Curriculum Vitae

Pieter H Pretorius

1. Personal Profile

I am an electrical engineer, 50 years of age. My career, built on research, technical investigation and design work, gave me a platform to specialise in the field of earthing (grounding), electromagnetic compatibility (EMC) and lightning protection of industrial installations. My career further granted me opportunity to participate in varying degrees of design (concept through detail) of parts of power plant, power lines and substations. I have experience in strategic and forward planning; operating within sometimes tight and ambitious budgets and methodical administration to deadlines. The project work I have been involved in demonstrates my ability to work on my own or as part of a team. Involvement in my own business venture over the last 8 years has left me confident in engaging in management of both technical and business issues, identification of opportunities, marketing, setting and achievement of targets within my scope and ability. My career is my investment, built on my technical interest and aspirations.

Technical Skills Base

My technical skills include:

- Familiarity with research and design environments in electric utility and industrial context.
- Ability to work on my own or as part of a team.
- Good analytical skills.
- Time-efficient, systematic working methodology.
- I can manage a steep workload for extended periods.
- Adaptability to new challenges presented.
- Languages: English – speak, read and write; Afrikaans – speak, read and write.
- Computer literacy - General: Word, Excel, Power Point, Windows Based
- Computer literacy - Specialised: CDEGS, COULOMB, ELECTRO, MAGNETO, VISIO, COMSOL Multi-Physics

2. Personal Details

Full name	:	Pieter Hermanus Pretorius
Nationality	:	South African
Date of Birth	:	27 March 1963
Marital status	:	Married, 2 children (twins).
Health	:	Excellent (somewhat unfit at present).
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3. Summary of Qualifications

3.1 Tertiary Qualifications

Qualification	Area of Study / Discipline	Education Institute	Duration
B.Eng. (Electrical and Electronics)	Electronics and electrical engineering.	Potchefstroom University	1982 - 1985
M.Eng.(Bio-Engineering)	Dissertation: The Assessment of Human Exposure to Power Frequency Electric and Magnetic Fields	University of Pretoria	1989 - 1990
Ph.D.(Electrical Engineering)	Thesis: Analysis and Control of Electromagnetic Interference Generated in High Voltage Substations During the Repetitive Breakdown of Disconnector Air Gaps	University of the Witwatersrand	1996 - 2000
PBL	Programme in Business Leadership	University of South Africa (UNISA)	2001
B.Eng. (Hons) Chemical Engineering	Polymer Technology	University of Pretoria	2004

3.2 Vocational Qualifications

Continuing Engineering Education and Short Courses attended:

Topic	Presented by	Date
Basic Conditions of Contract	Eskom College	1988
Models of Human-Machine Interaction	University of Pretoria	1990
Biomedical Engineering	University of Pretoria	1992
Flexible AC Transmission Systems (FACTS)	Wits University	1992
Lightning Protection and Earthing of Electronic Systems	Wits University	1992
An Introduction to EMTP (Electromagnetic Transients Programme)	Wits University	1993
Design of Low Cost Reticulation Networks	Wits University	1994
Insulation Co-ordination	Wits University	1994
Electromagnetic Interference and Grounding Analysis	Wits University	1994
Grounding & Electromagnetic Fields (5 day – CDEGS)	Eskom College	1994
How to do Research	Wits University	1995
Practical Planning, Design and Maintenance of Power Lines	Megawatt Park	1995
Five day Course on Electromagnetic Compatibility (EMC)	Don White & Associates (USA)	1996
EMC (I)	University of Stellenbosch	1997
EMC (II)	University of Stellenbosch	1997
Cellular Radio Design	University of Pretoria	1998
MATLAB	Wits University	1998
Internet Web Development	Internet Solutions	1999
Visual Basic	TSI	2000
Design of Earthing Systems	University of Stellenbosch	2000
Application of Optical Fibre Technology to Overhead Power Lines	TSI	2000
Practical Wireless Communications	Wits University	2001
Trouble Shooting and Problem Solving of Industrial Data Communications	IDC	2002
Practical Project Management for Engineers and Technicians	IDC	2002
Tutorial – HVDC and FACTS	IEEE	2005
Tutorial – Customer Quality of Supply	IEEE	2005
Electric Cables	Aberdare	2006
Broad Based Black Economic Empowerment Scorecard Workshop	Econo Serv	2007
Workshop on Electromagnetic Field Analysis (BEM: Coulomb / Electro)	IES (Canada)	2008
Grounding and Electromagnetic Fields (CDEGS)	SES Tech (Canada)	2008
Lightning Protection, Earthing & Electromagnetic Compatibility (EMC)	Conference Zone	2009
Nuclear Power Plant Design Seminar and Power Plant Visit	ASME (USA)	2009
EPRI Red Book (Transmission Line Design) Seminar	EPRI / Eskom	2009
Fault Current and Arc Extinction	SAIEE / Viv Cohen	2010
EMC for Nuclear Power Facilities	Washington Laboratories (USA)	2011
HVDC Technology Seminar	ABB (RSA)	2012

