27th Technical Convention 2019

The 4th Industrial Revolution ("4IR") | *Building the Power Utility of the Future, Today*

LOW COST INTELLIGENT OUTAGE MANAGEMENT

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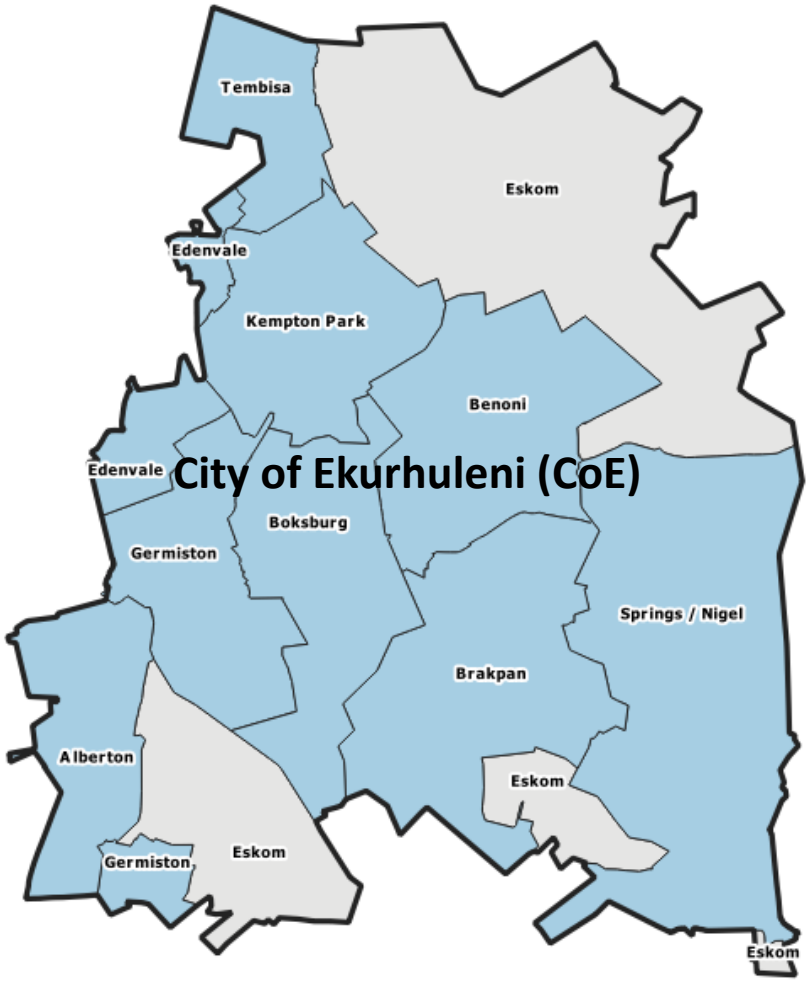
HOD: Energy, (Energy Revenue Services)

City of Ekurhuleni, (City of Ekurhuleni)

