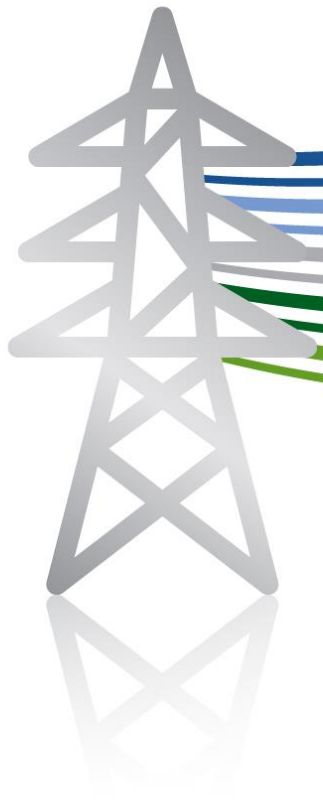


Network Model

SAVE Closedown Event – 6 June 2019



Paul Morris – EA Technology

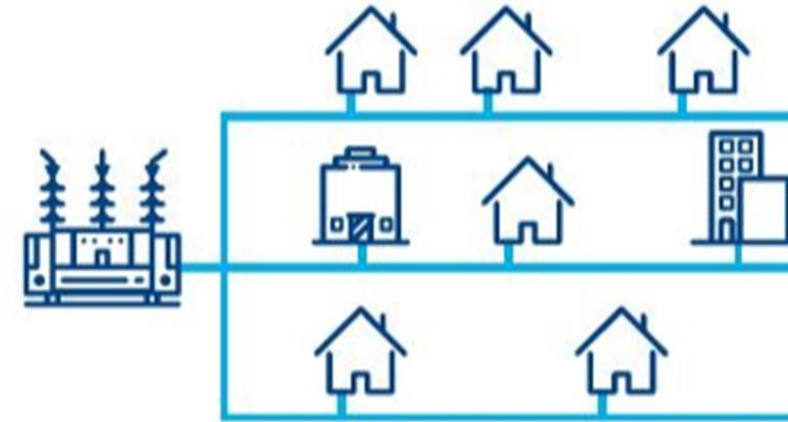


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The Network Model

Traditional approaches have used design rules to manage LV Networks.

- Low insight into what is happening
- Cannot express the effect of non network solutions



