Decision Making & Forecasting using “Real” Utility Data – Pitfalls, Challenges, and a Way Forward

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Outline

- Introduction
- Service Performance Data - What's the issue?
- Prediction
- Data Re-Construction – Filling in the Gaps
  - Example
- Conclusions

Introduction

- Interest in Asset Management for Cable Systems continues to grow.
- The goals are to
  1. Wisely use the resources allocated to Operations and Maintenance
  2. Predict how these resources will need to grow with time as the system continues to age
  3. Estimate when the threshold is reached

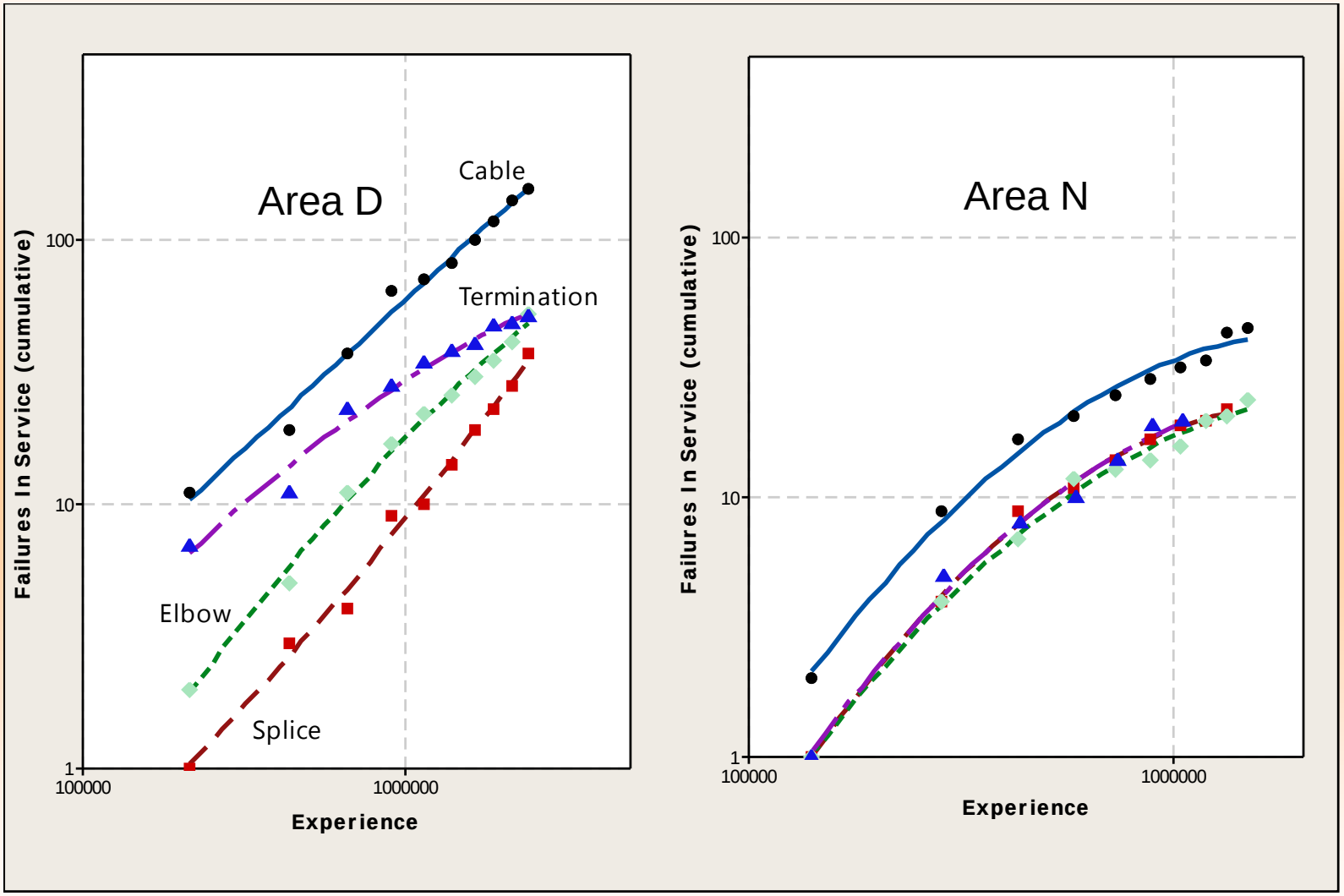
- Key challenge is: develop baseline models which realistically estimate future under “status quo” operation.

