente en op rigting.

7. „Straat-meublement” deur mnr. Peter Whitworth.

Die voorkoms van ons strate word sterk beïnvloed deur die groot verskeidenheid voorwerpe dat daarin opperig word en wat bekend staan as straat-meublement, soos byvoorbeeld pale, verkeerstekens, buskuilings, kiosks, posbusse en 'n groot hoeveelheid ander strukture. Daar is klem gelê op die noodsaaklikheid van versigtige beplanning, nie alleen van die voorwerpe as sodanig nie, maar ook van die keuse en die plasing daarvan. Dit is noodsaaklik om 'n modulêre stelsel daar te stel waaraan die vervaardigers van die verskillende strukture moet voldoen, sodat die hoogte van 'n vuilisblik sal aanpas by dié van 'n transformator-kiosk en die wydte van 'n buskuiling by dié van 'n telefoonkiosk. Op hierdie wyse kan verseker word dat alle items waaruit straat-meublement bestaan, bymekaar sal pas en mekaar sal aanvul.

8. „Verligte pad-tekens” deur mnr. M. Baylis.

Akriel-bedeekte padtekens met verligting van binne is veel beter as die ouer tipes met verligting van buite, nie alleen sower dié sigbaarheid betref nie, maar ook met betrekking tot hul selfskoonmakende eienskappe (bv. deur middel van reën). Daar word aan die daglig-tipe fluoressende buise voorkeur gegee vanweë hul langer lewensduur, doeltreffendheid en kleurweergawe. Besonderhede van ontwerp, konstruksie en montering is verskaf. Daar is bespreking gewy aan die spesifikasies en vereistes vir tekens in die Verenigde Koninkryk en die aanpassing daarvan by Suid-Afrikaanse toestande. Hierdie tekens is van besondere belang by die bou van lang afstande super-paaie, snelweë, motor-paaie ens.

9. „Enkele menings, indrukke en ondervindinge met betrekking tot sierverligting by 'n vakansieoord” deur mnr. R. M. O. Simpson.

Daar is 'n oorsig gegee van die oorsprong en die ontwikkeling van feesverligting vanaf die vroegste tye toe daar van olielampe, papierlanterns en vreugdevure gebruik gemaak is, tot vandag, waar verligte Kersbome, geboue, oop ruimtes, strate en strande 'n alle-

**6. “High mast lighting structures and servicing gear”
by Mr. A. E. Grutzmacher.**

The development of the structures used for high mast lighting was described, from the early lattice towers to the modern streamlined sheet steel mast, usually in tapered hexagonal form. The problem of wind loading were dealt with. Methods of fixing the light fittings and electrical equipment, the mechanics of raising and lowering gear including the use of winches, anti-corrosion treatment and painting, foundations and erection were all described.

7. “Street furniture” by Mr. Peter Whitworth.

The appearance of our streets is greatly affected by the large number of diverse objects in them known as street furniture, that is poles, traffic signs, bus shelters, kiosks, pillar boxes and a host of others. The need for careful planning, both of the objects themselves and of their choice and siting is emphasized. A modular system to which the manufacturers of the different components could adhere is essential, so that the height of a dirt bin could be matched to that of a transformer kiosk and the width of a bus shelter to the width of a telephone box. Thus all items of street furniture would be seen to be complementary to each other.

8. “Illuminated road signs” by Mr. M. Baylis.

Acrylic faced road signs with internal illumination are superior to older types with external lighting, as regards both visibility and self-cleaning (rain-washing) properties.

Daylight fluorescent tubes are recommended for reasons of long life, efficiency and colour rendering. Details of design, construction and mounting are given. Specification and requirements of signs in the United Kingdom and their adaptation to South African conditions are discussed. These signs are particularly important in connection with the construction of large mileages of super roads, freeways, motorways etc.

9. “Some opinions, impressions and experiences with decorative lighting in a holiday resort” by Mr. R. M. O. Simpson.

The origins and development of festive lighting from the earliest times when oil lamps, paper lanterns and bonfires were used were traced up to the present time when illuminated Christmas trees, buildings, public spaces, streets and beaches are usual in most

daagse gesig in die meeste groot stede van die Weste is. Daar is baie probleme verbonde aan moderne feesverligting, nie alleen tegnies en esteties nie, maar ook geldelik en selfs polities. Daar is op hierdie aspekte uitgebrei en hulle is in verband gebring met die uitgebreide Kers- en strandverligtingsondernemings in die stad Durban. Daar is 'n beskrywing gegee van die vele ontwerp-, konstruksie- en instandhoudingsprobleme en van die metodes wat aangewend word om dit op te los.

10. „Lamp-spektrum en sigbaarheid by straatverligting” deur mnr. H. D. Einhorn.

Weens die feit dat die outeur van hierdie referaat oorsese was, is dit deur mnr. D. H. Piekma voorgedra.

Die verhouding tussen die spektrale hoedanigheids van verskillende lampe en die gesigsmeeganisme onder padverligtingstoestande is ontleed en die uitslae is gegee van proefnemings in verband met wasigheid as gevolg van die uiteendrywing van lig in die oog. Daar is bespreking gewy aan die geldigheid van fotopiese ontwerpwaardes van lampe vir padverligtingsdoelindes. Die outeur het tot die slotsom geraak dat Waldram se stelling, naamlik „'n lumen is 'n lumen” vir die meeste praktiese doelindes onder heersende ekonomiese omstandighede geldig is, dog dat kennis van die komplekse aspekte van gesigsvermoë onder mesopiese omstandighede tot hulp kan wees om die maksimum voordeel uit straatverligting te trek en om die ekonomie daarvan te bevorder.

Forum :

'n Forum is onder leiding van mnr. D. H. Piekma gehou met die tema „Is straatverligting die moeite werd?”. Die paneel het bestaan uit Rdl. Caldwell van Johannesburg, Brig. C. C. von Keyserlinck van die Suid-Afrikaanse Polisie, mnr. E. L. Roelofse van die Automobiël-assoiasie en mnr. E. E. de Villiers, Elektrotrengiese Stadsingenieur van Bloemfontein.

'n Groot aantal persone het aan die forum deelgeneem en daar is veral klem gelê op die koste verbonde aan straatverligting, byvoorbeeld in Johannesburg waar dit R1.33 per kop van die bevolking en R6.90 per belastingsbetaler per jaar kos, asook op die talle voordele wat daaruit voortspruit, soos byvoorbeeld 'n vermindering van misdaad en minder padongelukke. Daar is ook melding gemaak van die probleme wat deur munisipale elektrotrengiese ingenieurs ondervind word om genoegsame fondse vir Straatverligting te bekom, soos byvoorbeeld plaaslike politieke oorweginge by sommige Raadslede en 'n gebrek aan simpatie by sommige Stadtesouriers.

Daar is eenpariglik tot die slotsom geraak dat staatverligting **wel** die moeite werd is.

Algemeen :

Die aandag van die Vereniging van Munisipale

population centres of the Western world. Many problems are involved in modern festive lighting, not only technical and aesthetic but also financial and political. These aspects are discussed and are related to the extensive Christmas and beach front illuminations in the City of Durban. The many problems of design, construction and maintenance and the methods of dealing with them were described.