Hosted by CITY OF CAPE TOWN ISIXEKO SASEKAPA STAD KAAPSTAD

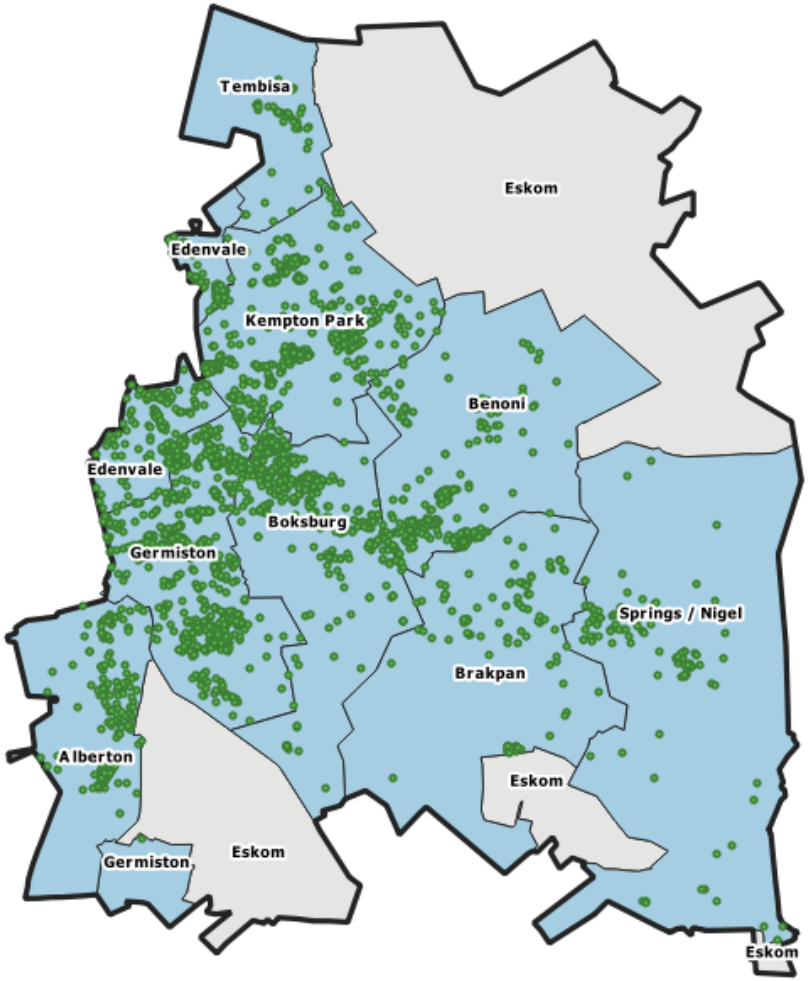
Introduction

- The industrial hub of Gauteng
- 1 300 000 households
- 115 375 informal dwellings without access to electricity
- 9 Electricity Distribution Business Units (DBUs)
- Power outages negatively impact customers and the municipality
- Cost effective solution for notification of power outages required to minimise downtime



