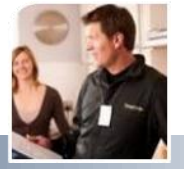
LI Methodology

Methodology and Assumptions

Paul Bircham & Steve Cox

May 2012

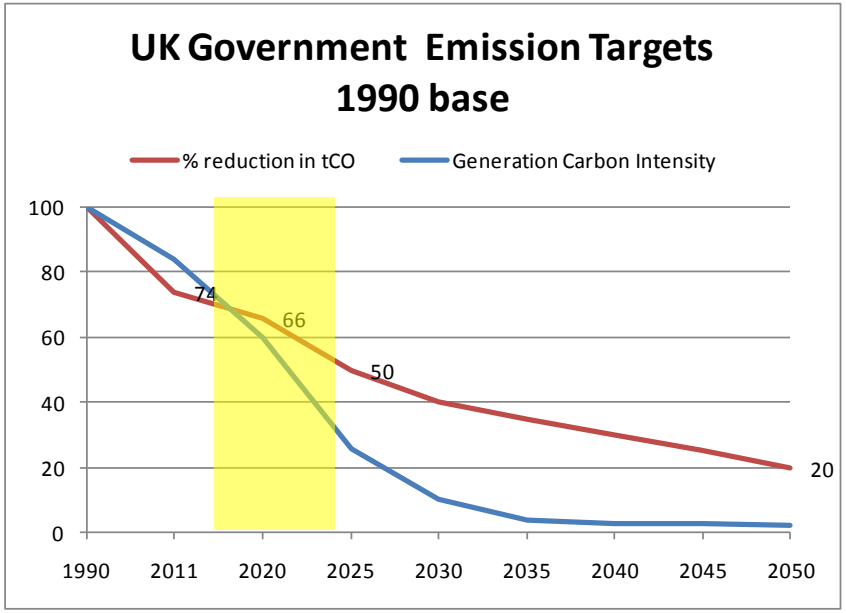




Agenda

- Background and objectives
- Overview of demand forecasting
  - Base forecast
  - LCT forecast
  - Secondary network LIs
- Output metrics
  - Definition of a Problem
  - Estimation of volumes of Problems
  - Benchmarking of resolution costs
  - Measurement of actual Problems

Load related Reinforcement - background

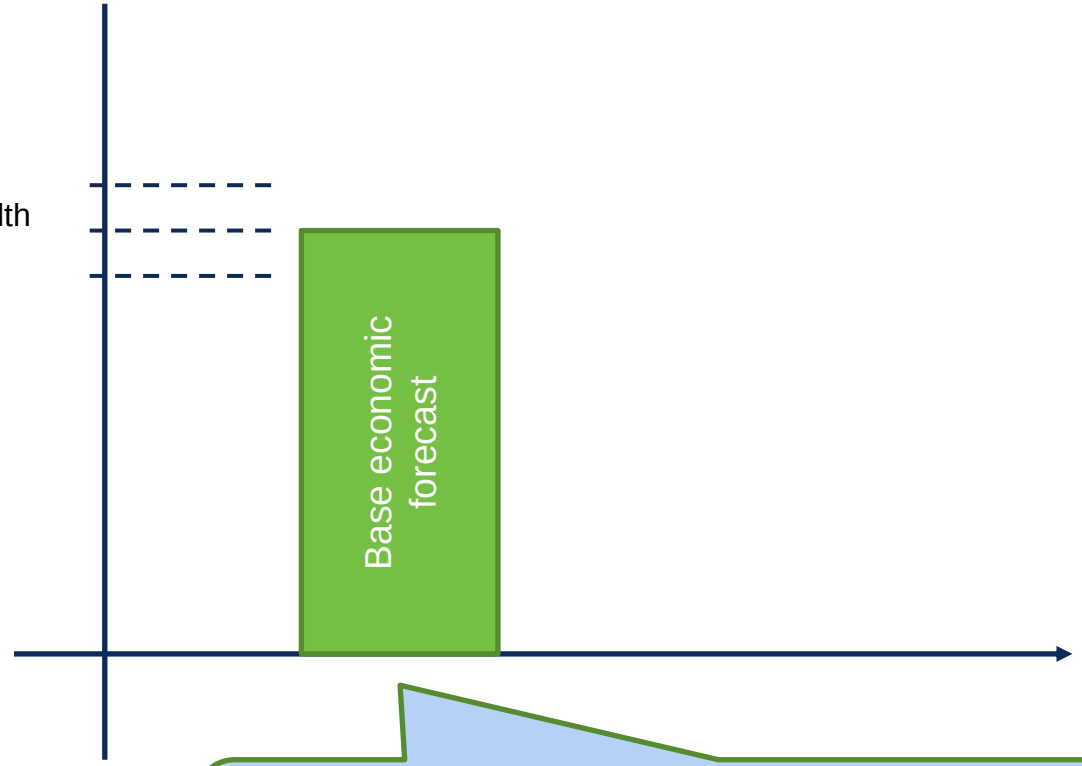
- 2011 Position 1/3rd Electricity, 1/3rd Gas, 1/3rd Oil
- 2023 **34%** Reduction in CO_2
  - 40% from Wind / PV & new Nuclear
  - 5% Transport 120,000 EV / Hybrid
  - 26M Smart Meters fitted
- 2050 **80%** Reduction in CO_2
  - Doubling in electricity demand