10. “Lamp spectrums and road lighting visibility” by Dr. H. D. Einhorn.

In the absence of the author overseas this paper was presented by Mr. D. H. Piekma.

The relation between the spectral properties of different lamps and the vision mechanism under road lighting conditions was analysed and experimental results on haze due to scattering in the eye were presented. The validity of photopic lamp ratings for road lighting was discussed. The author came to the conclusion that Waldram's statement “a lumen is a lumen” is good enough for most practical purposes under present economic conditions, but an awareness of the complex aspects of vision under mesopic conditions may sometimes aid in optimising street lighting design and improving economy.

Forum :

A forum was conducted by Mr. D. H. Piekma on the theme “Streetlighting — is it worth it?”, the panel consisting of Councillor Caldwell of Johannesburg, Brigadier C. C. von Keyserlinck of the S.A. Police, Mr. E. L. Roelofse of the Automobile Association and Mr. E. E. de Villiers, City Electrical Engineer of Bloemfontein.

There were numerous participants in the discussion which highlighted the costs involved in street-lighting, e.g. in Johannesburg R1.33 per head of population or R6.90 per ratepayer per annum, and the numerous benefits resulting, such as reduced crime and fewer road accidents. Problems encountered by municipal electrical engineers in obtaining funds for streetlighting, much as local politics on the part of some councillors and lack of sympathy on the part of some treasurers, were mentioned.

The conclusion that “Streetlighting is worth it” was unanimous.

General :

Attention of the Association of Municipal Elec-

Elektrisiteitsondernemings van Suidelike Afrika word gevestig op die feit dat die Provinsiale Administrasie van Transvaal erkenning aan die S.A.N.K.V. verleen het, in dié mate dat goedkeuring aan plaaslike besture met 'n jaarlikse inkomste van meer as R2.000.000 verleen is om lede daarvan te word en die byeenkomste van die liggaam by te woon.

R. W. BARTON,
Verteenwoordiger.

JAARVERSLAG VAN DIE REGISTRASIERAAD VIR ELEKTROTEGNIËSE DRAADWERKERS

Twaalf vergaderings van die Raad is gedurende 1969 gehou en van die 878 aansoekom registrasie wat oorweeg is, is 873 toegestaan.

Die Raad het gedurende die jaar 1106 voorwaardelike sertifikate uitgereik of hernieu, soos vergeleke met 683 gedurende die vorige jaar.

Vier geskrewe eksamens is op 48 sentrums vir altesaam 1061 kandidate gereël, en die uitslae was soos volg:—

Slaag Deel AI en Deel AII	54	(41)
Slaag Deel A I dog druip Deel AII	94	(74)
Druip Deel AI dog slaag Deel AII	15	(25)
Druip Deel AI en Deel AII	214	(183)
Druip Deel AI	115	(82)
Slaag Deel AI	119	(78)
Druip AII	172	(113)
Slaag Deel AII	59	(39)
Afwesig	219	(142)
Totaal	1061	

(Statistiek vir 1968 word in hakies aangegee).

Vir verskillende kandidate wat, as gevolg van taal- of ander probleme, nie die geskrewe eksamens kon aflê of slaag nie, is daar 'n mondelike eksamen gereël.

Ag-en-sewentig praktiese eksamens is gedurende die jaar in die agt vernaamste sentrums gehou en van die 1322 kandidate wat ingeskryf het, het 273 geslaag, 875 het gedruip en 174 was afwesig. Die totale aantal kandidate wat die vorige jaar geslaag het, was 117.

Van die 875 kandidate wat gedruip het, het 'n aantal in sekere toetse geslaag dog die eksamens as 'n geheel gedruip omdat hulle nie die voorgeskrewe 60%-slaagpunte vir elke afsonderlike taak behaal het nie.

In vergelyking met die 219 van die vorige jaar, is 367 registrasiesertifikate gedurende 1969 uitgereik, wat die totale aantal wat sedert die inwerkingtreding bring.

Uit diestatistiek wat in hierdie verslag vervat is, is

tricity Undertakings of South African members is drawn to the fact that the Transvaal Provincial Administration has recognised S.A.N.C.I. to the extent of approving membership and attendance at conventions by local authorities with an annual revenue exceeding R2.000.000.

R. W. BARTON,
Representative.

ANNUAL REPORT OF THE ELECTRICAL WIREMEN'S REGISTRATION BOARD.

Twelve meetings of the Board were convened during 1969 and of the 878 applications for registration which were considered, 873 were accepted.

Compared with 683 in the previous year, the Board granted or renewed 1106 provisional certificates during the year.

Four written examinations were arranged at 48 centres to accommodate a total of 1061 candidates with the following results:—

Passed Part AI and Part AII	54	(41)
Passed Part AI but failed Part AII	94	(74)
Failed Part AI but passed Part AII	15	(25)
Failed Part AI and Part AII	214	(183)
Failed Part AI	115	(82)
Passed Part AI	119	(78)
Failed Part AII	172	(113)
Passed Part AII	59	(39)
Absent	219	(142)
Total	1061	

(1968 Statistics in parenthesis).

Oral examinations were arranged for several candidates who, due to language or other disabilities, were unable to undergo or pass the written examination.

Seventy-eight practical examinations were held at the eight principal centres during the year and of the 1322 candidates who entered, 273 passed, 875 failed and 174 were absent. During the previous year the number of passes totalled 117.

Of the 875 candidates who failed, a number passed certain tests but failed the examination as a whole due to not obtaining the required 60% pass mark for each individual task.

In comparison with 219 during the previous year, 367 registration certificates were issued during 1969, thus bringing the total number issued since 1940 when the Act first came into operation to 10392.

From the statistics quoted in this report, it will

dit duidelik dat daar 'n merkbare toename in die aantal suksesvolle kandidate teenoor dié van die vorige jaar was.

Die Advieskomitees van Durban, Bloemfontein en Kaapstad het gedurende die jaar gereëld vergader en was vir die Raad tot groot hulp.

Ten slotte wil ek die Raad bedank vir die inligting wat in hierdie verslag vervat is en vir sy toestemming om dit aan die Konvensie voor te lê.

C. LOMBARD.

Verteenwoordiger.

SUID-AFRIKAANSE BURO VIR STANDAARDE

Die laaste van die sestigerjare was 'n jaar van besondere betekenis vir die Buro. Nadat dit vir byna 'n kwart-eeu in tydelike geboue gehuiswas, het die organisasie begin om in sy eie nuwe gebou, wat spesiaal vir sy werk ontwerp is, in te trek en ons sien saam met die Buro uit na die dag waarop hierdie verskuiving afgehandel sal wees.

Ons wens die bestuur van die S.A.B.S. en sy personeel geluk met die uitstekende wyse waarop hulle hul mondigwording kon vier, alhoewel die oorhandiging van die sleutel so 'n paar jaar vertraag was!

Nog 'n belangrike gebeurtenis in 1969, wat van besondere belang vir munisipaliteite is, was die aanvaarding deur die Buro van die verantwoordelikheid vir die Standaard-regulasies vir die bedrading van persele.