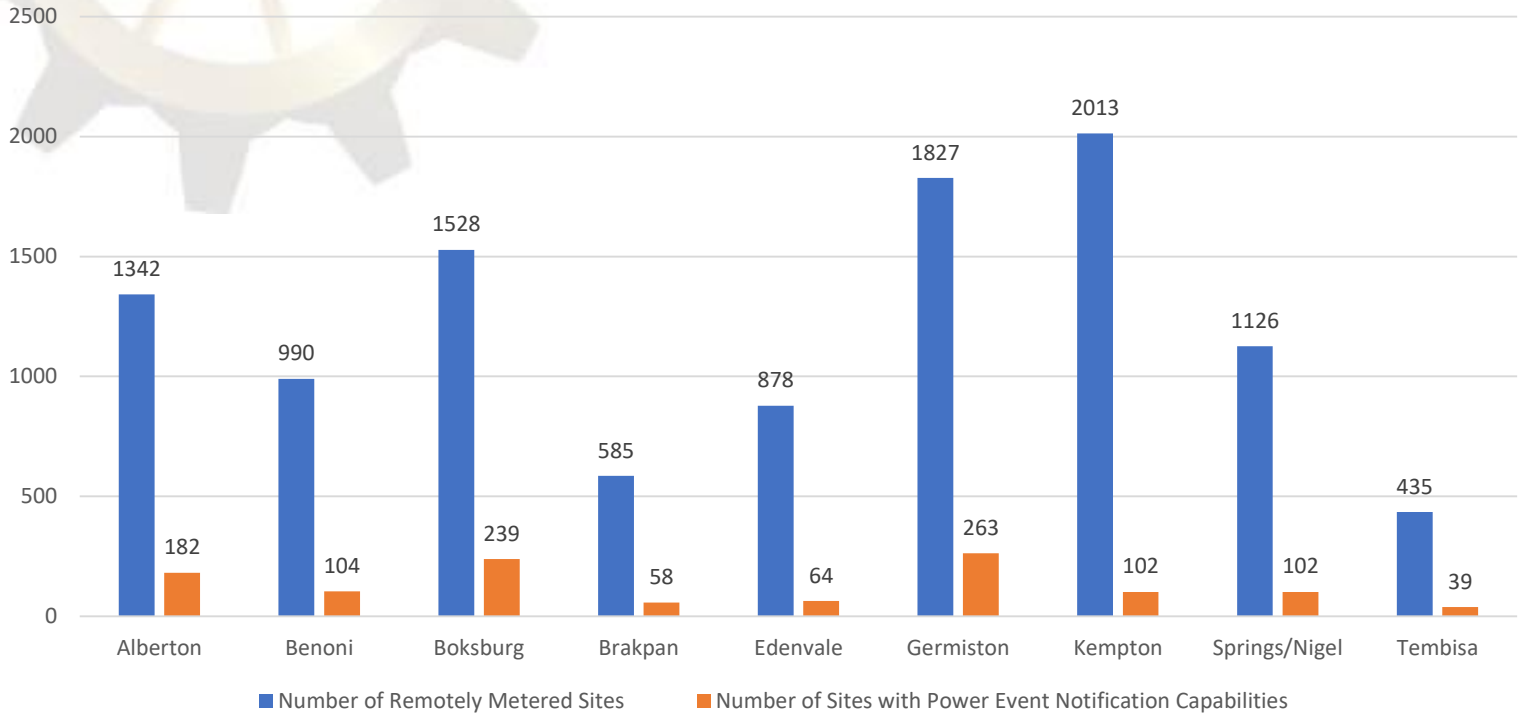
Factors influencing adopted solution

- Remotely read meters deemed to be acceptable as:
  - Key customers and large business customers all metered remotely
  - Residential bulk connections remotely metered, providing notifications of area outages in surrounding residential areas
- Suitable open source software and in house skills available



Power loss and return event alerting

10 724 sites are remotely metered of which 1 153 are currently capable of generating notifications of power loss and return events



Distribution of Remotely Metered Sites and Power Event Notification Capabilities between DBUs

Power loss and return event alerting (continued)

The modems at the sites monitored by the system provide a “last gasp” notification of a power loss event that has occurred. On a power return event the modem provides notification of the power return event.

The remote metering service provider sends the following notifications to the Energy Department:

- SMS notifications to staff whose cell phone numbers have been included in the notification list.
- Email notifications to staff whose email addresses have been included in the notification list.
- A HyperText Transfer Protocol (HTTP) Post request to an Energy Department HyperText Preprocessor (PHP) server for further processing.

Display of Power Loss and Return Events

Accomplished using a PHP server and a script supplied by the remote metering service provider to process the HTTP Post request sent to CoE and the following open source software:

- A PostgreSQL database (https://www.postgresql.org/) for the processing and logging of the power loss and return events together with PostGIS (https://postgis.net/) to spatially enable the PostgreSQL database.
- GeoServer (http://geoserver.org/) to publish the spatial data.
- Leaflet (https://leafletjs.com/) to display the map showing current power outages.