Corrosion Engineering Course	CORRISA (RSA)	2012
Mini Courses in COMSOL	COMSOL (Sweden & Italy)	2012
Introduction to Geology	University of Johannesburg (RSA)	2012
HVDC Design Workshop	EPRI / Eskom (RSA)	2013
Current Interruption Transients in AC Power Systems	Eskom (RSA)	2013
Fundamentals of Probabilistic Risk Assessment	Northwest University (RSA)	2013

4. Career and Professional Experience

4.1 Trans-Africa Projects (Under Contract)

Position held	Duration	Primary Responsibilities	Significant Achievements
Electrical Specialist	1 April 2007 to 30 May 2010 / Oct 2010 to 30 Nov 2013.	I am responsible for executing technical tasks and for technical deliverables on identified projects done by Trans-Africa Projects (that relate to overhead line and substation design).	• Successful completion of several tasks within time and budget (See Project Work – Section 6).

4.2 Empetus Close Corporation

Position held	Duration	Primary Responsibilities	Significant Achievements
Founding Member	1 May 2005 to Oct 2010 (Wrapped Empetus activities up for position at Kema in the Netherlands - this did not realise due personal document missing at Dept of Home Affairs - continued business under TERRATECH).	As Founding Member, I was responsible for both the business and technical performance of Empetus Close Corporation.	• Successful establishment of Empetus Close Corporation and execution of technical work (See Project Work – Section 5).

4.3 TERRATECH

Position held	Duration	Primary Responsibilities	Significant Achievements
Founding Member	Oct 2010 to present (Wrapped Empetus activities up for position at Kema in the Netherlands - this did not realise due personal document missing at Dept of Home Affairs - continued business under TERRATECH).	As Founding Member, I was responsible for both the business and technical performance of TERRATECH.	• Successful establishment of TERRATECH and execution of technical work (See Project Work - Sections 6 & 7).

4.4 Eskom - (Eskom is the major electric utility in South Africa)

Position held	Duration	Primary Responsibilities	Significant Achievements
Position: Corporate Consultant: EMC **Group:** Consulting, Research & Development	1 April 2003 to 30 April 2005.	**High level Functions** • Technical director for Electrical / R & D on EMC. • Research advisor to the Electromagnetic Compatibility and Electromagnetic Research Portfolios. • Tertiary Education Support Programme (TESP) director on EMC to two Universities. **Corporate activity for Resources & Strategy** Leader of specific research programmes on EMC. Activities included: • Equipment susceptibility in substations – reviewing policy on mobile phone usage in control rooms; • (Started) Drafting an EMC guideline for C&I in Power Generation. • Assessment of live line worker exposure to magnetic fields in view of the revised	• Appointment as Corporate Consultant – 2003. • Financial targets exceeded for financial years 2001, 2002 and 2003. • Set details and technical framework for development of Eskom policy on use of mobile phones in sensitive control rooms at power stations – 2004. • Drafting EMC guideline for control and instrumentation (C&I) for Generation – 2004. • Provided EMC support in the support of cellular base station antennas on power line

ICNIRP limits;
- Cell C study: Magnetic field interference with computer monitors.
- EMC in the support of cellular base station antennas on power line towers.

Technically contributes to the following Resources & Strategy projects:
- EMC considerations for mothballed power stations.
- Novel earthing techniques for improved EMC in HV substations.
- Convenor of CIGRE TF C4-02-01 – Review and update CIGRE EMC Guide.
- Post Graduate course (EMC module) to be presented at the University of Durban Westville.
- Writing of a Transmission Line Reference Book (Sections to 3 Chapters relating to EMC).
- (Started) Writing and EMC reference book.

Consultation to the line and other groups

- Pebble Bed Modular Reactor (PBMR) – Drafting an EMC & Earthing design document plus specifications;
- EMC support to Trans Africa Projects (Earthing and interference);
- Partial contribution on EMC aspects for new SEONI 765kV substation in India.
- Generation – on EMC aspects through research portfolio.
- Transmission – on EMC aspects through research portfolio.
- Distribution – on EMF through research portfolio.

Project leader

Leads strategic research projects.

Mentoring

Mentored to 2 TSI employees.

Publication of papers

Produces on average 1 to 2 papers per year. Has authored / co-authored more than 60 papers on EMC / EMF presented at both local and international conferences.