- Challenges
  - Where will this growth occur in ED1?
  - How will future demands be provided efficiently?
  - How do we set associated allowances and incentives?

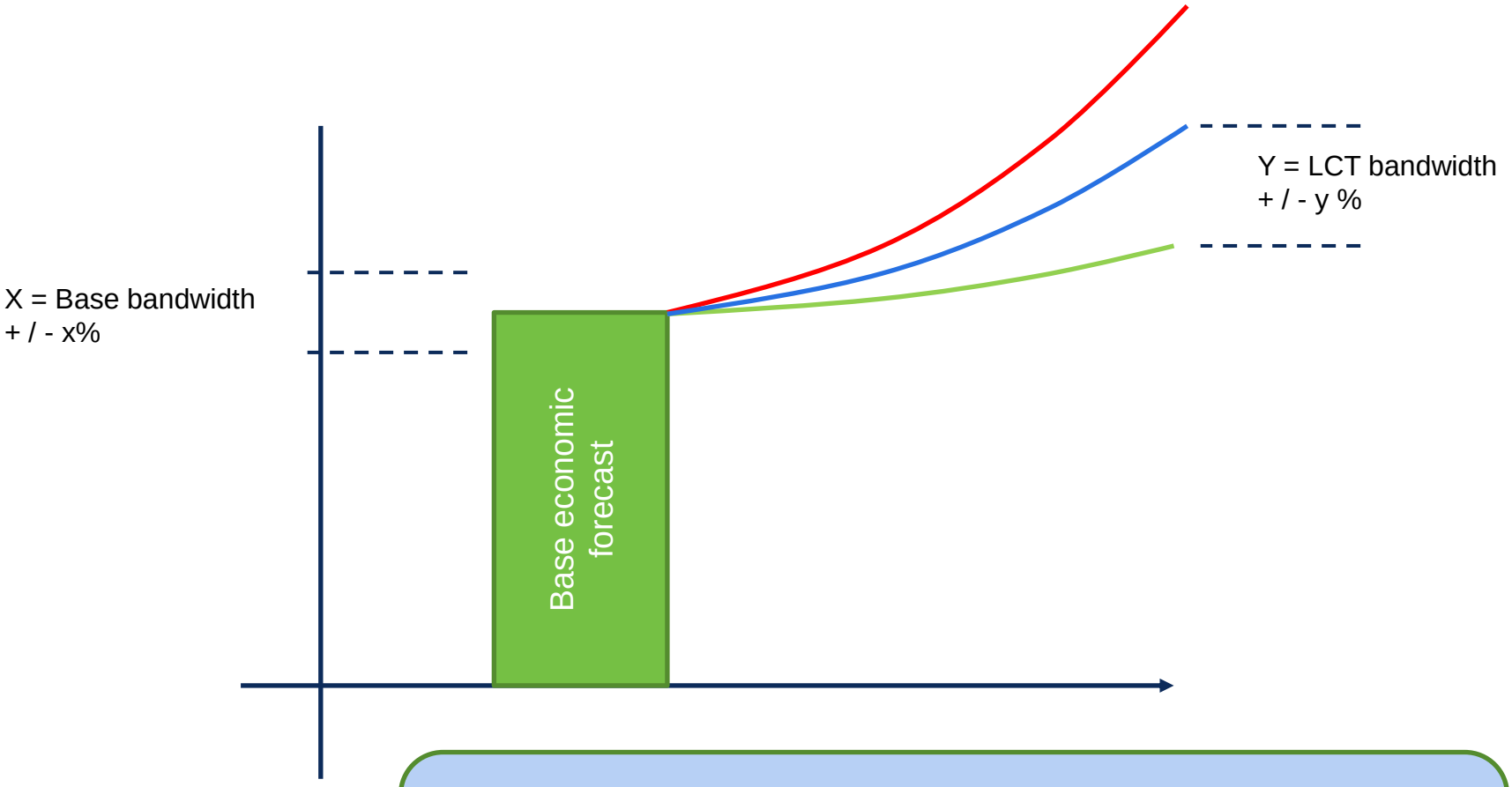
Load Forecast - Overview

X = Base bandwidth
+ / - x %



1. Base forecast - rolling load forecast incorporating energy efficiency assumptions on appliances, population and GDP growth.
2. Appropriately disaggregated and scaled to regional and national forecast
3. Projected out to 2023 / 2024