Logging of Power Loss and Return Events

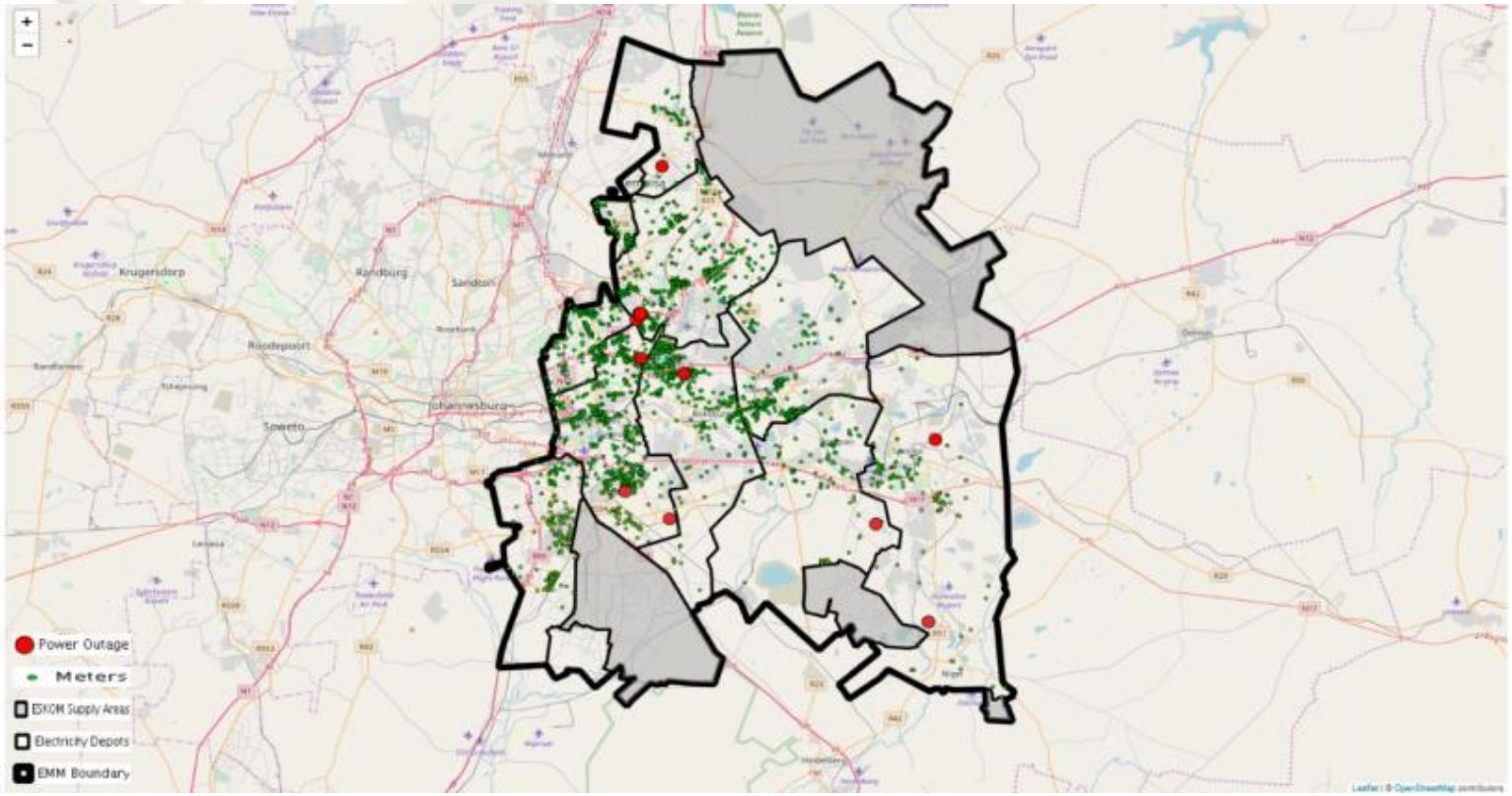
The HTTP Post request parameters are processed by the PHP script and the status (power loss or return) of the site/s updated within the PostgreSQL database.

The update triggers a stored procedure which then logs the event after assigning a sequential (per site) event number and, if a power return event, classifying the power outage in accordance with NRS 048-2: 2007 for interruption durations longer than 3 seconds and as a voltage dip for interruption durations less than or equal to 3 seconds.

Display and logging of Power Loss and Return Events

(continued)

A map of the current power outages can be displayed in any web browser from within the CoE ICT network using an intranet URL.



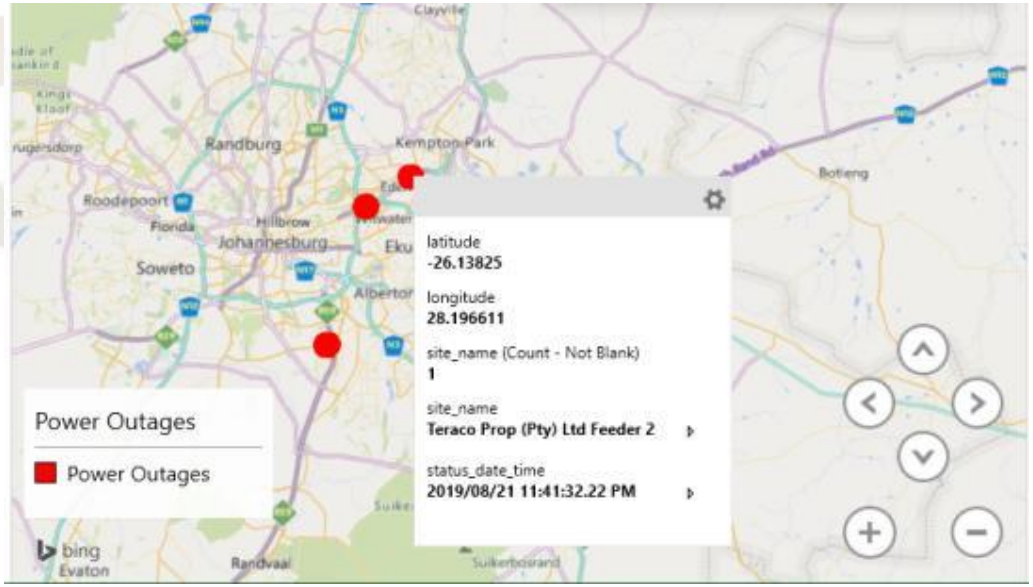
Reporting on power loss and return events