Die veelvuldige nuwe begrippe in verband met die bedrading van persele wat uit die gebruik van nuwe materiale voortspruit, vereis herwaarding, en die regulasies sal heel waarskynlik gedurende die volgende paar jaar 'n gedaanteverwisseling ondergaan. Die voorstel van die S.A.B.S. om die regulasies op 'n landswye basis te hanteer met behulp van streekskomitees wat opwerk na 'n hoofkomitee, word ten volle deur die Vereniging ondersteun.

Die kwessie van metrisering het in die jongste tyd sterk na vore getree en dit werp tans sy skaduwee oor die werksaamhede van al die verskillende kommoditeitskomitees. Daar moet ten volle van die geleentheid gebruik gemaak word om die spesifikasies, waar nodig, op datum te bring, dog daar moet terselfdertyd gewaak word teen die té liberale omskeping van gehalte-vereistes.

Baie van u verteenwoordigers op die kommoditeitskomitees het gedurende die afgelope jaar lang ure in vergaderings deurgebring, en baie van die ander sal gedurende 1970 baie besig wees. U vereniging is veel dank aan hierdie ingenieurs verskuldig vir die

be observed that there has been a marked increase in the number of passes when compared with those obtained during the previous year.

The Durban, Bloemfontein and Cape Town Advisory Committee have held meetings regularly during the past year and have been of considerable assistance to the Board.

In conclusion, I wish to thank the Board for providing the information included in this Report and for permission to submit it to the Convention.

C. LOMBARD,

Representative.

SOUTH AFRICAN BUREAU OF STANDARDS

The last year of the nineteesixties was of particular significance for the bureau. After being housed for nearly a quarter century in temporary premises, the organisation started moving into its own new buildings specially designed for the work and with the bureau we are looking forward to the day when the move will be complete.

We congratulate the S.A.B.S. management and staff on this excellent manner of celebrating their coming of age, although the handing over of the key was a few years late.

Another important event in 1969 with particular interests for Municipalities was the acceptance by the bureau of responsibility for the Standard Regulations for the Wiring of Premises.

Many new concepts on wiring resulting from the introduction of new materials require evaluation and the regulations will probably acquire a new book in a few year's time. The proposal of the S.A.B.S. to handle the wiring regulations on a country wide basis through regional committees pyramiding to a main committee is fully supported by the association.

The question of metrication is very much in the forefront at present and is casting its shadow over the work of all the commodity committees. The opportunity must be fully utilised to update the specifications where necessary but at the same time one must guard against a too liberal conversion of quality requirements.

Many representatives of your association on commodity committees had long sessions during the past year and many others are going to be very busy during 1970. Your association is much indebted to these

baie ure wat hulle vrywilliglik in die belang van die Vereniging gearbei het, temeer nog as die mannekragtekort en die ongeëwenaarde ontwikkelinge wat vandag aan die orde is, in gedagte gehou word.

Namens die Vereniging ook 'n woord van dank aan die Bestuur en die personeel van die S.A.B.S. vir hul vriendelike hulpvaardigheid en vir die harde werk wat hulle in die belang van vervaardigers en verbruikers dwarsdeur die land gelewer het.

G. C. THERON,
Ko-ordinerende Verteenwoordiger.

ADVIESKOMITEE INSAKE ELEKTRIESE BEVEILIGING

Twee vergaderings van hierdie Komitee is gedurende die jaar 1969 gehou, die laaste een in Oktober, net voordat die Direkteure van die S.A.B.S., Mnr. Middlecote, oorsee gegaan het vir 'n vergadering van die I.E.K., waartydens die kwessie van aardlek-relê's bespreek sou word.

Die hele onderwerp van veilige strome, indruisende uitklinking, installasies wat beskerm moet word, die verslapping van aardingsvereistes ensovoorts, is weer in oënskou geneem.

Die Komitee funksioneer op 'n breë grondslag, met 'n wye reeks van besprekings wat uitloop op aanbevelings aan die kommoditeitskomitees en veredere navorsingswerk deur die Buro.

G. C. THERON,
Verteenwoordiger.

KO-ORDINASIE VAN DIENSTE

Die Uitvoerende Raad het uitvoering gegee aan die besluit van die Konvensie te Umtali en het Mnr. Frantz, Simpson en Theron aangewys as lede van 'n sub-komitee om samespreking te voer met die afdeling telekommunikasie van die Poskantoor in verband met die ko-ordinasie van elektrisiteits- en telefoondienste in dorpsgebiede.

Twee vergaderings van die sub-komitee is gedurende die verslagjaar gehou, en daar is oor verskeie beginsels ooreengekom, waarvan die volgende die belangrikste is:

- (1) Dat die ko-ordinasie van diensgeriewe nie 'n las op die plaaslike bestuure moet wees nie, maar veeler van gemeenskaplike voordeel vir albei partye en vir die land as 'n geheel.
- (2) Dat die voorsiening van hierdie geriewe op 'n wederkerige basis moet geskied.
- (3) Dat die aanleg van kables en diensaansluit-

engineers for the many hours of work they have willingly contributed particularly in these days of staff shortages and unprecedented development.

Also a word of thanks to the Management and staff of the S.A.B.S. for all their friendly assistance and hard work in the interest of manufacturers and consumers throughout the country.

G. C. THERON,
Co-ordinating Representative.

ADVISORY COMMITTEE ON ELECTRICAL SAFETY

Two meetings of this committee were held during the year 1969, the last being in October before the director of the S.A.B.S., Mr. Middlecote, went overseas for an I.E.C. meeting at which earth leakage relays were to be discussed.

The whole subject of safe currents, spurious tripping, installations to be protected, relaxation of earthing requirements etc. was again reviewed.

The committee is broadly based with a wide range of discussions which culminate in recommendations to the commodity sub-committees and further research work by the bureau.

G. C. THERON,
Representative.

CO-ORDINATION OF SERVICES

The executive council implemented the resolution of the convention at Umtali by appointing Messrs. Frantz, Simpson and Theron as a sub-committee to carry on discussions with the department of telecommunications of the Post Office on the co-ordination of electricity and telephone services in townships.

Two meetings of the sub-committee took place during the year under review as a result of which certain principles were accepted, the most important being:—

- (1) That the co-ordination of service facilities should be no burden on the local authorities but of mutual advantage to both parties and the country as a whole.
- (2) That the provision of such facilities should be reciprocal.
- (3) That the layout of cables and service connec-

ingspunte deur die Poskantoor en Munisipaliteite op 'n streeksbasis en tot die grootste algemene voordeel bepaal sal word.

Daar word beoog om 'n gebruikskode op te stel vir die prosedures wat gevolg moet word by die beplanning en uitvoering van geko-ördineerde dienste, welke kode as leidraad vir plaaslike owerhede en die Poskantoor moet dien. 'n Toetsprojek vir die verskaffing van gemeenskaplike diensgeriewe word tans by 'n sekere plaaslike owerheid onderneem teneinde ondervind van die praktiese toepassing van die beginsels wat hierby betrokke is, op te doen.