Load Forecast - Overview



1. Range of LCT scenarios considered and applied to 2023 / 2024 base.
2. Total reinforcement therefore comprises three elements of uncertainty
   a) Economic activity ~ DPCR5
   b) LCT which is new and in the main driven by external policy and incentives
   c) The value or discount available from Smart solution sets ~ WS3 output

WS3 Work Structure

Network model

- Construct an average network model to represent vanilla UK topology 6EHV, 7HV 19 LV.
- Load network based on uniform average load level

LCT allocation

- Aggregate adoption of LCT allocation as per UK plan with broad regional weightings compliant with DEC medium case
- Develop load curves and project future demand

Solution Sets

- Establish a library of transitional and smart solution sets.
- Establish typical traditional solution costs
- Establish potential Smart solution costs

Solution Sets

- Apply solution set to identified interventions (eg 20% of LV type 1 feeders)
- Establish minimum 5 year SSS life cycle
- Establish cost benefit case for traditional / SSS

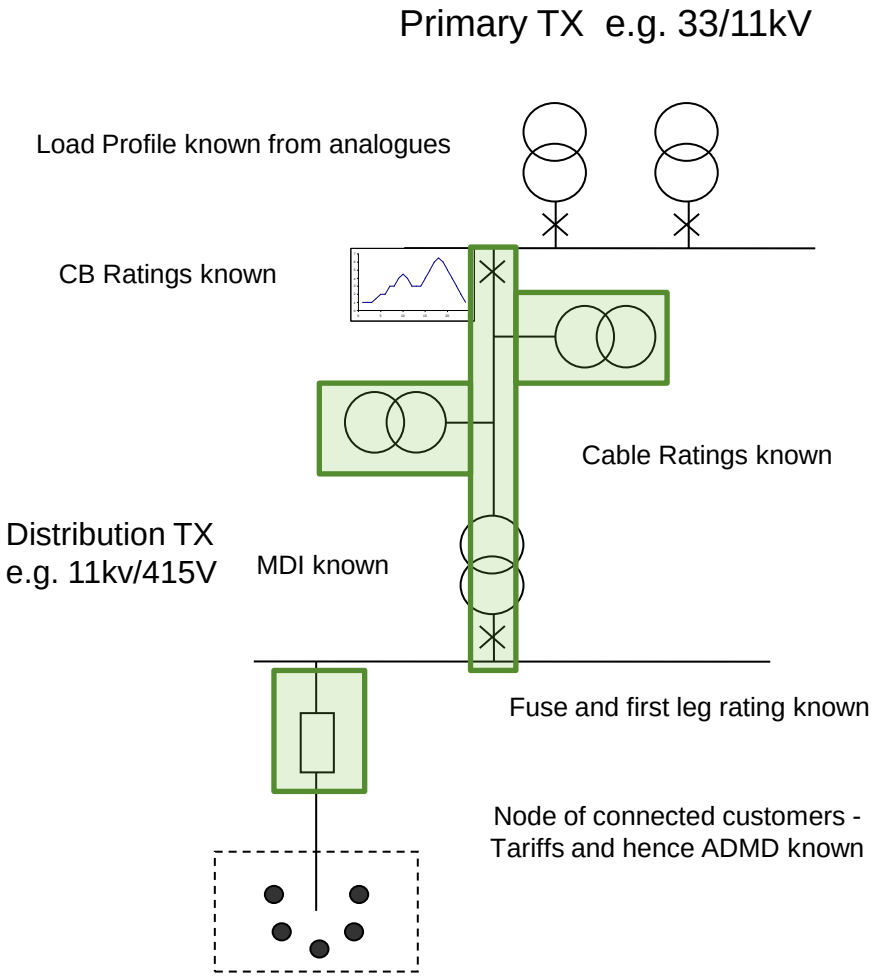
Smart solution set is at TRL 5 and adoption in investment forecasts requires considerable work.

Most SSS require considerable enabling investment eg Level 3 NMS, EDMS, mirco RTUs and associated comms.

