

Curriculum Vitae of Tobie Nortje (Pr.Eng.)

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Nationality	South-African	Languages	Afrikaans, English

Background

Tobie is a professionally registered electrical engineer with more than 23 years experience in the power delivery business and related industries. After a successful career in sub-transmission network planning at Eskom, Tobie became a key member of the Eskom IDM (Integrated Demand Side Management) programme. During his time at IDM Tobie managed the establishment of the Measurement and Verification function and later took ownership of delivering large scale energy and demand savings projects in the industrial and mining sectors. He also worked in the utilities management field before joining the EON Consulting management team as Principal Consultant. In his role as Principal Consultant, Tobie was responsible for the management of the Business Analytics and Decision support Division at EON comprising of 20 consultants and the implementation of various client projects in the utility and infrastructure development environment. This wide exposure has given Tobie an in-depth insight and extensive experience into the following areas:

- Energy Modelling
- Measurement and Verification
- Electrical Systems
- Complex Capital Plans
- Advanced Analytics and Decision Support
- Demand Side Management
- Renewable Technologies
- Business Strategy
- Business Analytics

Qualifications and Key Courses

Qualification	Year	Institution
B. Eng. (Electrical)	1999	University of Stellenbosch, SA
Systems Thinking ¹	2013	D. Stroh & M. Goodman
Professional Consulting	2013	Mike Murray

Professional Associations

Institution	Membership	Year
Engineering Council of South Africa	Professional Engineer	2003
South African Institute of Electrical Engineers	Member	2003

Summary of Working Experience

Company	Sector	Position	Duration
Private Consultant	Tobie Nortje Solutions	Owner	6 months
BBE Energy	Municipal Consulting	Business Unit Manager	3y2m
EON Consulting	Management Consulting	Practice Head (Acting)	6m
EON Consulting ²	Management Consulting	Principal Consultant	5y4m
Enerweb	Engineering and IT	Project Owner	1y1m
House4Hack ³	Innovation	Co-founder	1y9m
TFMC	Engineering	Electrical Design Manager	1y
Eskom	Utilities	Industrial Sector Manager	6y10m
Eskom	Utilities	Planning Engineer	2y5m

¹www.appliedsystemsthinking.com

²Reflects total time employed by EON Consulting

³Involvement was mostly in parallel whilst employed by Enerweb

Authored Papers

- **Measurement and Verification: Matching the Costs to the Needs**, Tobie Nortje, Willem den Heijer, Prof. L.J. Grobler, 2004, *Presented at the Industrial and Commercial Energy Use Conference and published in Energize magazine⁴ magazine during 2004.*
- **DSM implementation in South Africa** ⁵, Tobie Nortje, Mari-Louise van der Walt, *Vector Magazine, April 2007*

⁴<http://www.eepublishers.co.za/images/upload/Pg52-55Measurementandverification.pdf>

⁵<http://eepublishers.co.za/images/upload/InstallationSoutAfrica.pdf>

Summary of Electricity Tariff Related Assignments

Project	Client	Year
Motraco/EDM Wheeling/Trading Contract	APV Pty(LTD)	2020
Cost of Supply	APV Pty(LTD)	2020
Electrical Tariffs Design	Madibeng Municipality	2020
Cost of Supply	Madibeng Municipality	2020
Electrical Tariffs Design	Stellenbosch Municipality	2019
Cost of Supply	uMhlathuze Municipality	2017
Bulk Service Contribution	uMhlathuze Municipality	2017
Cost of Supply	Mbombela Municipality	2017
Cost of Supply	Stellenbosch Municipality	2017
Renewable Energy Tariff	Stellenbosch Municipality	2017
Wheeling Tariff	Stellenbosch Municipality	2017
Cost of Supply	City of Ekurhuleni	2016
Renewable Energy Feed in Tariff	City of Ekurhuleni	2015
Cost of Supply Study	City of Ekurhuleni	2015

Summary of Utility Consulting Experience

Tariff Analysis, East London Industrial Development Zone (Pty) Ltd - A review of the current ELIDZ tariffs structure to their customers was conducted. The scope included: 1. *Alignment between current tariff structures and the NERSA guidelines for Re-sellers*, 2. *Assess the current Eskom, Municipality and ELIDZ tariff structures*, 3. *Reporting on profit and loss model*

Costing of the implementation of the Municipal Environmental function, SALGA - SALGA quantified the cost to implement the environmental functions within the country for treasury consideration. The project scope involved: 1. *Data analysis and data requirements specification* 2. *Data sample design* 3. *Data collection protocols* 4. *Data collection* 5. *Developing an Excel based decision support model to quantify impacts and assist what if analysis*; 6. *Detailed findings report and excel models*.