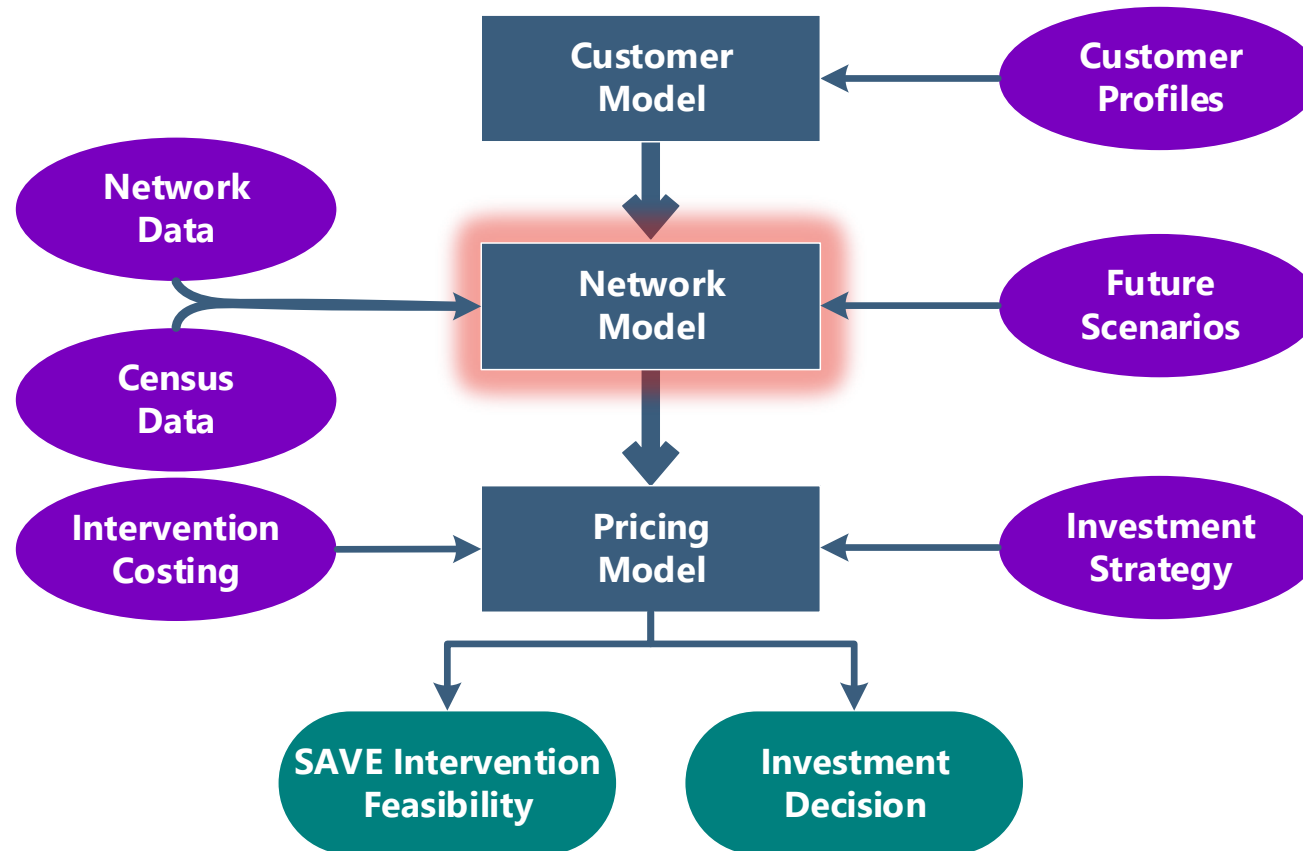
The Network Model delivers:

- Visibility of any present issues
- Visibility of how energy efficiency and Low Carbon Technology (LCT) growth changes the network

The Network Model enables:

- Investigation into the best way to manage the network

Components



“How will our customers behave”
“How will energy efficiency change customer behaviour?”

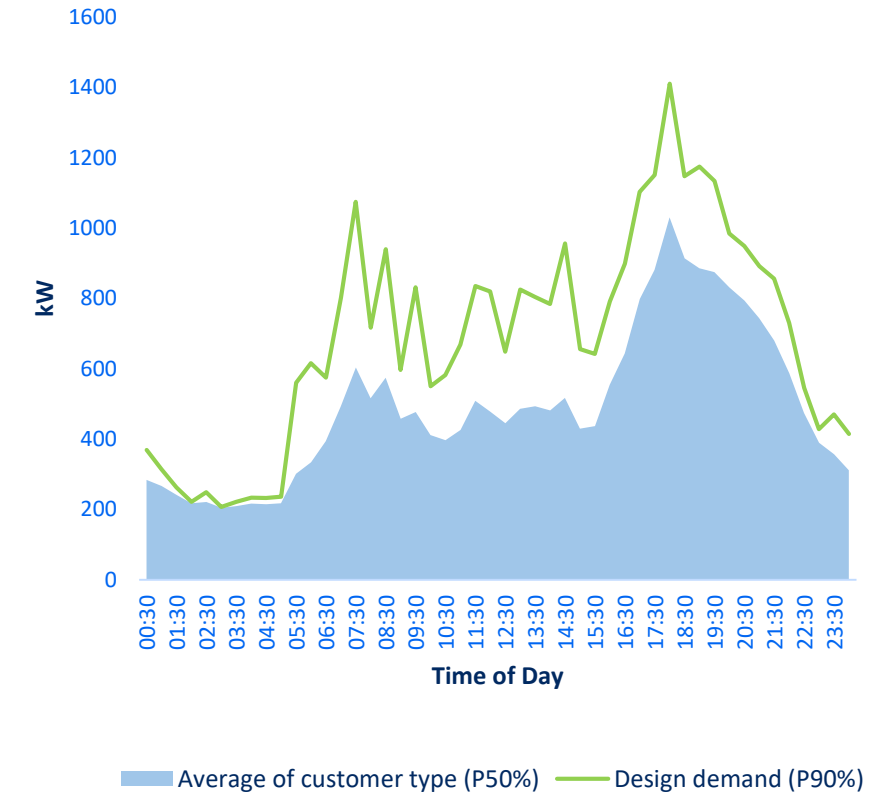
“What is happening on the network”
“Will the network continue to be reliable?”
“What mitigations are effective?”