Skills transfer
- Introduction to EMF to Generation / Distribution / Transmission / Occupational Hygiene
- Non-Ionising Radiation to Occupational Hygienists
- Electric and Magnetic Fields to Transmission / TAP
- Electromagnetic Compatibility (EMC) to PBMR

External Examiner:
- Exposure to Electromagnetic Fields in Selected Industrial Environments – M.Eng, University of the Witwatersrand.
- Induced Electromagnetic Interference in Substation Earthing Networks During High Voltage Disconnector Switching Tests on a Substation Model – M.Eng, University of the Witwatersrand.
- Electromagnetic Field Exposure from towers for Eskom / Siemens / Cell C test site – 2002, 2003 and 2004.
- Developed simplified technique to evaluate live line worker exposure to magnetic fields – 2004.
- Convenor of international (CIGRE) Task Force on EMC in high voltage substations – 2003, 2004.
- Drafting EMC and Earthing design requirement specification for PBMR – 2003, 2004.
- Set details and technical framework for revising Eskom policy on health effects from electric and magnetic fields. Technical base and arguments developed may lead to cost saving of R9million in view of planned Eskom 765kV line and revised ICNIRP exposure guidelines (Reference Levels) that are exceeded – 2004.
- Reason for leaving: Career advancement limited.

		Magnetic Resonance Imaging Apparatus – M.Tech, Technicon of the Free State. • Electromagnetic Interference from Power Generation Plant – M.Eng, RAU. • Electromagnetic Compatibility – M.Eng, RAU.	

Position held	Duration	Primary Responsibilities	Significant Achievements
Position: Chief Consultant: Electric and Magnetic Fields (EMF) **Department:** Electrical Engineering	1 March 1994 to 30 March 2003	Project leadership, as noted in Section on Projects below, entails liaison with customers, planning, scheduling and managing projects in terms of resources, cost, time and deliverables. In addition, technically directing them and in most cases, technical execution. The projects I have been involved in over this period ranged between R 10,000 and R 1,4 million (2000 Rands).	• Successful completion of several projects (see Section 7 for details). • Appointment as Chief Consultant: EMF.

Position held	Duration	Primary Responsibilities	Significant Achievements
Position: Senior Engineer **Department:** Electrical Engineering	1 Jun 1992 to 28 Feb 1994	I was involved in setting Eskom's policy on the topic and was also involved in drawing up the EMF Policy Document for the EMF Forum of South Africa. I organised five meetings for the EMF Forum of South Africa (1990 to 1994). Since 1994 I became more involved in projects related to Electromagnetic Compatibility (EMC) in the Eskom (power utility) context. I was project leader on research and technical investigative projects.	• I designed and developed the hardware of a magnetic field exposure arrangement for the University of the Orange Free State to be used in a case control study on the possible role of magnetic fields as leukemia promoter in mice (1994). • Appointment as Senior Engineer.

Position held	Duration	Primary Responsibilities	Significant Achievements
Position: Engineer **Department:** Electrical Engineering	1 Feb 1990 to 31 May 1992	My duties included the design and conduct ing of research and investigative studies, presentation and publication of papers and the transfer of knowledge and information on the topic of EMF.	• Successful completion of several projects (see Section on Projects below for details), including: Appointment as Assistant Engineer.

Position held	Duration	Primary Responsibilities	Significant Achievements
Position: Assistant Engineer **Department:** Electrical Engineering	24 Sep 1988 to 31 Jan 1990	Eskom TSI, Rosherville: From 1988 to 1994 I acted as project leader on investigative and research projects related to the issue of power frequency electric and magnetic fields (EMF), their possible biological effects and the quantification of the electromagnetic field environment.	• Followed my passion and joined TSI and research environment – 1998. • Completed several quantification surveys of electric and magnetic field environments in Eskom – 1988 to 1994. • Appointment as Assistant Engineer.

4.5 Employer: Eskom – Matimba Power Station

Position held	Duration	Primary Responsibilities	Significant Achievements
Position: Engineer in Training **Department:** Electrical Engineering	4 Jan 1988 to 24 Sep 1988	**Matimba Power Station, Ellisras** Employed as Engineer in Training. As member of the erection team on the Matimba Power Station construction site, I was mainly responsible for contract supervision on 380V, 6,6kV and 11kV switchgear, 1600kVA dry type transformers, 220V and 24V batteries and battery chargers, cabling and 3,3kV diesel generators. I had to plan erection activities, supervise and inspect completed parts of the plant.	• Joined economically active workforce – 1988. • Reason for leaving: Desire to do work more related to research and technical investigations.