Gauteng Energy Strategy, COGTA - COGTA was tasked with the implementation of the Gauteng Energy Strategy (GESS). A significant portion of the work consists of the modelling of various technologies for implementation consideration. The model was developed by Mr. Tobie Nortje. It included the following technologies - *Electricity, Solar PV, Coal generation, Storage technologies, Tri and Co-generation, Grid infrastructure, Smart grid potential, Municipal structures, Eskom structures, Independent Power Producers, Electric Vehicles, Waste to Energy Technologies (Landfill gas, Wastewater Treatment), Energy efficiency technologies*

Development of Alternative Energy Tariff, *City of Ekurhuleni* - Development of a Alternative Energy Tariff for a large South-African Metropolitan Municipality. The increased cost of electricity, market innovations as well as extended periods of load shedding have been a strong driver for the increase in the connection of alternative (non-traditional) Small-scale embedded generation (SSEG) capacity to electrical networks. To enable the connection of Alternative Energy generators the need has arose to develop an electricity tariff specific to these interventions.

Technical Losses Study, *City of Ekurhuleni* - The task of splitting the total electrical network losses into technical and non-technical losses is drastically improved if the technical losses could be estimated as accurate as possible. This highlights the real size of the non-technical losses (money lost). Tobie conducted a study at a large Metropolitan Municipality to calculate the total network technical load loss (I^2R) as a percentage of the total load and company level, as well as determine the possible seasonal variation in technical loss percentage for the electrical network.

Impact of Disruptive Forces on the Utility, *City of Ekurhuleni* - The proliferation of Renewable Energy Technologies as well as the eminent introduction of Electric Vehicles into the economy causes uncertainty with regards to the operating models of Electrical Utilities, Metros and Municipalities. Various funding sources is accelerating the uptake of these technologies. Tobie lead a team of experts that determined the potential of cost savings and/or reduction in revenue and other impacts, potential financial and economic advantages or threats, when customers migrate away from Eskom generated electricity to these “disruptive” renewable and/or efficient options.

Time of Use impact study, *City of Ekurhuleni* - Tobie conducted a financial impact study for 8000 affected Large Power Users and the Utility with the structural change in the Eskom MegaFlex Tariff in 2015.

Cost of Supply Study Study, *City of Ekurhuleni* - The NRS 058 (Cost of Supply Methodology for the application in the Electrical Distribution industry) prescribes how to regulate energy prices to different customer classes whilst being fair and equitable and at the same time yielding the expected budgetary income per annum. Tobie lead a team of experts that conducted one of the first successful Cost of Supply studies in South-Africa in accordance with NRS058.

Utility Business Case Review, *City Power* - Tobie managed a diverse team of experts in reviewing the current client business case against the current policy and regulatory environment, energy supply and demand options, customers, network infrastructure, gas and petroleum sources and revenue impacts. The team made recommendations regarding the potential future business structure in the short, medium and long term to support the envisaged transition from a utility to an energy company.

Shift work implementation, *City Power* - Tobie researched shift work paradigms and used this knowledge to model tailored shift implementation options. The client was able to use these models in negotiations with organised labour to determine the optimal shift scenario.

Large capital budget optimisation, *Eskom* - Eskom faces many challenges related to its complex and very large 5 year capital plan (MYPD3). Tobie formed part of the management team that rationalised and prioritised this budget and was responsible for the development of a methodology to 'scrub' the portfolio as part of a capital efficiency drive.

Asset handover process, *City Power* - Tobie developed and refined the handover process between Capital Execution and the Maintenance division.

Equipment condition assessments, *City Power* - Tobie managed a team of engineers that delivered detailed condition assessments for various client transmission and distribution substations. These assessments forms a key input into the client short and long term refurbishment planning.