G. C. THERON,
Sameroeper.

ADVIESKOMITEE VAN DIE W.N.N.R. INSAKE ELEKTROTEGNIÛSE INGENIEURSEWESE

Die jaarvergadering van hierdie komitee is in Oktober 1969 gehou, toe daar 'n oorsig gegee is van die werk wat deur hierdie afdeling van die W.N.N.R. gedoen word, in die eerste plek in die verskillende laboratoria en later by wyse van die jaarverslae en die voorgestelde program.

Soos lede kon aflei uit die uitstaande referaat oor die rekenaaringenieurswese wat by die Umtali-konvensie deur Mnr. van Wyk van die W.N.N.R. gelewer is, is die W.N.N.R. besig met baie gevorderde werk in verband met geïntegreerde stroombane en is in baie opsigte wêreldleiers.

Op die gebied van navorsing na weerlig en hoogspanning het die W.N.N.R., en in die besonder Mnr. Anderson, wêreldwye erkenning verwerf.

Hierdie afdeling van die W.N.N.R. onderneem produksie op 'n beperkte skaal en vir hierdie doel is daar 'n opleidingsentrum vir tegnisi gestig. Hierdie sentrum stel 'n baie hoë standaard en word ook gebruik vir navorsing in verband met die opleiding van tegnisi in samewerking met die Pretoriase Kollege vir Gevorderde Tegnieëse Onderrig. Op hierdie wyse word die leerplanne van hierdie kolleges op datum gebring en verbeter.

U verteenwoordiger is veral getref deur die benadering van die personeel van die departement deur 'n praktiese toepassing van die beginsels as die einddoel te stel by 'n groot aantal van die navorsingsprojekte.

Die W.N.N.R. verkies egter om vroegetydig ingeroep te word in plaas daarvan om later versoek te word om advies te gee in verband met die regstelling van foute of mislukkings.

G. C. THERON,
Verteenwoordiger.

S.A. HOOFKOMITEE INSAKE ELEKTROTEGNIÛSE VERWERING

Die vierde vergadering van hierdie Komitee is op

tion points will be determined by Municipalities and G.P.O. at regional level to best overall advantage.

It is proposed to draw up a code of practice of the procedures to be followed in the planning and execution of co-ordinated services for the guidance of local authorities and the G.P.O. A test run of the provision of common service facilities is at present being undertaken at a local authority in order to gain experience in practical application.

G. C. THERON,
Convenor.

C.S.I.R. ADVISORY COMMITTEE FOR ELECTRICAL ENGINEERING

The annual meeting of this committee was held in October, 1969 when the work done by this section of the C.S.I.R. was reviewed. First in the various laboratories and later by way of the annual reports and proposed programme.

As members are aware from the outstanding paper on computer engineering read by Mr. van Wyk of the C.S.I.R. at the Umtali convention, the C.S.I.R. is doing very advanced work on integrated circuits and are world leaders in many respects.

In the field of lighting and H.V. research the C.S.I.R. and Mr. Anderson in particular, has gained world recognition.

This section of the C.S.I.R. undertakes production on a limited extent and for this purpose has established a training centre for technicians. This centre is setting a very high standard and is also used for research on the training of technicians in conjunction with the Pretoria College for Advanced Technical Training. In this manner the syllabuses for these colleges are being updated and improved.

Your representative was particularly struck by the approach of the personnel of the department in setting a practical application as the end goal in a large number of the research projects.

The C.S.I.R. would, however, prefer to be consulted in advance instead of being called in to advise on the rectification of failures.

G. C. THERON,
Representative.

S.A. ELECTROLYTIC CORROSION MAIN COMMITTEE

The Fourth meeting of the above Committee was

19 Februarie 1970 in die kantore van die Randwater-raad gehou.

Mnr. A. J. G. Gosling, vooreen Elektrotegniese Hoofingenieur van die S.A. Spoorweë, is op 28 Oktober 1968 vir 'n tydperk van twee jaar as Voorsitter van die Komitee verkies, met Mnr. L. H. James, Adjunk-hoofingenieur van die Randwateraad, as Adjunk-voorsitter. Na Mnr. Gosling se onlangse aftrede met pensioen, is Mnr. L. H. James vir die onverstreke gedeelte van die tydperk, naamlik tot Oktober 1970, tot Voorsitter verkies, met Mnr. W. W. Lehmann, E.ektrotegniese Hoofingenieur van die S.A. Spoorweë, in die vakature vir Adjunk-voorsitter wat as gevolg daarvan ontstaan het.

Tegniese Bulletins:

Daar is besluit om normaalweg slegs tegniese bulletins uit te reik wanneer daar sake van besondere belang of artikels oor die ontwikkeling van nuwe tegnieke ter bestryding van elektrolise beskikbaar is, wat die uitreiking van 'n bulletin sal gerverdig.

Gebruikskodes:

Die volgende gebruikskodes word tans voorberei, en die Komitee wat daarvoor verantwoordelik is, is versoek om die eerste konsepte voor die volgende vergadering van die Hoofkomitee te probeer voltooi:

- (a) Katadiese beskerming van begraaftde strukture in die Republiek van Suid-Afrika; en
- (b) Anti-elektrolise-maatreëls vir ondergrondse dienste wat pyplyne in die Republiek van Suid-Afrika kruis of ewewyding daarmee loop.

Kleurkode vir Hoofplanne:

Daar is oorweging verleen aan die wenslikheid daarvan om 'n standaard-kleurkode te aanvaar vir gebruik deur alle streeksveldkomitees met die oog daarop om die verskillende dienste wat op hoofplanne aangedui is, te onderskei, en daar is besluit om besonderhede van die kodekleure wat deur elke streeksveldkomitee gebruik word, in te win, teneinde te kan bepaal in welke mate standaardisasie redelikerwys ingevoer kan word.

Standaard-spesifikasie vir Diodes:

Na aanleiding van 'n item wat op 'n vergadering van die Wes-Kaaplandse Streeksveldkomitee ter sprake gekom het, is daar oorweging verleen aan die moontlikheid van die uitreiking van 'n standaard-spesifikasie vir diodes wat in verband met dreineringsverbindinge gebruik word. Vanweë die wyd-uitteenlopende vereistes vir verskillende installasies, is besluit dat dit onprakties is, dog daar is ooreengekom dat die S.A. Spoorweë

held in die offices of the Rand Water Board, Johannesburg, on the 19th February 1970.

Mr. A. J. G. Gosling, formerly Chief Electrical Engineer, S.A.R., was elected Chairman of the Committee on the 28th October, 1968, for a term of two years, with Mr. L. H. James, Deputy Chief Engineer, Rand Water Board, as Deputy Chairman. Arising from Mr. Gosling's recent retirement on pension. Mr. L. H. James was elected Chairman for the remainder of the period, i.e., until October 1970, and Mr. W. H. Lehmann, Chief Electrical Engineer, S.A.R., was elected to the consequentially vacant office of Deputy Chairman.

Technical Bulletins :

It was decided that, in general, bulletins should only be issued when warranted by the availability of items of unusual interest or articles covering the development of new techniques for combating electrolysis.

Codes of Practice :

The following codes of practice are in the course of preparation and the drafting sub-committee was requested to endeavour to complete the first drafts before next meeting of the Main Committee :—

- (a) Cathodic protection of buried structures in the Republic of South Africa and
- (b) Anti-electrolysis measures for underground services crossing or running parallel to pipelines in the Republic of South Africa.