5. Project Work – During my Career with Empetus Close Corporation

The following Table presents a summary of some of the projects I have been involved in during my career with **Empetus Close Corporation**:

Project Title / Description	Client	Year
EMC standards in substations.	EPRI (USA)	2005
Mathcad algorithm to calculate and display magnetic fields in 3-D along overhead power lines.	Trans-Africa Projects (RSA)	2005
Magnetic field survey at Matla Power Station.	Eskom Holdings (RSA)	2005
RF field survey at shared mobile phone base station.	Body Corporate, Ruskom Court (RSA)	2005
Course module: Introduction to EMC in Power Systems.	University of Kwa-Zulu Natal / Eskom Holdings (RSA)	2005
Course module: Power Frequency Electric and Magnetic Fields (EMF).	Trans-Africa Projects (RSA)	2005, 2006
Course module: EMC in Substations.	Trans-Africa Projects (RSA)	2005, 2006
Electric field design limit for overhead power lines.	Trans-Africa Projects (RSA)	2006
Novel earth electrodes for improved EMC performance in HV substations.	Eskom C,R&D (RSA)	2006
Earthing and EMC investigation in healthcare facility.	Netcare (RSA)	2006
NRS 083 - Standard on EMC in substations.	NRS (RSA)	2006
Earthing and EMC investigation at Kriel Power Station.	Eskom CED (RSA)	2006
Electromagnetic interference with precision farming equipment.	Eskom Holdings (RSA)	2006
Magnetic field exposure assessment.	Thermtron (RSA)	2006
Electric and Magnetic Fields from Overhead Power Lines – Summary of Technical and Biological Aspects.	Eskom Holdings (RSA)	2006
Preparation of a Reference Book on Electromagnetic Compatibility (EMC).	Eskom C,R&D (RSA)	2006
One Day Course (ECSA CPD Activity): EMC in Substations – Ensuring Interference Free Secondary Environments.	Eskom / NRS / Tshwane Metro / City Power (RSA)	2006
EMC Guideline – Re-commissioning of Mothballed Power Stations.	Eskom C,R&D (RSA)	2007
Hillside Aluminium Smelter – Visual inspection of earthing system.	BHP Billiton (RSA)	2007

PBMR EMC & Earthing Design Report and Specifications.	Murray & Roberts / SNC Lavalin / PBMR (RSA)	2007, 2008, 2009
Training in the use of Earth Electrode Design Software (CDEGS / AutoGrid Pro) and Consulting on the design of the earth Electrode for Medupi Power Station.	Thabile Engineering (RSA)	2008
Development of a Process Flow Document for Eskom on Earthing, EMC and Lightning Protection.	Thabile Engineering (RSA)	2008
Design of an earth electrode for an 88 kV / 11 kV substation.	KV3 Engineers (RSA)	2009
Conceptual design (EMC and Earthing) of an HV Transformer Test Bay.	HV Test (RSA)	2009
Design of an earth electrode for an 88 kV / 11 kV substation	SSI Engineers & Consultants (RSA)	2009
Magnetic field survey - Hillside Aluminium Smelter	BHP Billiton (RSA)	2010
Magnetic field survey – Bayside Aluminium Smelter	BHP Billiton (RSA)	2010
Sole CDEGS Software Distributor (Agent) in South Africa	(RSA)	2006 – 2010
Conceptual Earth Electrode Design for 10111 Call Centre	Universal Lightning Protection Services (RSA)	2010
CDEGS and Coulomb Training	Trans-Africa Projects (RSA)	2010
Electrical Safety of Large Haul Trucks in Open Cast Mines	Kumba Iron Ore (RSA)	2010

6. Project Work – During my Contract with Trans-Africa Projects

The following Table presents a summary of some of the projects I have been involved in during my career under contract to **Trans-Africa Projects**:

Project Title / Description	Client	Year
Impact of ICNIRP guidelines on worker exposure in substations.	Eskom (RSA)	2007
EMF exposure assessment – Palmiet Stikland 400 kV line.	Eskom (RSA)	2007
Surge impedance modelling of transmission line towers.	Trans-Africa Projects (RSA)	2007
Lead: Electrical Design – 765 kV double circuit tower development. My other activities included: Development of CDEGS Surge Impedance model for new 765 kV double circuit towers; Preparation of user requirement specifications; Specialist assistance in technical analysis of electrical performance of towers; Assessed tower reliability in view of fire induced flashovers; Specialist assistance in general electrical design of towers; Evaluation of live line worker exposure to magnetic fields under high power transfer situations; Electric field performance and design of corona rings for glass insulator string with assembly (3-D COULOMB modeling); Evaluation of tower footing resistance presented by micro-pile anchors; Evaluation of lightning performance of new 765 kV tower structures; Co-ordination of part of electrical engineering design activities;	Eskom (RSA)	2007, 2008, 2009
Electric and magnetic field coupling to fences in close proximity to overhead power lines.	Eskom / Trans-Africa Projects (RSA)	2007
Consulting on exposure assessment of workers in 765 kV open air substations to power frequency electric and magnetic fields and its impact on substation design (reduced busbar height application lead to saving in cost).	Eskom / Trans-Africa Projects (RSA)	2007
Presented modules of EMF and EMC in the Line Design and Substation Design courses of Trans-Africa Projects	Trans-Africa Projects (RSA)	2006 – 2009
Developed and presented a two day CDEGS course (Covers eg earthing design of substation earth electrodes, Electromagnetic Field coupling to pipelines and Tower Surge Impedance modeling).	Trans-Africa Projects (RSA)	2008

