Tshwane University Innovation Challenge #1

Reduce Cable Theft and Unauthorised Use of Electricity

Deadline for Submission
27April 2020

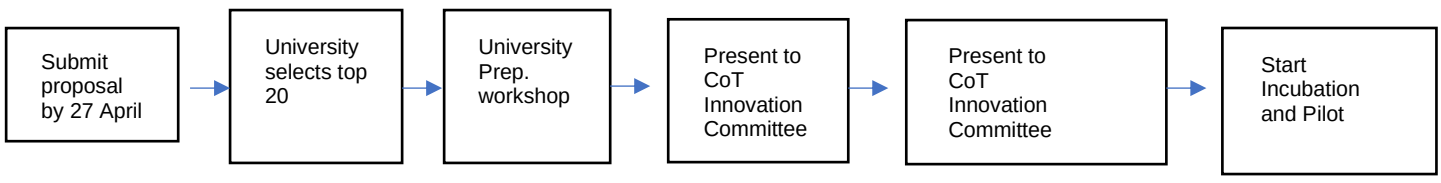
Challenge overview

The City of Tshwane's Electricity Division would like students to propose innovative ideas to address either: (1) theft of overhead and underground copper cables, as well as vandalisation of electricity infrastructure which results in power outages and significant replacement costs for the municipality; or (2) tampering with or bypassing of electricity meters or unauthorised/illegal connections to the electricity network which means that some residents and are not paying for services and creating safety issues in their communities.

What we are interested in

Meter tampering and the illegal connection of electricity are detrimental to the economy and regular public awareness campaigns have been held to encourage residents to report illegal and corrupt activities. However, these initiatives have only had partial success. So we are interested in new ways of improving the identification of incidents and addressing underlying issues driving electricity cable and infrastructure theft and illegal connections, such as low-value alternatives to copper conductors, creative applications of IoT and analytics-based approaches, community-led education programmes and better management of technicians.

Challenge process



Evaluation Criteria

Novelty Is it something we haven't seen before?	**Feasibility** Can it be implemented within reasonable time and cost?	**Team** Do you and your team have the right mix of skills to do this?	**Impact** What is the potential impact on City service delivery or revenue?

What's in it for you?

Up to 12 projects will share R1.2 million in funding and receive technical assistance for the piloting of solutions in the City of Tshwane. Your university will provide top-up seed funding and/ or incubation support as needed.

Who may apply?

As of 1 March 2020, at least one team member must be registered as a student (not staff member e.g. post-doc) at Tshwane University of Technology, University of South Africa (national) or University of Pretoria. Teams do not (do) need to be formally registered as a business with CIPC.

Submissions will be received and reviewed by the project partners and your university, and will not be shared with other organisations or individuals.

Appendix A: Challenge Background

The City of Tshwane's Electricity Division supplies over 4 million households with electricity and manages public lighting services. Electricity is generated by Eskom at several power stations and transmitted to the City of Tshwane on high voltage overhead powerlines. The City then distributes medium and low voltage electricity to individual households, complexes, businesses, and government buildings through overhead and underground cables. Users of electricity are charged for how much electricity they use, and approximately 70,000 low-income households receive a fixed amount of 50kWh of free electricity per month. The City is working on a number of projects to improve the sustainability of electricity supply in the region, however, we have identified two issues we would like university students to address for this challenge:1) theft of copper cables and other components that are used for the distribution of electricity, and 2) tampering with or bypassing of electricity meters or unauthorised/illegal connections to the electricity network.

What is the situation?

Theft of copper cables and associated components of electricity infrastructure is a well-known problem in South Africa and it affects many services, from the supply of electricity to households to the operation of trains. Based on the City of Tshwane experience and research, the theft of cables typically involves both subsistence thieves working at a smaller scale in urban areas and more organised syndicates working at a large-scale in more rural areas. Theft has moved from overhead to underground cables.

Perpetrators typically ‘trip’ a cable by starting a fire or cutting the line to interrupt the electricity supply, then remove the line. Cables are often cleaned in informal ‘bucket shops’ acting on behalf of metal waste recyclers who on-sell to export syndicates and as inspection of recyclers improves - unattended containers which are shipped out of the country. Tampering with meters and unauthorised/ illegal connections in residential areas in South Africa is largely a result of the difficult financial situation many households are in, but also because billing is confusing or inaccurate and residents do not feel they can trust the system. Research has found that technicians from municipalities and Eskom often support those involved with cable theft and unauthorised connections and meter tampering.

What has been tried here and in other regions?

Technology: The municipality has explored a variety of electronic and IoT-based solutions for detecting and monitoring cable theft, meter tampering, and illegal connections. As in other countries, Gauteng municipalities have also analysed incident and usage data to map cable theft hotspots and identify anomalies in consumption which could indicate illegal connections. Copper cables have also been replaced with lower-value alternatives, however, these have not been immune to theft. Can challenge participants improve on existing IoT-based monitoring, data analysis, and cable replacement approaches?