Colour Code for Master Plans :

The desirability of adopting a standard colour code for use by all Regional Field Committees for distinguishing the various services recorded on master plans was discussed and it was decided to obtain details of the colour coding used by each Regional Field Committee in order to determine the extent to which standardisation could reasonably be implemented.

Standard Specification of Diodes :

Arising from an item raised at a meeting of the Cape Western Regional Field Committee, the possibility of issuing a standard specification for diodes used in connection with drainage bonds was discussed. Because of the widely diverse requirements for different installations, it was decided that this was impracticable, but it was agreed that the South African

en die Randwaterraad hul ondervinding met die verskillende tipes diode beskikbaar sal stel.

Vergerings van Streeksveldkomitees:

Die Grondwet bepaal dat Streeksveldkomitees elke ses maande moet vergader. Die vraag het ontstaan of daar nie meer dikwels vergaderings gehou moet word nie, maar die Hoofkomitee was nie ten gunste hiervan nie, aangesien Streekskomitees kan vergader wanneer dit ookal nodig is. Daar is egter ooreenkom dat die betrokke klousule van die Grondwet gewysig word om te bepaal dat enige lid van 'n Streeksveldkomitee die Sekretaris kan versoek om 'n vergadering te belê as hy enige dringende saak het wat sonder versuim bespreek moet word.

D. C. PLOWDEN,
Verteenwoordiger.

KO-ORDINERENDE KOMITEE VIR HOOGSPANNINGS-NAVORSINGSGERIEWE

In Junie 1969 is 'n omsendbrief gestuur aan alle liggamme wat met hoogspanningsnavorsing besig was, waarin hulle versoek is om inligting te verstrek oor die navorsing wat reeds voltooi is, wat nog aan die gang is en wat beoog word, tesame met besonderhede van die toetstoerusting wat beskikbaar is. Hulle menings is ook gevra omtrent projekte wat aandag nodig het, dog waaraan daar nog nie gewerk word nie.

Die antwoorde op hierdie omsendbrief is deur die Ko-ordineerders op Gespesialiseerde Gebiede verwerk en ingesluit by hul verslag aan die Derde Vergadering van die Komitee wat op 7 Oktober 1969 gehou is. Hierdie verslag kan soos volg opgesom word:

- (1) Mnr. R. A. Hellawell neem die plek in van Prof. G. R. Bozzoli as Ko-ordineerder op die gebied van isolasie-navorsing.
- (2) Die reaksie op die 1969-omsendbrief waarin inligting omtrent hoogspanningsnavorsing aangevra is, was teleurstellend, en dit wou voorkom asof vervaardigers staatmaak op navorsing wat deur oorsee firmas gedoen word.
- (3) Daar is 'n oorsig gegee van die volgende items in verband met navorsing en toetsing:
 - (a) Navorsingsgebiede in Suid-Afrika.
 - (b) Oorsig van navorsing en toetsing:
 - (i) Navorsing wat deur gebrek aan hulp gestrem word
 - (ii) Vordering van navorsingsprojekte.
 - (c) Nasionale navorsing na E.H.S. en toetsgeriewe.
 - (d) Nuwe navorsingsprojekte.
 - (e) Besikbaarheid van hoogspannings-toetstoerusting.

Railways and the Rand Water Board would make available their experience with various types of diode.

Regional Field Committee Meetings:

The Constitution provides that Regional Field Committees shall meet every six months. The question was raised as to whether more frequent meetings should be stipulated, but the Main Committee was opposed to this, because Regional Committees could meet whenever the necessity arose. It was agreed, however, to amend the relevant clause of the Constitution by providing that any member of a Regional Field Committee could request the Secretary to arrange a meeting if he had a matter of immediate urgency for discussion.

D. C. PLOWDEN,
Representative.

REPORT ON CO-ORDINATING COMMITTEE FOR HIGH VOLTAGE RESEARCH FACILITIES

In June 1969 a circular was sent to those bodies engaged in High Voltage Research, requesting information on research completed, being undertaken, or planned, with details of the test equipment available. Opinion was invited on those projects which needed attention but on which no work was being done.

Answers to this circular were collated by the Co-ordinators in Specialised Fields and included in their report to the Third Meeting of the Committee, which was held on the 7th October 1969.

Report is summarised as follows:—

- (1) Mr. R. A. Hellawell replaced Prof. G. R. Bozzoli as Co-ordinator in the specialised field of insulation research.
- (2) The June 1969 circular requesting information on H. V. research drew a disappointing response from manufacturers, who appear to rely on research carried out by overseas principals.
- (3) The following items relating to research and testing were reviewed.
 - (a) Research fields in South Africa.
 - (b) Review of research and testing
 - (i) Research hampered by lack of assistance
 - (ii) Progress of research projects.
 - (c) National EHV Research and Testing Facility
 - (d) New research projects.
 - (e) Availability of high voltage test equipment.

(f) Tegiese Dienste.

- (4) Die volgende skedules is by die verslag aangeheg, en die verslag is voorts vergesel van 'n Tegiese Verslag van die W.N.N.R. oor „Navorsing na Elektriese Isolasië” (NRIMS/E/66/7 gedateer 30 Junie 1969):

- Skedule 1.1 Basiese navorsing aan die gang—8 projekte
1.2 Toegepaste navorsing aan die gang—5 projekte
1.3 Navorsing en Toetsing beplan — 5 projekte
1.4 Voorgestelde toekomstige navorsing en toetsing—10 projekte
1.5 Navorsing gedurende 1968/69 voltooi—1 projek

Skedule 2 Hoogspanningsfasiliteite by die Universiteite van die Witwatersrand, Pretoria, Kaapstad en Natal, W.N.N.R., S.A.B.S., EVKOM, S.A.S., en Stad Johannesburg.

Skedule 3 Lyste van 60 publikasies en verslae gedurende die tydperk 1960-1969.

- (5) Die Ko-ordineerders is van mening dat navorsing na korona, weerlig en stuwings en isolasië goeie vordering gemaak het, alhoewel dit in 'n paar gevalle deur 'n gebrek aan navorsingshulp in die wiele gery is. Daar bestaan nog steeds 'n dringende behoefte om voort te gaan met nasionale navorsing na e.h.s. en toetsgeriewe, teneinde die probleme te ondersoek wat waarskynlik oor die volgende twee of meer dekades sal ontstaan as gevolg van die invloed van plaaslike omgewings. Hierdie behoefte word beklemtoon deur die groot aantal navorsingsprojekte wat op die oomblik as nodig beskou word in verband met spannings van tot 400 kV.

Na aanleiding van hierdie verslag het die Komitee ooreenkom dat:—

- (i) die Ko-ordineerders op gespesialiseerde gebiede elke jaar in April byeenkom vir die voorbereiding van hul verslag aan die Komitee, wat elke jaar in September sal byeenkom.
- (ii) die S.A.F.S.I.N. aangespoor word om die vraelys wat na aanleiding van die Simposium oor Hoogspanning in 1967 uitgestuur is, te voltooi.
- (iii) die Voorsitter die Universiteit van die Witwatersrand nader om die toekoms van die Weerlig-groep van die Bernard Price-instituut

(f) Technical Services.