3-D (Coulomb) model of 350 kV HVDC line to determine corona performance of ground wires	Nampower / Trans-Africa Projects (Namibia)	2009
2-D (Electro) model of 132 kV line space potential for the placement of an ADSS communications cable.	Uramin / Trans-Africa Projects (Namibia)	2009
Earthing of 132 kV line wood-pole structures.	Uramin / Trans-Africa Projects (Namibia)	2009
Participation and co-presentation of electric and magnetic field modules in the EPRI / Eskom 5 day Red Book Seminar.	EPRI / Eskom / Trans-Africa Projects (RSA)	2009
Co-author of EMC Reference Book.	Eskom / Trans-Africa Projects (RSA)	2009
3-D electric field modelling (Coulomb) of GIS disconnector failure.	Eskom / Trans-Africa Projects (RSA)	2009
IEEE Working Group 3-D electric field modelling (Coulomb) - benchmarking of electric fields associated with HV insulators.	IEEE (USA)	2009
Initiate background study on Controllable Reactors	Eskom / Trans-Africa Projects (RSA)	2009
Appointed Lead: Electrical Design - 400 kV double circuit tower development (Resigned because of planned move to KEMA, the Netherlands).	Eskom (RSA)	2010
Electromagnetic coupling from 400 kV and 275 kV power lines with rail and pipeline services at Sishen mine.	Kumba Iron Ore / Trans-Africa Projects (RSA)	2010
Electromagnetic field concerns from a newly proposed 132 kV line.	Eskom (RSA)	2010
On the earthing of off-terrace substation barrier fences.	Eskom (RSA)	2010
On the revised ICNIRP (2010) electric and magnetic field exposure guidelines.	Eskom / Trans-Africa Projects (RSA)	2010
Technical support to the Electrical Design of: * 400 kV double circuit tower development; * 400 kV / 132 kV multi-circuit tower development; My activities include provision of technical support to: Preparation of user requirement specifications; Specialist assistance in technical analysis of electrical performance of towers; Assessed tower reliability in view of fire induced flashovers; Electromagnetic coupling between circuits and associated line performance; Specialist assistance in general electrical design of towers; Surge Impedance model (CDEGS) for new towers; Evaluation of live line worker exposure to magnetic fields under high power transfer situations; Electric field performance and design of corona rings; Evaluation of lightning performance; Co-ordination of part of electrical engineering design activities;	Eskom (RSA)	2011
Technical support to the Electrical Design of: * 600 / 800 kV HVDC tower development; My activities include provision of technical support to specific activities associated with the tower development and line application.	Eskom (RSA)	2011 - to Date Current project
Proposed solutions to the ground wire corona and other problems experienced with the Cahora Bassa 533 kV HVDC line. In particular, I did the following studies: - Induced voltage on the ground wire as a result of harmonic current on the pole conductor. - Induced voltage on the ground wire as a result of lightning. - Specification of the surge arrester to protect terminal equipment associated with the ground wire. - Specific field measurements in support of the above studies.	Eskom (RSA)	2011 - 2012