“What is the most efficient management strategy?”

Usage Diversity

- Everyone uses the network differently, even within the same customer class
- The more customers sharing an asset, the greater the potential economy
- The effect of diversity is pronounced at low voltage
- Industry traditionally uses a document called ACE 49
 - Customers types modelled by a mean and standard deviation per 30 minute time slot
 - Network is designed to withstand up to a 9 in 10 diversity event
 - Workstreams underway for to include new technology

Customer Type – 3 Bedroom, 3 People, gas Heating
Winter Weekday - Consumer Profile (kW)



Load Flow Engines

Used to calculate voltages and currents in the network

The original specification called for two load flow engines to be used to allow all problems to be resolved

DEBUT

- Used for consumption dominated networks
- Direct numerical computation
- Easily facilitates tapered network diversity
- Aligned with ACE49

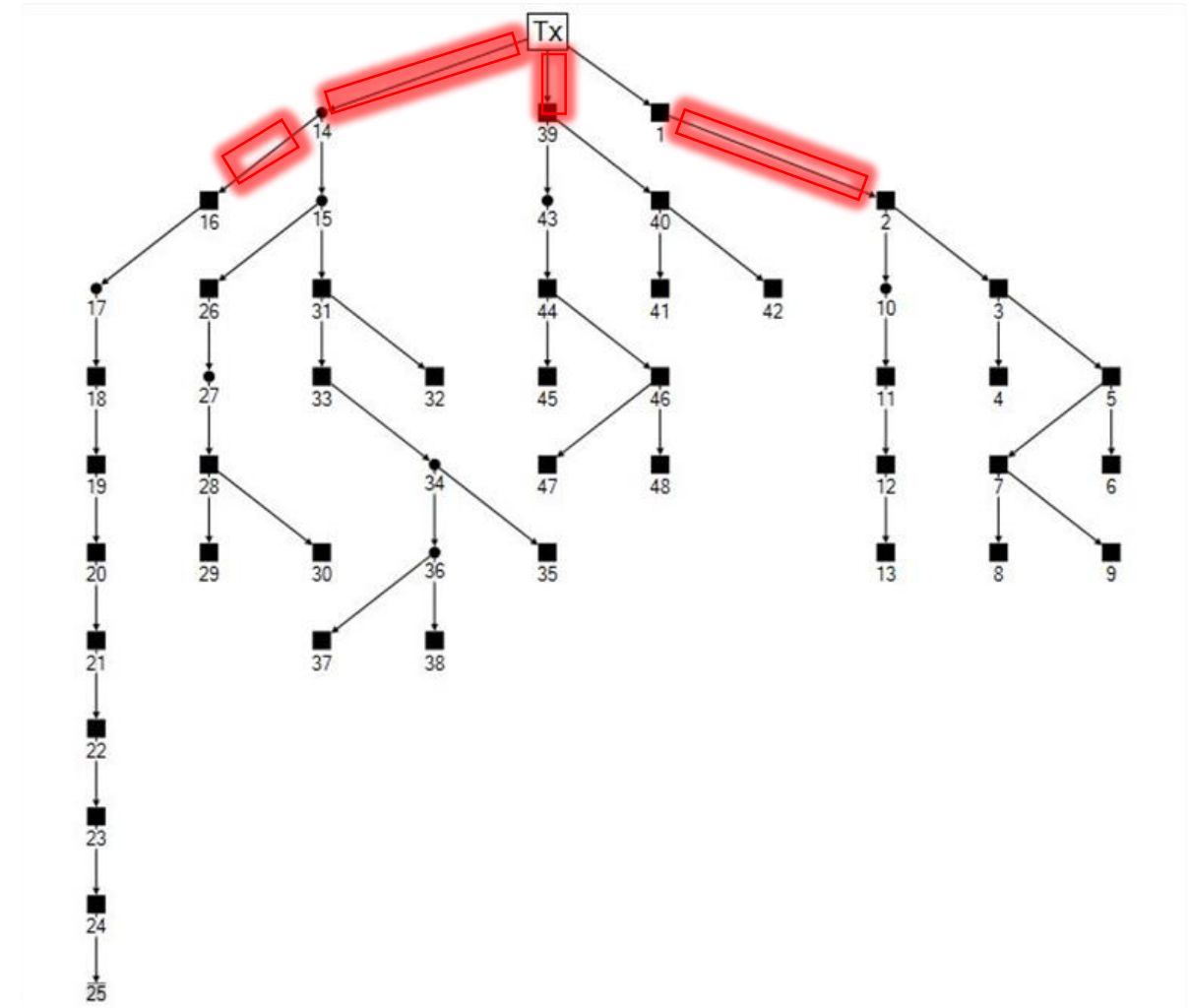
EGD

- Used for generation dominated networks,
- Iterative numerical computation
- Facilitates analysis of generation
- Simplified diversity model

User Reports

Different users need different reports

- Single assessment
 - What is happening today
- Future assessment
 - How will customer growth change the network
 - Assess potential mitigants
- The network model enables the pricing model



Single Assessment

Base case conditions

Dependencies

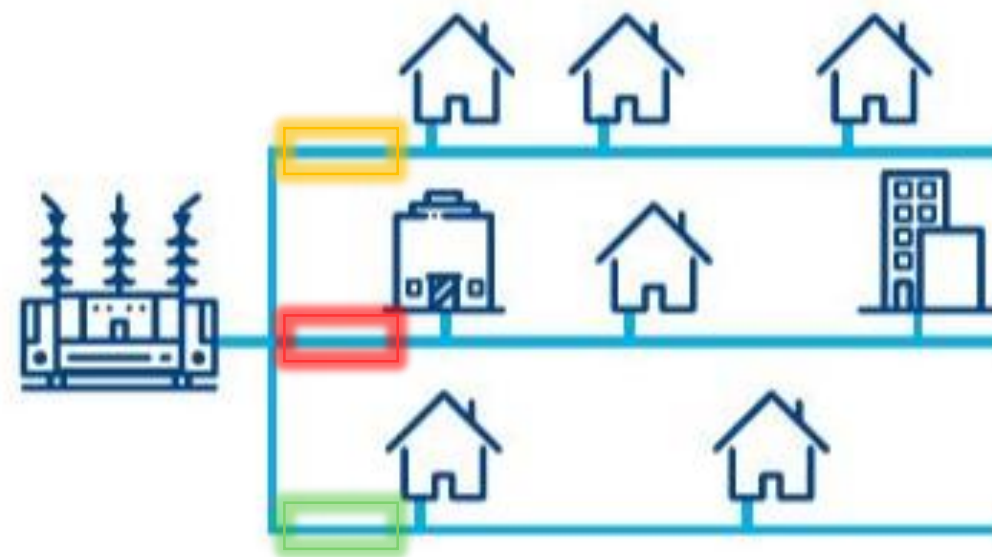
- Network Model, Customer Model, Census Interface

Output

- Base case voltage and loading issues, across one secondary substation

Insights

- Which parts of my network are the most stressed?
- At what time does greatest stress occur?
- Do I have enough capacity to connect a new customer?