Achieved using MS Excel. The spreadsheet is automatically updated through a data connection to the PostgreSQL database when the spreadsheet is opened. The spreadsheet can then be used to analyse and report on the data.

	A	B	C	D	E	F	G	H
1	event_number	action_tstamp	site_name	account_number	elec_depot	status	outage_duration	outage_classification
212	16	2018/12/11 16:57:08	Actom (Pty) Ltd	3501974695	Springs	Power Outage		
213	16	2018/12/11 17:01:17	Actom (Pty) Ltd	3501974695	Springs	Power Restored	00:04:09.622	Momentary Interruption
214	17	2018/12/28 14:16:57	Actom (Pty) Ltd	3501974695	Springs	Power Outage		
215	17	2018/12/28 14:39:03	Actom (Pty) Ltd	3501974695	Springs	Power Restored	00:22:05.969	Sustained Interruption
216	18	2018/12/29 14:33:02	Actom (Pty) Ltd	3501974695	Springs	Power Outage		
217	18	2018/12/29 14:33:02	Actom (Pty) Ltd	3501974695	Springs	Power Restored	00:00:00.146	Voltage Dip
218	19	2019/01/07 22:22:45	Actom (Pty) Ltd	3501974695	Springs	Power Outage		
219	19	2019/01/07 23:12:54	Actom (Pty) Ltd	3501974695	Springs	Power Restored	00:50:09.437	Sustained Interruption
220	20	2019/05/03 12:57:16	Actom (Pty) Ltd	3501974695	Springs	Power Outage		
221	20	2019/05/03 13:31:16	Actom (Pty) Ltd	3501974695	Springs	Power Restored	00:33:59.542	Sustained Interruption