Online energy game, *Eskom* - Using his energy knowledge Tobie developed the algorithms and models used in the educational online Eskom Energy Planner Game⁶. The game play was realistic and based on the challenges an electrical utility will face in supplying energy to it's clients. This game was a finalist in the Games of Change Competition in the USA⁷.

Residential energy use end use research, *Eskom* - Tobie led a team of researchers and hardware specialists that investigated the use of a new meter to measure residential energy consumption in a non-intrusive (non-appliance) level. Tobie was also responsible for the analysis of the data obtained with the device and the de-composition of this data into specific end use consumption profiles e.g. cooking, pool pumps. Various software systems were used during this research including Python, MySQL and SQLite.

Review of MYPD and IRP input data, *Eskom* - Tobie was responsible for the automation of data extraction from various data sources within the IDM environment. The data sets were then transformed into specific inputs to the MYPD and IRP planning processes. This automatic process reduced weeks of manual labor into a trivial exercise lasting around an hour or two.

Residential efficient equipment mass roll out impact modelling, *Eskom* - Tobie was responsible for the (technical) impact modelling of the Eskom IDM Mass Residential Roll out project.

Asset remnant life estimation, *City Power* - Tobie managed a team of analysts and engineers in the estimation of the remaining useful life of specific primary plant equipment at 10 client substations. The AG (Auditor General) requires this from all municipal entities. Using a mixture of quantitative data (loading, maintenance, fault analysis) and qualitative visual

⁶<http://eskomidm.co.za/energyplannergame/>

⁷<http://www.gamesforchange.org/play/eskom-energy-planner/>

inspections a model was developed to estimate equipment remnant life at a level acceptable to the AG.

Homeflex residential tariff design, *Eskom* - Tobie managed the research team that was investigating the implementation of this new tariff in an initial pilot phase. The Homeflex tariff aims to introduce a two part, seasonally differentiated tariff in the residential sector. The project team was responsible for a representative sample design, various data analysis and online reporting initiatives.

Critical Peak Day demand response tariff pilot, *Eskom* - Tobie managed a research team that was investigating the implementation of a Demand Response tariff option in the small commercial and industrial sectors. The team was responsible for the sample design, marketing material and customer conversion to the new tariff. Various online data analysis and reporting tools were also developed to assist with customer support. A platform was also developed to notify participants a day ahead of pending Demand Responsive schedules.

Hot water analysis online tool, *Eskom* - Tobie developed an online tool that enables customers to make better informed decisions by enabling them to do comparisons of various hot water technologies on an intra day but also yearly energy use base.

Innovation management, *Eskom* - Tobie led a team of innovation experts in the development and delivery of an innovation strategy for the client. This included the whole innovation value chain from opportunity investigation to implementation.

Hot water systems research project, *Eskom* - Tobie developed a thermodynamic model to simulate yearly energy consumption between normal household hot water cylinders, solar water heaters and heat pump technologies.

Integrated Demand Management, *Eskom* - Tobie led a team of consultants that provided specific solutions of energy efficiency projects. This includes the day to day management and administration of the department and strategic support to the senior management team.

Various modelling exercises, *Eskom* - On an ongoing basis Tobie is involved with technical modelling exercises. Past modelling includes – Energy models, Lighting sustainability models, Hot water models, Solar radiation models, Energy Efficient household appliance savings models.

Energy efficiency product development, *Eskom* - Tobie is a member of various client project teams that is developing specific energy efficiency market solutions including – efficient lighting and hot water supply.

Standby generation research project, *Eskom* - Tobie performed research that informed the client on the potential electrical demand reduction that can be achieved using domestic and residential estate standby generation systems.

Strategic sourcing, *Eskom* - Tobie led a large team of analysts and consultants that assisted the client to secure the long term supply of strategic commodities including – substation clamps,

transformers, high voltage circuit breakers, wooden poles, steel and cement. An approved strategic sourcing methodology was applied to each commodity.

Asset management, Eskom - Tobie was part of a team that developed a detailed asset management strategy and implementation plan for the client. The strategy and implementation plan will ultimately lead the client to international PAS55 certification.