- (4) The following schedules were attached to the report, which was also accompanied by a Technical Report of the C.S.I.R. on “Electrical Insulation Research” (NRIM/E/66/7 dated 30th June 1969):—

- Schedule 1.1 Basic Research in progress—8 projects
1.2 Applied Research and Testing in progress—5 projects
1.3 Research and Testing Planned—5 projects
1.4 Proposed future research and testing—10 projects
1.5 Research completed during 1968-1969—1 project

Schedule 2 High Voltage Facilities at the Universities of Witwatersrand, Pretoria, Cape Town and Natal, C.S.I.R., S.A.B.S., E.S.C.M., S.A.R. and City of Johannesburg.

Schedule 3 Lists of 60 Publications and Reports during the period 1960-1969.

- (5) The Co-ordinators consider that research into Corans, lightning and surges and insulating has made good progress, although hampered in a few cases through lack of research assistance. There is still an urgent necessity to proceed with national e.h.v. research and testing facility to examine problems likely to arise over the next two decades or so as a result of the effects of local environment. This is emphasised by the large number of research projects currently found necessary in respect of voltages up to 400kV.

Arising from this report, the Committee agreed that:—

- (i) the Co-ordinators in specialised fields meet in April in each year to prepare their report to the Committee which shall meet each September.
- (ii) S.E.I.F.A. be urged to complete the questionnaire sent as a result of the H.V. Symposium held in 1967.
- (iii) the Chairman of the Committee approach the Witwatersrand University to discuss the future of the lightning group of the Bernard Price In-

na die naderende aftrede van Professor Malan te bespreek.

- (iv) die kwessie van die Nasionale Navorsing na EHS en Toetsgeriewe verder gevoer word deur 'n panel wat deur die W.N.N.R. saamgestel sal word en wat die S.A.B.S., EVKOM en Prof. Heyman moet insluit.
- (v) die definisie van „hoogspanningsgebied” alle onderwerpe moet insluit wat met spannings bokant 1,000 volt verband hou.

D. C. PLOWDEN,
Verteenwoordiger.

VERSLAG AAN STANDAARD-BEDRADINGSREGULASIES

Die 1969-wysigings aan die Standaard-bedradingsregulasies vir die Bedrading van Persele is gedurende Augustus 1969 deur die Suid-Afrikaanse Instituut van Elektrotegniese Ingenieurs uitgereik, en wel in pamfletvorm teneinde die beliggaming daarvan in die Tweede Uitgawe (soos in Januarie 1960 gewysig) te vergemaklik. Die wysiging is blykbaar goed ontvang, aangesien dit tot op die hede nog geen kommentaar uitgelok het nie.

Na voltooiing van die 1969-wysiginge het die Suid-Afrikaanse Buro van Standaarde verantwoordelikheid vir die administrasie van die geldende Standaard-regulasies aanvaar, en die Buro is van plan om 'n nuwe stel regulasies of 'n gebruikskode vir die bedrading van persele op te stel. Die verskillende belanghebbende organisasies is versoek om verteenwoordigers te benoem om op die Komitee wat vir hierdie doel deur die Buro in die lewe geroep word te dien, en Mnr. Grant, van die Buro se personeel, is as Same-roeper van hierdie Komitee benoem.

D. C. PLOWDEN,
Vereenwoordiger.

VERSLAG: S.A. NASIONALE KOMITEE VAN DIE I.E.K.

Die werk van hierdie Komitee word hoofsaaklik by wyse van briefwisseling gedoen.

Verskeie ingenieurs wat redelik ver van Pretoria af woon, dien op subkomitees van die Nasionale Komitee en hulle waardevolle hulp en diens word hoog op prys gestel.

Na aanleiding van die vergadering van Tegniese Komitee No. 8 van die I.E.K., wat in Julie 1967 in Praag gehou is, is inligting ingewin van alle Nasionale Komitees aangaande die kwessie van die standaardi-

stitute following Professor Malan's impending retirement.

- (iv) the matter of the National EHV Research and Testing Facility be pursued by a panel to be convened by the C.S.I.R. and to include S.A.B.S., E.S.C.O.M. and Professor Heyman.
- (v) the definition "high voltage field" should include all subjects connected with voltage in excess of 1,000 volts.

D. C. PLOWDEN,
Representative.

REPORT ON STANDARD WIRING REGULATIONS

The 1969 Amendments to the Standard Wiring Regulations for the Wiring of Premises were issued by the South African Institute of Electrical Engineers during August 1969. They were published in pamphlet form to facilitate incorporation in the Second Edition (amended January 1960) and appear to have been well received, having evoked no comments to date.

With the completion of the 1969 Amendments, the South African Bureau of Standards has assumed responsibility for the administration of the current Standard Regulations and intends drawing up a new set of regulations or a code of practice for the wiring of premises. The various relevant organisations have been requested to nominate representatives to serve on the committee being established by the Bureau for this purpose and Mr. Grant of the Bureau's staff has been appointed Convenor of this committee.

D. C. PLOWDEN,
Representative.

REPORT—S.A. NATIONAL COMMITTEE OF THE I.E.C.

The work of this Committee is mostly by correspondence.

Various Engineers at a reasonable distance from Pretoria serve on sub-committees of the National Committee and we appreciate their valuable assistance and service.

Following from the meeting held in Prague in July 1967, Technical Committee No. 8 of the I.E.C., information was collected from all National Commit-

ASSOCIATION OF MUNICIPAL ELECTRICITY UNDERTAKINGS
OF SOUTHERN AFRICA

TECHNICAL MEETING 4 - 5 MAY 1970

WATER - ITS ROLE IN SOUTH AFRICA'S POWER SUPPLIES

by D.C. Midgley

Professor of Hydraulic Engineering
University of the Witwatersrand, Johannesburg

The world demand for energy, already enormous, is growing at a frightening pace. Six thousand years ago, many thousands of slaves toiled for two decades to construct the Great Pyramid of Egypt; in today's world that much energy is expended in just two minutes to launch a Saturn 5 rocket for man's journey to the moon.

South Africa still relies on coal as its chief source of electrical energy. At present our installed generating capacity at coal-fired power stations is about 7,000 MW. ESCOM's Chairman estimates that in thirty years' time our annual electrical energy requirements will be more than 300,000 GWh and that to generate this we shall have to install 68,000 MW of plant. These figures represent almost a tenfold increase within one generation. By conventional evaporative cooling methods, even with the latest acid treatment to lengthen the blow-down cycle, nearly 600 million gallons a day (mgd) or 32 cubic metres per sec. (cumec) of cooling water make-up will be needed in the electrical power industry - that is, eight times the peak water demand for the whole of Johannesburg. Technology has not yet advanced to the stage where grand-scale dry-cooling can be employed without substantially increasing the cost of electricity.