Current power outage visualization in Excel

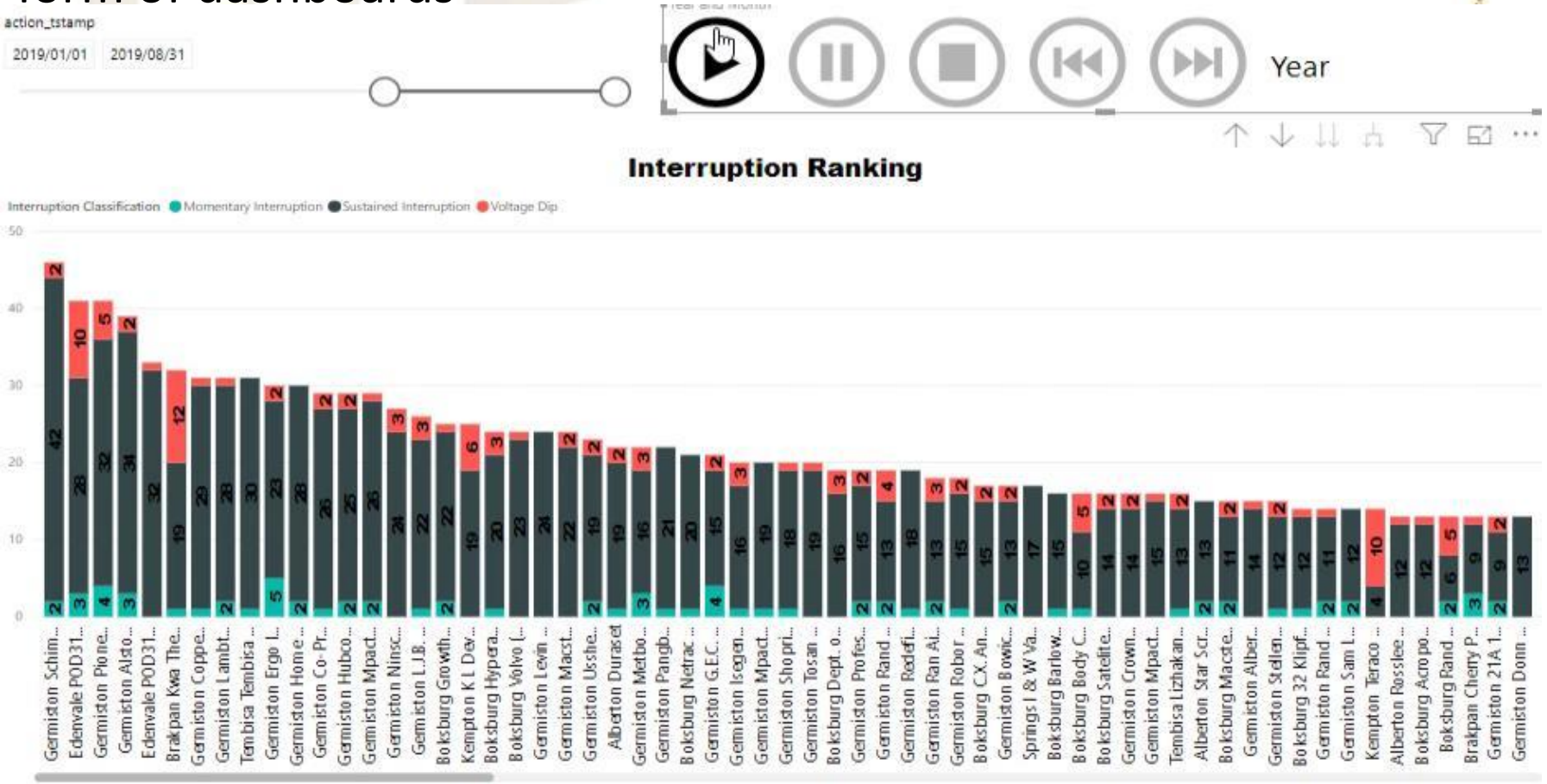
Current power outages displayed spatially in Excel and in tabular format together with the date and time and duration of the current outage.



	A	B	C	D	E	F	G
1	site_number	account_number	site_name	elec_depot	power_status	status_date_time	outage_duration
2	93614302		POD31b: Edenvale Town Supply Sub 2	Edenvale	Power Outage	2019/08/22 10:33:36	0.01:38:07.135
3	15548696	1708105655	Teraco Prop (Pty) Ltd Feeder 2	Kempton	Power Outage	2019/08/21 23:41:32	0.12:30:10.822
4	15682942	3500255682	I & W Van Der Merwe Boerdery	Springs	Power Outage	2019/08/21 21:01:37	0.15:10:06.060
5	15682893	2101071647	Soleprops 39 (Pty) Ltd	Alberton	Power Outage	2019/08/19 22:30:47	2.13:40:55.769

Business Intelligence derived from the data

Power BI is used to derive information from the data in the form of dashboards



Interruption ranking by site (customer) for number of interruptions from 1 January 2019 to 31 August 2019 (animation by month over period)

Future enhancements

Using data on substation zones together with notifications of power loss events from check meters on substation feeders, as well as GIS based feeder connectivity models, to allow power loss and return events for customers downstream of feeder outages to be reliably logged is being investigated.

A power loss notification includes the rolling 12-month Maximum Demand for a customer. The value of using this together with the interruption duration in hours and the load factor for the substation zone to calculate an estimate of the energy lost as a result of the power interruption is being considered.

Conclusion

The system has shown itself to be an effective and efficient low-cost method for:

- the display, monitoring and alerting of power loss and return events.
- providing the underlying historical data to assist in identifying problem areas that contribute to network downtime thus providing valuable input to contributing to optimal reliability of supply to customers.

There is potential to substantially enhance the value derived from the system through further innovation and development.

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Thank you

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