Cost benefit modelling requires development.
Optionallity and No Regrets overlap this module

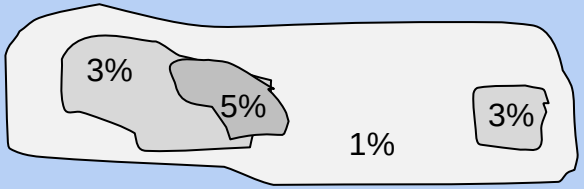
- Output
  - Barometer for regional demand growth & LCT adoption levels
  - Indicative balance of traditional v SSS volumes and costs

How could we derive LIs in the secondary network

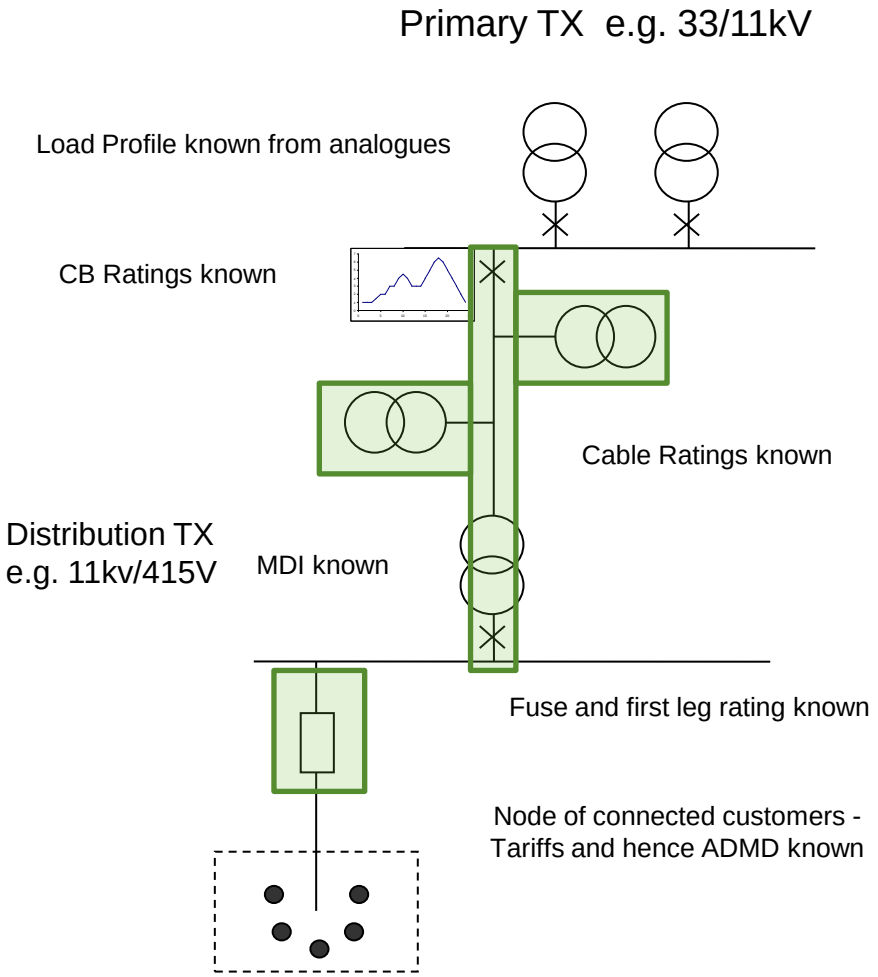


Load Allocation

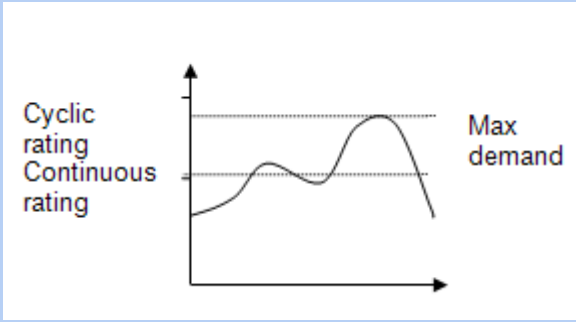
- LV Fdr load profiles assembled from MPAN class, HH &TMS connectivity.
- TX demand derived from MDI and sense checks to scale LV Feeder data.
- TX demands in turn scaled to match know HV feeder profiles.
- Base case & LCT growth applied in line with LA stakeholder plans scaled to selected scenario
- Able to select level of peak shaving DSM used
- LCT Clustering applied by LA area
- Spatial distribution combines X% take-up in each local authority, with semi-random clustering (may be income or attitude linked.