How is our spectacular energy demand to be met and how are we to handle the formidable water problems associated with the power industry? By accident of geology, four-fifths of our coal resources happen to be located in the south-eastern Transvaal and the remaining one-fifth is in scattered pockets in northern Natal, northern O.F.S. and north-western Transvaal - all of them regions where water resources are either scarce or heavily committed for purposes other than power generation. To rescue our transportation system from inundation by coal traffic, all

sasie van W.S.- en D.S.-spannings in die reeks van waardes wat ingevolge die I.E.K. se aanbevelings onder oorweging is.

Die S.A. Nasionale Komitee I.E.K./T.K.8 het inligting ingesamel omtrent die Suid-Afrikaanse standpunt ten opsigte van sekere belangrike aspekte en hierdie inligting is deur Mnr. R. B. Anderson van die W.N.N.R. aan die gekombineerde vergadering van die I.E.K./T.K.8 en I.E.K./T.K.28 insake die koördinasie van isolering, wat in September 1969 in Melbourne, Australië, gehou is, voorgelê. Die hoofpunt van die S.A. standpunt was dat 380/220 volt die aanvaarde standaard vir Suid-Afrika is en, indien dit verhoog sou word na 400/231 volts met 5% speling, sou daar ernstige probleme ontstaan. Die beste wat oorweeg kan word, is 400/231 volts met plus 5 en minus 10 persent speling, en daar is hierop ooreengekom.

Al die ander aspekte van die I.E.K. se aanbevelings waarmee die S.A. Nasionale Komitee saamgestem het, is aanvaar.

tees on the question of Standardisation of A.C. and D.C. voltages in the range of values under consideration by the I.E.C. recommendation.

The South African National Committee IEC/TC8 collected the South African view point on certain important aspects which was presented to the combined meeting of IEC/TC8 and IEC/TC28 on insulation co-ordination in Melbourne, Australia in September 1969 by Mr. R. B. Anderson of the C.S.I.R. The main concern affecting the South African view point was that 380/220 volts is the declared standard for South Africa and that raising it to 400/231 volts with 5 per cent regulation would pose serious problems. At best 400/231 volts could only be considered with plus 5 and minus 10 per cent regulation which was agreed to.

On all other aspects of the I.E.C. recommendation, with which the South African National Committee was in agreement, were accepted.

future major coal-fired power stations will have to be sited at pit head. The result will be the creation in the south-eastern Transvaal of a vast pithead power station complex, the like of which will probably not be seen anywhere else in the world, and from which will radiate power lines to feed load centres in all parts of the country. To cool the giant condensers water will have to be brought into this complex from across several catchment divides. By expanding our electricity grid we are decoupling ourselves from accidents of geology and, by building the closely associated water network we are gradually rectifying accidents of geography - not only in South Africa but throughout the sub-continent.

What of alternative sources, such as hydro-electric and nuclear power? South Africa's hydro-electric energy potential is relatively unimpressive. The firm energy potential at all feasible dams and waterfalls throughout the country would probably not exceed 8,000 GWh per annum - less than a quarter of our current demand - and, if allocated to base load, hydro could replace perhaps 1000 MW of steam plant. On the other hand, if reserved mainly for peaking and as spinning and outage reserves, hydro installations totalling 10,000 MW and more might ultimately be warranted. Moreover, as the load patterns change, extensive use of pumped storage hydro will prove attractive. Remote from the river systems, interesting possibilities for pumped storage are already being re-examined, e.g. in old gold mine workings, in the Big Hole at Kimberley and at Table Mountain, Cape Town.

Our main power sources of the future, however, will without doubt be nuclear. The western world's known reserves of low-cost uranium amount to about 600,000 tons, of which about one-third is to be found in this country. In fact, South Africa has the world's second largest reserves, so it is obviously in our interest to identify ourselves closely with the development of nuclear energy. A nuclear station circulates considerably more cooling water than does the equivalent conventional coal-fired station and, seeing that we are relatively short of water, we could hardly countenance locating a wet-cooled nuclear station inland. The first stations will therefore be sited on the west coast where the cold waters of the Atlantic can be used for cooling purposes.

No doubt Port Elizabeth is also a good location for a nuclear power station because, some time before the turn of the century, local water resources will have been exhausted and augmentation supplies would have to be imported from the Orange River Project. On the other hand, with a nuclear station combined with a desalination plant at its doorstep, Port Elizabeth could forego drawing water from the interior where supplies will become ever more vital to continued development.

It may be of interest to note here that a 2,000 MW coal-fired station consumes about 20,000 tons of coal per day, or twenty conventional trainloads, whereas a well-designed nuclear station of the same capacity would need less than one ton of uranium a day. In common with coal, uranium is of course a wasting asset and reserves will not last indefinitely. It is therefore of vital importance that breeder stations (which produce plutonium fuel as a by-product) be developed as rapidly as possible. The next century may see the end of our coal and uranium resources. After that, who knows? The hope is that the tantalizing prospect of nuclear fusion will provide new sources of energy before uranium supplies are exhausted.

Where will all this power we have been talking about be needed and, relevant to the subject of this paper, what will be the rôle of water? Let us try to predict where the main nodes of development are likely to be located. There can be little doubt that, even after the gold mines have ceased production, South Africa's foremost complex - the Witwatersrand - will continue to be self-sustaining. Again by accidents of geology, the Reef abuts on coalfields that contain 64 per cent of the known coal resources of the African continent; it is contiguous to the Bushveld Igneous Complex and other geological systems containing the ores of many of today's most important metals such as platinum, iron, vanadium and chromium; it stretches along the edge of probably the largest expanse of highly productive soils in the land - the maize triangle, South Africa's principal granary. On its southern side, Sasolburg, Vereeniging and Vanderbijl Park embrace the petro-chemical and heavy steel industrial zone, which forms a strong link tending to draw the O.F.S. goldfields into the sphere of influence of the main complex. From the Witwatersrand radiate the main railroads, highways and national and international air routes. Having long since become the greatest

mining, industrial and commercial complex in all Africa it cannot avoid continuing for the foreseeable future to hold its position as the hub of Southern Africa. Only failure to keep it supplied with sufficient water for normal growth could prevent the heart of the subcontinent from beating strongly. Plans are well advanced for bringing additional supplies from the Tugela, the upper Orange and elsewhere to augment the over-worked Vaal and there is every indication that the Government recognises the compulsion to avoid a coronary thrombosis of the Greater Witwatersrand while at the same time encouraging decentralization through conscious creation of new development nodes.

South of the giant power complex, which can hardly fail to act as a magnet to industrial development, lies another of South Africa's most important new nodes - the upper Tugela basin - development of which has been triggered by the Government's decision to establish the third ISCOR near Newcastle. The two new nodes, coupled with the fast-growing Pietermaritzburg-Durban industrial complex, will serve to establish the broad arc between the Reef and Durban as South Africa's principal development axis. The railway link through Vryheid to Empangeni will stimulate a subsidiary axis towards the new growth point that will be created by Richards Bay harbour, oil terminal and aluminium smelter.

Water supplies along the Witwatersrand-Durban axis and its Richards Bay spur are assured from dams such as Spioenkop in the Tugela, Midmar in the Umgeni and numerous others that are being planned.