I participated in the conceptual design and considerations related to earthing and electromagnetic compatibility of the 132 kV power distribution system required to supply the Square Kilometer Array (SKA) space telescope at Carnarvon (South Africa is bidding against Australia to host the array).	Eskom (RSA)	2011
I was involved as part of a team in setting up a collaborative technical symposium between Eskom, Trans-Africa Projects and the State Grid Corporation of China.	Eskom (RSA)	2011
I am reviewing and updating Eskom's Transmission Line Earthing Standard	Eskom (RSA)	Current
I completed a 3-D numerical modeling of the failure of a 400 kV GIS post insulator in support of determining the root cause of the failure.	Eskom (RSA)	2011
I am working as part of a team to compile a guideline on electromagnetic coupling between power lines and pipelines.	Eskom (RSA)	2011 - To date Current
I am participating in a team addressing guy wire corrosion of power lines.	Eskom (RSA)	Current
I am working on a numerical model to study space charge to be applied in the design of HVDC lines.	Eskom (RSA)	Current
I am working as part of a team addressing the poor performance of specific HVAC lines.	Eskom (RSA)	2011
I regularly advise on the modeling approach used in CDEGS models as applied by (Trans-Africa Projects) designers of earth electrodes.	TAP (RSA)	2011 - To date Current
I advised on the safety of buildings and wind mills on farms close to 765 kV lines.	Eskom (RSA)	2011
I am involved, as part of a team, in setting up the 2013 collaborative technical symposium between Eskom, Trans-Africa Projects and the State Grid Corporation of China.	Eskom (RSA)	2012 to 2013
400 kV (Ariadne Hector) line corona performance improvement - investigation and execution.	Eskom (RSA)	2012
Noted involvement in work of innovative nature for possible publication in Eskom book (see list of publications).	Eskom (RSA)	2012
I was responsible for the calculation and measurement of the induced voltage in the ground wire of the Cahora Bassa HVDC line for specification of its re-insulation.	Eskom (RSA)	2012
I was involved in the specification and design of the lightning protection of surveillance cameras at the Apollo HVDC converter station.	Eskom (RSA)	2012
I conducted a safety analysis of a construction site adjacent to a 400 kV line servitude.	Eskom (RSA)	2012
I participated in the review of the CESUL HVDC technology plan.	Eskom (RSA)	2012
I participated in Chief Engineering meetings of Eskom's Line Engineering Services	Eskom (RSA)	2011 to present
I participated in meetings of the Electrolytic Corrosion Institute of South Africa and the Pipeline and Power Line Interaction Working Group	Eskom (RSA)	2012 to present
I presented a course on the use of CDEGS to Eskom Substation Design personnel.	Eskom (RSA)	2012
I conducted a root cause investigation into the failure of the ground wire of the 400 kV Majuba Umfolozi line.	Eskom (RSA)	2012
I prepared a Technical Memorandum on why ground wires should not be removed at line crossings	Eskom (RSA)	2012

I advised on the health and safety aspects of power frequency electric and magnetic fields to members of the public.	Eskom (RSA)	2012
I prepared technical memoranda on the safety of boundary fences running for long distances parallel to overhead power lines.	Eskom (RSA)	2012
I reviewed estimations of induced voltages in ground wires in an attempt to explain the differences noted between calculated and measured values.	Eskom (RSA)	2012 to present.
I participated in the selection of possible sites for HVDC earth electrodes.	Eskom (RSA)	2012 to present.
I participated in the development of the Technology Plan for the Limpopo HVDC Western Corridor	Eskom (RSA)	2012
I did the electric field modeling of broken glass disk insulators in support of a better understanding of flashover phenomena observed in the laboratory.	Eskom (RSA)	2012 to 2013
I did the electric field modeling in support of understanding observations of a bird streamer laboratory experiment.	Eskom (RSA)	2013 (Current)
I am actively involved in the Care Group - Earthing that forms part of the Eskom Study Committeee on Technology (SCOT).	Eskom (RSA)	2012 to present
I did a safety assessment on step and touch potentials associated with a carport close to a power line at the St Stithians College in Johannesburg (based on a probabilistic approach).	Eskom (RSA)	2012
I did a safety analysis of windmills under overhead power lines.	Eskom (RSA)	2012
I prepared with co-aucthors 10 x abstracts of papers that were accepted for presentation at the CIGRE Regional Conference in Oct 2013. I also participated in the preparation of the papers.	Eskom / TAP (RSA)	2012 / 2013
I participated in presenting part (EMF and Step and Touch potentials) of the course on SANS 10280.	Eskom (RSA)	2012
I participated in the improvement of the lightning performance of a 132 kV line	Eskom (RSA)	2012 to present
I am preparing for a study on safe stringing of ground wires in close proximity to energized conductors or lines.	Eskom (RSA)	2013 (Current)
I am preparing course material on the safe retrofitting of OPGW on towers with existing steel ground wires.	Eskom (RSA)	2013 (Current)
I am participating in the co-ordination of the Second Collaborative Symposium between State Grid Corporation of China / Eskom / Trans-Africa Projects planned for Jun 2013.	Eskom TAP (RSA)	2013 (Current)

7. Project Work – During my Career with TERRATECH

The following Table presents a summary of some of the projects I have been involved in during my career with **TERRATECH**:

Project Title / Description	Client	Year
At present the main projects were done under contract (as independent contractor) to Trans-Africa Projects as listed in Section in Section 6.	Trans-Africa Projects (RSA)	2010 to present

Project Title / Description	Client	Year
I have been asked to provide Expert Opinion on EMF related issues in a pending Court Case between the electric utility of South Africa (Eskom) and residents of an area in Midrand, South Africa.	Attorneys: Cliffe Dekker Hofmeyr Inc (RSA)	2013 (Current)
I am currently in the process of tendering with Royal Haskoning DHV to do conceptual and detailed design work on the Square Kilometer Array (SKA). My function will be Lead for the EMC / RFI Stream on the Design Team.	Royal Haskoning DHV	2013 (Current)

8. Project Work – During my Career with Eskom

The following Table presents a summary of some of the projects I have been involved in during my career with **Eskom**:

Project Title / Description	Duration	My role in the project and a brief description of the Project	Significant Achievements
50Hz electric and magnetic fields and health effects.	1989 – 30 Apr 2005	I played a key part in technically assisting to effectively manage concern about the health effects of electric and magnetic fields and its impact on Eskom business over the years.	• No power lines were re-routed and no court cases against Eskom.

Project Title / Description	Duration	My role in the project and a brief description of the Project	Significant Achievements
Magnetic field exposure arrangement to study the possible role of power line magnetic fields as leukemia promoter in mice.	1993 - 1994	I designed and developed the hardware of a magnetic field exposure arrangement for the University of the Orange Free State to be used in a case control study on the possible role of magnetic fields as leukemia promoter in mice (1994).	• Sharing of EMF information and the research conducted, eg, at the University of the Orange Free State assisted Eskom to maintain a zero risk (no court cases, re-routed lines, etc) EMF management position. In addition, the research has been published and referenced at international level.

Project Title / Description	Duration	My role in the project and a brief description of the Project	Significant Achievements
Development of an EMF policy for Eskom	1994	I contributed significantly to Eskom's policy on EMF. For example, I advocated the implementation of signs cautioning of high magnetic fields at Eskom SVC stations (1996).	• Publication and approval of EMF policy in Eskom.

Project Title / Description	Duration	My role in the project and a brief description of the Project	Significant Achievements
Solving 50Hz magnetic field interference with computer monitors.	1996 – 1997	I designed, developed, priced and marketed an ELF magnetic field shield for computer monitors. Two models: *MAGNA IMPRES* and *MAGNA OPUS* were fully commercialized (1996). RSA Patent No. 98/1894.	• Patent registered. • Solved interference problems at Duvha, Matla and Lethabo Power Stations, also outside Eskom.

			• Development and marketing costs were fully recovered from shield sales.

Project Title / Description	Duration	My role in the project and a brief description of the Project	Significant Achievements
Mitigating interference during measurements in HV substations.	1998	I did the conceptual design of an EMC cabinet for measuring equipment (digital storage oscilloscope and personal computer) for use in severe EMI environments such as high voltage substations (1998).	• EMC cabinet that allows accurate measurements in substations.

Project Title / Description	Duration	My role in the project and a brief description of the Project	Significant Achievements
Development of an EMF information website	1999	I developed an EMF web site for Eskom's intranet (averaging 57 hits per day in the first two weeks after publication) in February 1999.	• Knowledge base for information transfer and support to the organisation.

Project Title / Description	Duration	My role in the project and a brief description of the Project	Significant Achievements
Measurement of transient busbar currents in HV substations.	1999	I designed and developed a shielded Rogowski coil for busbar current measurements in high voltage substations (1999).	• Developed means of measuring busbar currents interference free.

Project Title / Description	Duration	My role in the project and a brief description of the Project	Significant Achievements
Diverting transient interference currents away from sensitive equipment in substation control rooms.	1999	I designed a conductive bulkhead used for the diversion of transient interference currents, away from substation control rooms, back to the interference source (1999).	• Provided cost effective solution to electromagnetic interference generated in HV substations. • Likely to influence future substation designs.

Project Title / Description	Duration	My role in the project and a brief description of the Project	Significant Achievements
Controlling disconnector generated interference at the source.	1998 – 2000	I designed and developed a resistive damping device (RSA Patent No. 99/7581) to control EMI at the source (disconnectors) in high voltage substations (1999).	• Patent registered. • Provided possible solution to electromagnetic interference generated in HV substations (prototype only).

Project Title / Description	Duration	My role in the project and a brief description of the Project	Significant Achievements
Co-use of servitudes.	2000 - 2003	I was project leader of the establishment of a test site to evaluate the co-existence of a cellular base station and a power system (the support of cellular base station antennas on power line towers).	• Successful establishment of the first base station system in co-existence with a power line in Africa.