How could we derive LIs in the secondary network

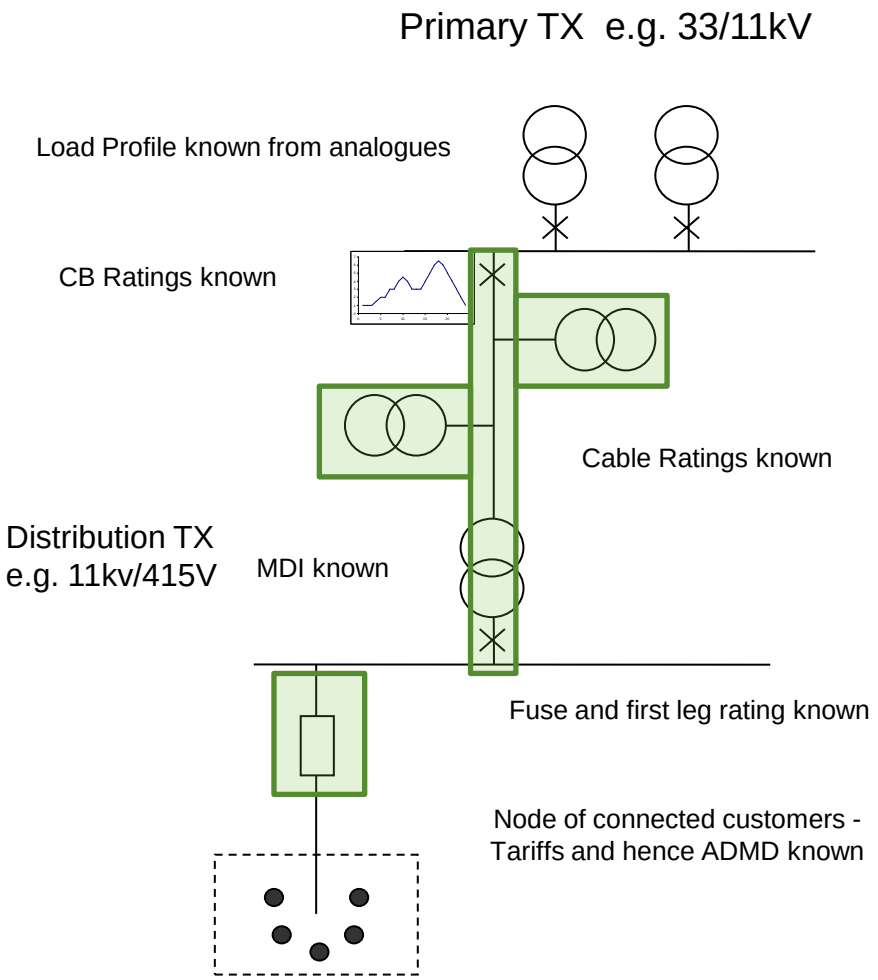


Complex Feeder / TX ratings



- Resultant network component load curve derived and appropriate rating selected
- Output is an assessment of load against LVFdr / TX / HV sub feeder rating ~ LI
- Identifies thermal interventions = LI_t
- LI_h & Li_v ~ % penetration level

How is load converted into an investment forecast



Other interventions

- Penetration thresholds set for voltage and harmonic interventions.
- Thresholds can be set by LCT type e.g. 20 kW on an asset, or % of rating.
- Uses same spatial distribution of EV, HP and PV in the thermal model.
- LI_h & Li_v ~ % WS3 penetration level

Outputs

- Count HV feeder sections, Dist TX and LV feeders which exceed thresholds
- LI_h & Li_v LI_t – volume of likely interventions
- Output can be contrasted against vanilla WS3 model
- Caters for DNO specific preloading and stakeholder plans versus WS3 vanilla assumptions.

How could we measure Problems Solved ?

- WS3 modelling provides a common set of thresholds that allow definition of a ‘problem’.
- LI model provides a planning assumption for volumes by asset type that are likely to require an intervention.
- WS3 model provides two alternate methods of intervening
  - Traditional Solution Set
  - Smart Solution Set
  - Both have associated costs.
- Subject to agreeing the solution valuation assessment criteria these predict a ‘benchmark’ solution cost.
- Benchmark cost x volume ~ allowance for a given set of assumptions

How could we measure Problems Solved ?

- What if the assumptions are wrong ?
  - Growth
  - Penetration levels
  - Clustering
  - Government policy
  - Disruptive technologies
- How can we measure actual problems ?
  - HP connections via MCS web site notifications of Mpans for RHI
  - EV connections process now passed to ENA HPWG
  - Annual re runs of WS3 models updated with actual penetration levels
  - Residual balance to attain latest UK Gov forecast makes up balance
- Data on actual TSS and SSS costs informs benchmark as technologies become mature.