Another important node is that centred on Phalaborwa where the power demand for metallurgical purposes has grown phenomenally. Prosperity at Phalaborwa, coupled with tourist attractions of the Kruger Game Park and scenic eastern escarpment region, has had a stimulating effect on the main urban centres of the north-eastern Transvaal, namely Nelspruit and Tzaneen. Water supplies to all these regions are assured from the Great Olifants, Crocodile and Great Letaba rivers in all of which storage works are either under construction or being planned.

There can be little doubt that completion in 1972 of the 400 kV transmission network connecting the Transvaal and Orange Free State undertakings with the Cape and Eastern Province undertakings,

via the Hendrik Verwoerd dam hydro station, will strengthen the ties between the hub and the Western Cape, the Port Elizabeth-Uitenhage and the East London-King Williamstown complexes.

Water supplies to the Western Cape complex are being augmented from the Berg river-Vogelvllei extension and the Riviersonderend-Bergriver project is being planned. Further water supplies to this area, however, will be strongly influenced by future trends in power development. The moment it becomes economic to establish large nuclear complexes at the coast to feed power back into the interior it will no doubt also become feasible to compound these with nuclear desalination plants. The utmost care is therefore needed in planning water supplies for all three of these coastal complexes. Substantial advantages stand to be gained if the water and power developments can be integrated and this can be satisfactorily accomplished only through expert application of systems engineering techniques.

The earliest benefits to flow from the Orange River Project - long before the scheme is anywhere near complete - will be the easing of the burden on the Vaal, the safeguarding of water supplies to the irrigation areas along the middle and lower Orange and, as soon as the Orange-Fish Tunnel is through, the resuscitation of the Cape midlands. It is likely to be many years, however, before other land development components of the project mature. In the meantime, the main revenue from the scheme will be that generated by the hydro station at Verwoerd dam.

An important interior node is the mineral-rich area around Posmasburg, water supplies to which will be augmented from the Vaal, backed up later probably by supplies from the Orange. The future impact of this important region on the nodular framework of development in South Africa will largely be determined by the outcome of current studies to optimize the type and location of the iron ore export route - whether by pipeline or railroad and whether through Port Nolloth or Saldanha Bay or Port Elizabeth. There is little doubt that a railway link to the west coast would do more to open up the arid west than would a pipeline. If one is to judge from trends in the United States, where industries are moving from the humid to arid regions and irrigation in the opposite direction, from the arid to the sub-humid parts, probably both railway and pipeline will ultimately be needed; but the question is: which first?

Except for clarification of this conundrum, we have sketched the broad framework of demand centres for power and water and the intertwined systems that feed them. The picture that emerges is that of a core-periphery type of development dominated by the Witwatersrand hub and by the giant southern Transvaal power complex, which will be called upon to meet practically the whole of South Africa's electricity load for many years to come; as one of the world's biggest concentrated power complexes it will without doubt evolve into an important urban and industrial region, lending continuity to the country's chief development axis from the Reef to Durban. In time, however, the electrical energy burden will gradually be taken over by the coastal ring of nuclear stations which, along the dry western and southern coastal stretches, will almost certainly be associated with desalination plants. Ultimately, power - and to some extent desalinated sea water - will be fed inland. These developments will tend to neutralise the initial dominance of the core over the periphery and thus stimulate the earnestly desired decentralization process. It is evident that the key to this orderly process of development is the power grid, and closely meshed with this is the water network.

An important subsidiary role will be played by what might be termed the inner power ring - hydro stations first in the Orange river, followed by others in the Tugela, Umkomaas and Umzimkulu in Natal and in the big rivers of the Transkei, and finally, to close the ring, pumped storage schemes in the goldfields of the Transvaal and O.F.S. These relatively high capacity, low load factor stations will lend stability to the national grid while permitting optimum beneficial use to be made of water resources, particularly in the Transkei.

Allowing for orderly expansion towards the periphery, the central part of the core will nevertheless be requiring by the turn of the century water supplies of the order of six times the present demand - something like 2500 mgd (130 cumec) of which, if evaporative processes are employed, the pithead power complex will need perhaps 500 mgd (26 cumec) for cooling purposes. By exploiting the Vaal to the full and importing reasonable proportions of the water resources of the Komati, Usutu, Tugela, upper Orange and Caledon rivers and by stepping up the extent to which water is re-used, we are confident that the demands can be met. The implication is, however, that the power complex must

be cooled with reclaimed water. This has certain disadvantages which must be carefully weighed against the increased expense of dry-cooling or of the additional polishing needed to bring reclaimed water to drinking water standards. It would seem a little illogical to drink treated sewage while despatching pure mountain water to the cooling towers or to other industrial processes that may not necessarily demand high class water or even onwards to the irrigation lands!

Thus far we have looked at the development picture purely within its South African frame but a wider canvas depicting the whole sub-continent is equally fascinating. Although the Republic has the resources to "go it alone", there are many advantages to be gained by encouraging our neighbour states to participate in the grand power and water plan and in this way to reach economic take-off much more quickly than would otherwise be possible.

Such participation has indeed already been initiated. The proposed 1500-km high voltage d.c. power link from Cabora Bassa to feed 1750 MW into the South African grid at Irene has already been sanctioned and the supply will doubtless be increased in time. An advanced stage has been reached in South Africa's negotiations with Swaziland and with Botswana to take power initially from ESCOM's network but as soon as possible to build major power stations on their recently proven coalfields and reverse the flow to the grid. South Africa has agreed to purchase water and possibly small supplies of hydro energy from Lesotho's proposed Oxbow scheme. Joint Portuguese-South African multi-purpose development of the Cunene river, too, will bring benefits to southern Angola and northern South West Africa; already work has started in a small way with Gove dam in Angola, the hydro station at Ruacana falls on the border and the pump station at Calueque to divert water into Ovamboland.

The potentialities of the Cunene are great; provided the system could be connected to a widespread grid, hydro stations totalling more than 2000 MW in capacity would be justified to develop the 8000 GWh of energy that could be made available annually.

Viewed in relation to the substantial hydro potential of the Zambesi system - at Kariba, Kafue, Shire, Cabora Bassa and elsewhere - coupled with a possible major pithead power complex on

the Wankie coalfields, there emerges the exciting prospect of a super grid interconnecting all the countries south of the Congo-Zambesi divide. Even more spectacular - but subject to more settled political conditions - is the possibility of linking the network northwards with potential hydro stations on the Congo; at the Inga site alone the firm potential is about 25000 MW - several times that of the largest hydro stations planned anywhere in the world today.

The revenue that neighbour states could derive from exports of power and/or water to South Africa would greatly assist them to balance their budgets and generally to improve their economies. It would be substantially in the Republic's interest to conclude the necessary pacts to permit these developments to proceed long before her own coal reserves run low and likewise it would be in the interests of neighbour states to initiate the necessary negotiations long before the nuclear age dawns in South Africa - otherwise it might prove too late. The Republic could scarcely afford to duplicate and could certainly not wait.

Far from being construed as placing South Africa in a position of dependence on her neighbours, participation in operating international power and water links would stimulate interdependence, greatly ease the burden of maintaining security and at the same time create a co-prosperity sphere in Southern Africa that would without doubt constitute a more effective bastion against communist infiltration than could be provided solely by military might.