Project Title / Description	Duration	My role in the project and a brief description of the Project	Significant Achievements
Use of mobile transceivers in control rooms.	2003 – 2004	I evaluated the electromagnetic radiation levels associated with mobile technology and developed the technical decision framework for the use of mobile transceivers in sensitive areas in Eskom power stations and substations.	• Ensuring a safe / interference free work environment in substation and power stations. • Developed technical decision framework for policy setting. • Influence Eskom policy on use of mobile phones in sensitive work environments.

Project Title / Description	Duration	My role in the project and a brief description of the Project	Significant Achievements
Evaluation of live line worker exposure to 50Hz magnetic fields.	2004	I developed a simplified approach to evaluate magnetic field exposure of live line workers without making use of sophisticated software. In addition, I developed the technical framework to show that live line workers meet the basic restrictions of the ICNIRP exposure guidelines, despite their exceeding the reference level of 500μT.	• Ensuring a safe work environment for live line workers. • Developed technical decision framework for policy setting. • Influence Eskom policy on EMF. • Simplified evaluation technique resulted in cost saving to Eskom.

Project Title / Description	Duration	My role in the project and a brief description of the Project	Significant Achievements
Critical evaluation of public exposure to electric fields of a 765kV line	2004	I evaluated public exposure to electric fields in view of the planned 765kV line and developed the technical framework to show that costly mitigative measures may not be required in view of public exposure exceeding the ICNIRP reference level of 5kV/m but coming close to the basic restriction for induced current density.	• Ensuring a safe exposure environment for public. • Developed technical decision framework for policy setting. • Influence Eskom policy on EMF. • Significant cost saving to Eskom in eliminating need for costly field mitigative measures.

9. Professional Role

9.1 Professional Membership

I held and am still holding the following membership:

Professional Body	Nature of Involvement	Duration
Engineering Council of South Africa (ECSA) – Membership No 920132	Registered as a Professional Engineer	1992 – present.
Institute for Electrical and Electronics Engineers (IEEE) – Membership No 03551637	Member	1993 – 2012.
South African Institute for Electrical Engineers (SAIEE) – Membership No 5398	Senior Member	1991 – present.

Bio-Engineering Society of South Africa (BESSA)	Member	1991 – 2000.
South African Bureau of Standards (SABS) Technical Committee 73: EMC – Working Group 5	Member of Working Group – Health Effects of Non-Ionising Radiation	1999 – 2010
URSI Commission K – Electromagnetism in Biology and Medicine	Alternate local representative	2000 – Apr 2005
CIGRE	Member	2010 – present
Corrosion Institute of South Africa	Member	2012 – present

9.2 Other

I was / am still involved with:

Extremely Low Frequency (ELF) Electric and Magnetic Field (EMF) Programme Executive	Member	1994 – Apr 2005
CIGRE Task Force C4.201 – Immunity in HV Substations	Convenor	2003 – 2007
South African Forum for Radiation Protection – EMF Working Group	Member	2004 – Apr 2004.
Member of Organising Committee (Treasurer) of the 16th International Conference on High Voltage Engineering (ISH 2009).	ISH 2009 (RSA)	2007 - 2009
Member of Organising Committee (Treasurer) of the 6th CIGRE Regional Conference (CIGRE 2009).	CIGRE 2009 (RSA)	2007 - 2009
Appointed Honorary Treasurer of the CIGRE National Committee of South Africa.	CIGRE National Committee (RSA)	2010
Participation in CIGRE SC B2 Activities - Working Group 45 on Veld Fires and Power Lines.	Participating Member	2012 to present
Participation in CIGRE SC B2 Activities - New Working Group on Step and Touch potentials.	Participating Member	2012 to present

10. Patents

I have registered three patents:

Magnetic field shield for computer monitors (RSA Patent No. 98/1894). Patent assigned to Eskom due to conditions of service. Two models: *MAGNA IMPRES* and *MAGNA OPUS* were fully commercialised (1996).

Resistive damping device (RSA Patent No. 99/7581) to control EMI at the source (disconnectors) in high voltage substations (1999). Patent assigned to Eskom due to conditions of service. Prototype developed.

Conductive harness in protection of live stock against ground potential rise set up during lightning activity (RSA Patent App No. 2005/08918) (2005). Prototype developed.

11. Publications

I have authored / co-authored more than 100 papers, on EMC / EMF and topics relevant to my field of study, that were presented at both local and international conferences.

I have contributed to and authored / co-authored chapters in the following books (Eskom Power Series):

- The Planning, Design and Construction of Overhead Power Lines;
- Electromagnetic Compatibility (EMC) in Power Utilities (Under development).