IT Systems health indicator, Arivia - Tobie was part of a team that develop a dashboard that could indicate to the client the inherent risk present in relevant IT systems deployed at its customer sites.

Asset valuation, Neotel - Tobie led a team of consultants and chartered accountants that investigated the intrinsic asset value of the diverse client asset base ranging from legacy systems to modern state of the art fibre optic systems.

Advanced Meter Research (Smart Meter), Eskom - Tobie was part of a team that investigated the current state of the art related to smart and advanced electricity utility metering systems.

Contractor management, Eskom - Tobie was part of a team that investigated the current contractor base used by the client, and the development of strategies to ensure optimal use of professional services supplied by contractors.

Hot water generation research, Eskom - Tobie was part time project manager and subject matter expert in the investigation into the optimal roll out of Solar Water Heating systems in South Africa.

Online energy auditing tool, Eskom - Tobie developed an online energy auditing tool to assist households to calculate their monthly energy consumption. The tool also makes very clear recommendations on how to save energy. The tool can be accessed on the client website.

Energy efficiency green bond research, Eskom - Tobie researched the various funding options that could be applied to finance electrically efficient and other “green” technologies.

Energy losses management programme, Eskom - The energy losses analysis research project has two distinct objectives, to identify the extent of the contribution of technical energy losses to the increasing trend of energy losses in Eskom Distribution and to test the hypothesis of customer stratification in non-technical energy loss management. One of the streams associated with Revenue protection is technology. Tobie was involved with the development of a geographical reporting system to aid in the planning and auditing of LPU, SPU and prepaid customer metering audits. He is also involved in the development of an interactive reporting tool which can be accessed by management and roll players.

Working Experience

Municipal Business Unit Manager · BBE Energy
September 2017 to present · 2 year 2months
Pretoria · South-Africa

The municipal business unit focuses on delivering projects of the following nature:

- Tariffs and Cost of Supply studies
- Network Planning and Losses studies
- Municipal EEDSM applications and projects
- Waste Water Treatment plants
- Bio-gas facilities

Head of Practice · EON Consulting
June 2016 to October 2016 · 6 months
Johannesburg · South-Africa

The head of the Management Sciences Consulting Practice have the following responsibilities:

- Project delivery
- Financial management
- New business development
- Client management
- Account management

Principal Consultant · EON Consulting⁸
October 2012 to Present · 3 year 5 months
Johannesburg · South-Africa

In his role as Principal Consultant, Tobie was responsible for the management of the Business Analytics and Decision support Division at EON and the implementation of various client projects in the utility and infrastructure environment. Current projects include:

⁸www.eon.co.za

- Tariffs and Cost of Supply Studies
- Developing condition based assessment methodologies in the municipal substation environment
- Optimisation and scrubbing of large multi-year capital budgets in the utilities environment
- Development of best practice asset handover processes between construction and maintenance environments
- The development of a Secondary Plant (Protection, Metering and Tele-control) medium term plan to increase network availability

Co-founder · House4Hack⁹

September 2011 to May 2013 · 1 year 9 months

Pretoria · South-Africa

The House4Hack is an initiative to bring together technology specialists and entrepreneurs in an informal setting. The setting is a 400m² house in in Centurion and is equipped with various prototyping tools. We are trying to combine concepts from hacker-spaces and innovation incubators in a way that hobbyists, folks stuck in corporations that want to take a break from their regular job can experiment with start-ups and technology in a safe friendly environment.

Project Owner · Enerweb¹⁰

September 2011 to September 2012 · 1 year 1 month

Johannesburg · South-Africa

Tobie was employed within the DI (Demand Intelligence) group within Enerweb. DI focuses on understanding how customers use electricity and the numerous factors that influence energy usage. DI plays a critical role in rate design, capacity planning, load forecasting, distribution system planning, customer relationship management and energy efficiency program design and evaluation. Load research activities offered by the DI group includes:

- Medium and long term energy and demand forecasting
- Tariff impact analysis and tariff design support
- Demand response programme impact studies

⁹www.house4hack.co.za

¹⁰www.enerweb.co.za, Enerweb was subsequently acquired by the EOH group

- Demand Side Management programme impact analysis
- Price elasticity of demand studies
- Sectoral demand profile research
- Time zone impact analysis

Tobie focused on researching residential energy use patterns and the design of residential and commercial demand response tariffs.

