



## Modeling Low Voltage Distribution Networks.

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The load demand on the electricity mains supply causes voltage drop down the distribution mains network. The demand is driven by deterministic and random processes. Extreme values in the demand may result in under and/or over voltage problems for customers and current overload problems in the network conductors and/or generation of negative sequence currents in 3-phase motors.

A model has been developed to predict the customer load. It takes account of diurnal, seasonal, and temperature factors together with a statistical model that replicates customer behaviours.

### RINO

RINO is a program Hyland McQueen Limited have developed that implements this model using a Monte Carlo technique. It provides prediction of the voltage and current distributions within the mains distribution network. The model is able to incorporate single rings in the network topology.

### Example

The feeder network from a distribution transformer supplying residential customers was analysed using RINO before and after remedial work. The results for a customer where problems had been reported is shown in figure 1 together with actual distributions of voltage quality recorded at the premises.

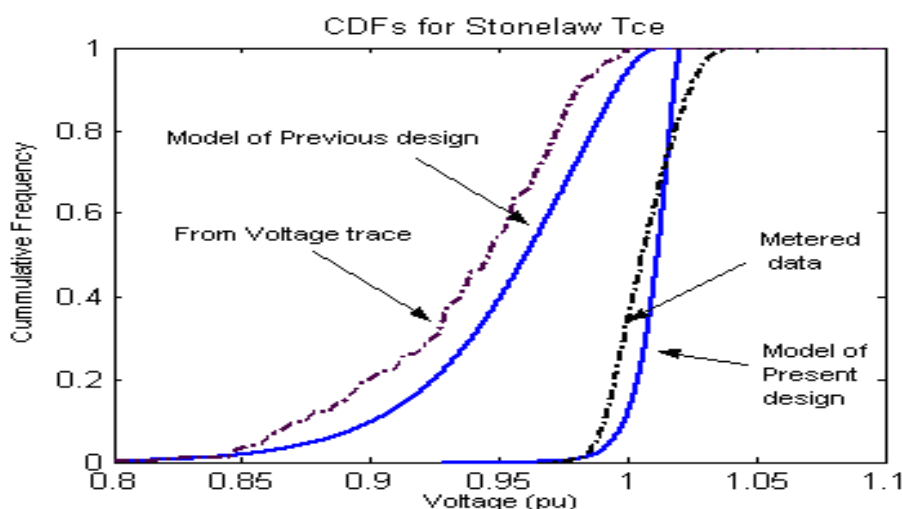


Figure 1: Voltage CDF for the complaining customer on the network

Results of the analysis agree well with monitoring measurements both before and after network remedial work.

The distribution network is shown in figure 2. Voltage and current PDFs are shown for the section of feeder \_E to \_F.

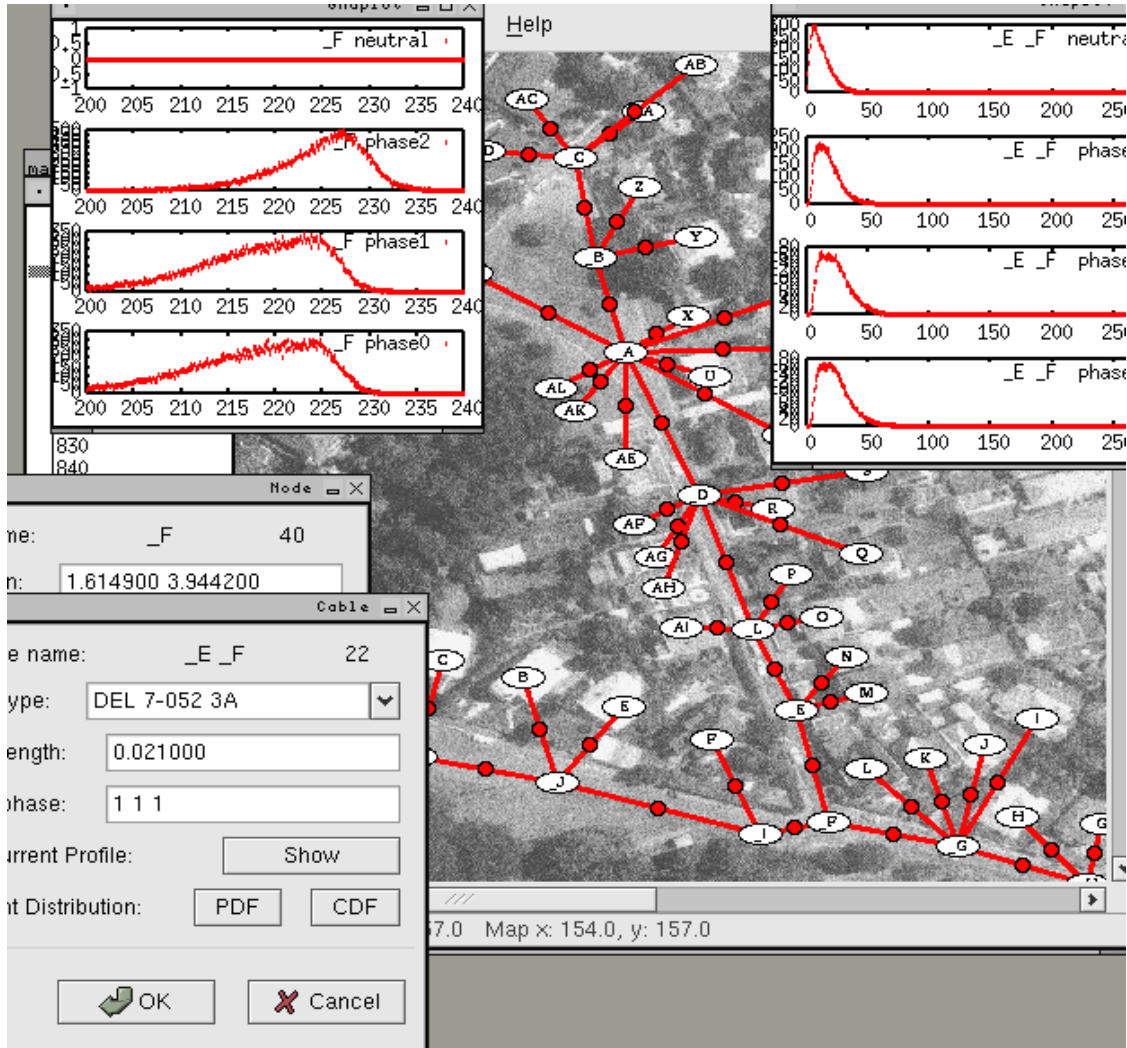


Figure 2 – Distribution network showing voltage and current PDFs for a single section.

## Service

Hyland McQueen offer a specialist service for the analysis of mains distribution networks for utility customers including network design and/or re-design, voltage quality and motor issues believed to result from voltage unbalance.