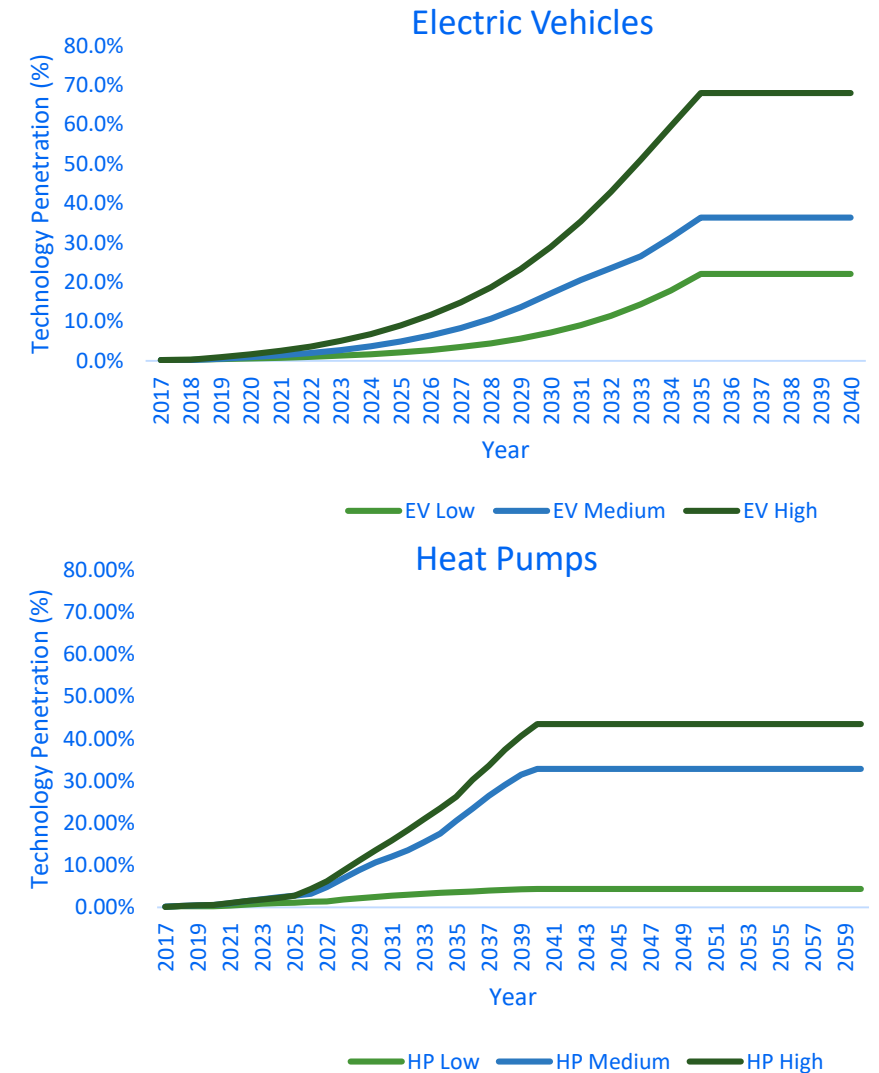


Future Assessment

Allowing for growth

Dependencies

- Network Model, Customer Model, Census Interface, Standardise LCT growth penetration
- **User Choices**
 - Domestic energy growth
 - Preferred LCT growth rate and size parameters
 - Preferred model for LCT distribution
 - Study case, base case or with intervention
 - Network led solutions
 - Non network solutions using SAVE findings



Learning Points

The learning points encountered were

- Reconciling a respected diversity model against the need to model embedded generation was a significant issue.
- Computational opportunities have grown since the creation of the original load flow engine,
 - Opportunities exist to join project learning to these new opportunities
- The network model enables well founded insight into how customer behaviour changes network commitment.
- The network model enables a founded view of how LCT growth changes LV networks
- Network models enable not only network visibility, but also economic testing of mitigations





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