Managing Consultant · EON Consulting
September 2007 to August 2011 · 4 years
Johannesburg · South-Africa

Tobie joined the EON consulting management team as Managing Consultant. As Managing consultant Tobie has been involved in the management and delivery of numerous and diverse client projects including:

- The implementation of an innovation management strategy
- Conducted an asset valuation at Neotel to satisfy lenders and insurers requirements
- Hot water generation systems research and modelling
- Integrated Demand Management project management office establishment and management
- Development and modelling of new Integrated Demand Management market offerings
- Development of a green bond strategy and associated research
- Development of an open innovation strategy
- Investigating the use of small standby generators for residential application
- Development of strategic sourcing strategies
- Development of a mass roll out strategy for Solar Water Heaters
- Development of Distribution and Low Voltage asset management strategies (PAS55)
- Various customer training initiatives
- Executive reporting and dashboards
- Renewable technologies business cases
- Implementation of energy losses reduction programmes
- Advanced metering research

Electrical Design Services Manager · TFMC
November 2006 to October 2007 · 1 year
Centurion · Pretoria

Tobie joined the TFMC Professional Services management team as the head of the electrical design department. The department was responsible for all electrical designs related to the supply of electricity to Telkom infrastructure ranging from small installations to high availability supply to critical data centres. The function also tightly integrated with other engineering functions e.g. Mechanical Engineering for the supply of reliable HVAC to sensitive IT infrastructure and adequate fire protection systems.

Industrial Sector DSM Manager · Eskom
May 2004 to October 2007 · 3 years 6 months
Sunninghill · Johannesburg

Promoted from M&V (Measurement and Verification) manager to the IDM (Integrated Demand Management) Industrial Sector Manager, Tobie led a team that was responsible for the strategic management and implementation of energy and demand savings in the industrial and mining sectors.

His duties included the development of energy and demand savings business cases for financial close and implementation contracting. During this time Tobie developed strong technical and financial evaluation skills. He was responsible for the development of more than 70 business cases with a combined value exceeding R200million.

Tobie was also responsible for the marketing of the industrial sector savings options and offerings to the South-African industrial and mining market.

Measurement and Verification Manager · Eskom
May 2003 to April 2004 · 1 year
Sunninghill · Johannesburg

Tobie furthered his Engineering career when he was appointed as the Measurement and Verification (M&V) manager during the startup phase of the Eskom IDM (Integrated Demand Management) programme.

The IDM programme's soul aim was to try and reduce the impact of anticipated energy supply shortages from 2007 onward by implementing large scale energy efficiency and load shifting projects.

Tobie was tasked with the establishment of an independent network of M&V authorities within the South-African University and Technicon sector. Working closely with these

authorities the energy savings and demand impact of many projects (Residential, Commercial and Industrial) were measured, verified and reported to Eskom and the National Energy Regulator of South-Africa.

He was also involved in the development of various M&V protocols and policies applicable to the South-African market. The standardisation of these protocols were a key factor in controlling the cost of the M&V function. Tobie also worked towards creating a standardised measurement approach and equipment for IDM projects.

Network Planning Engineer · Eskom
January 2000 to April 2003 · 2 years 4 months
Brackenfell · Cape-Town

Tobie started his engineering career as Distribution network planning engineer for the West Coast region, including the Northern Cape bordering the Orange River. As planning engineer Tobie was responsible for the long-term sub-transmission network planning in this region (11kV to 132kV).

His duties included the planning, specification and positioning of substations, HV lines and equipment to supply growing electrical loads. Tobie is proficient in load flow analysis and fault level studies using tools like PSSE, DigSilent Power Factory and SmallWorld.

He was also responsible for the financial evaluation of project and had to ensure projects were released within time to meet a two-year lead-time. laBy combining these skills Tobie developed network development plans (5 year planning horizon) and network master plans (20 year planning horizon).

Tobie was also a member of various network planning work groups.

The following attachments was removed due to limit file size and is available on request:

- Electrical Engineering Degree
- ESCA, Pr. Eng Certificate
- Certified Energy Manager Certificate
- Systems Thinking Certificate
- Identity Document