A Typical Annual Performance History

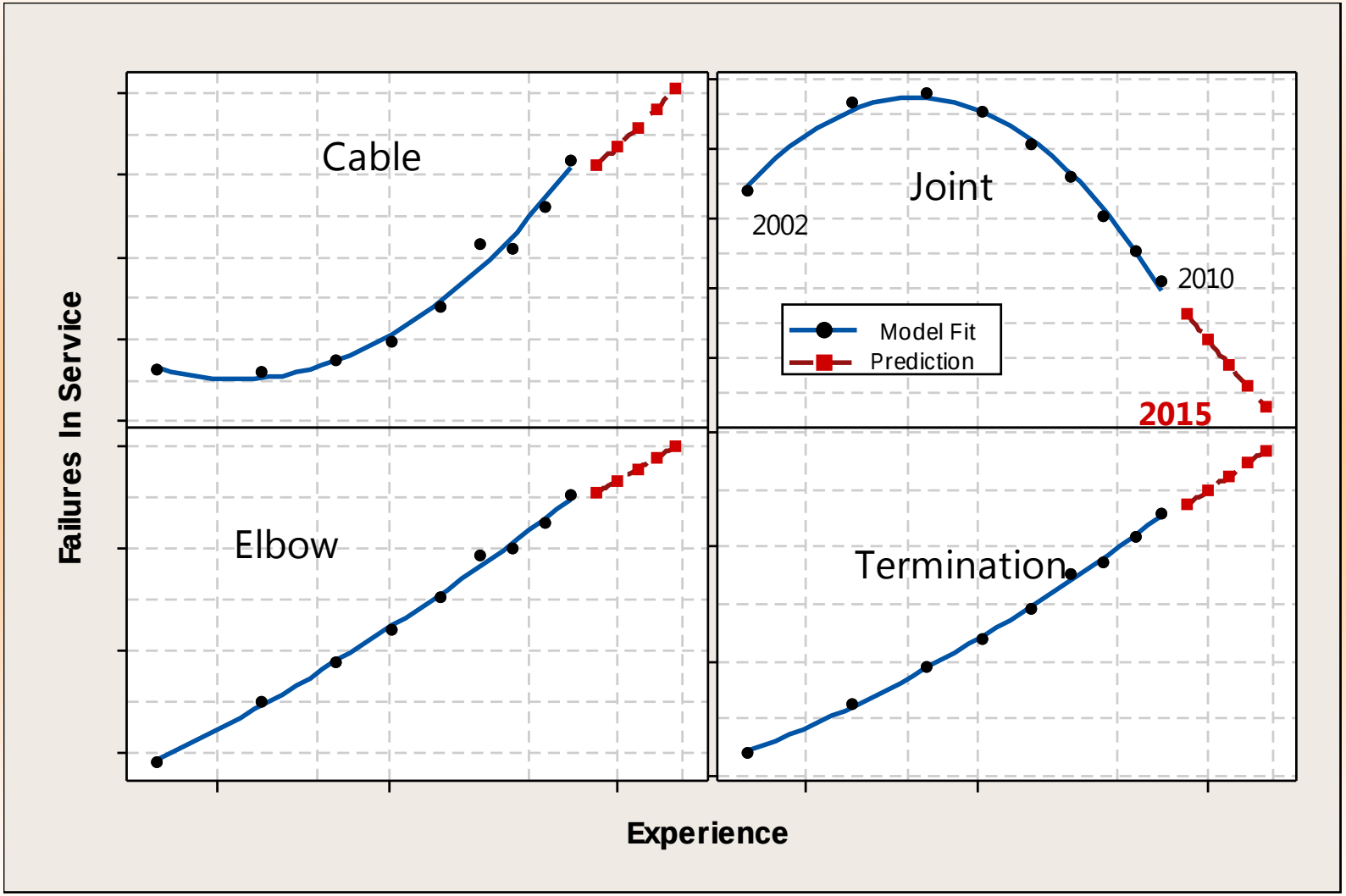
What are the roadblocks to use

- Completeness of the data – annual versus vintage
- Accuracy of the data
  - Everything is a cable failure
  - Forgetting to go back to correct entries
- Dispersal of the data (stored in different places)
- Changes
  - Recording systems
  - Categories

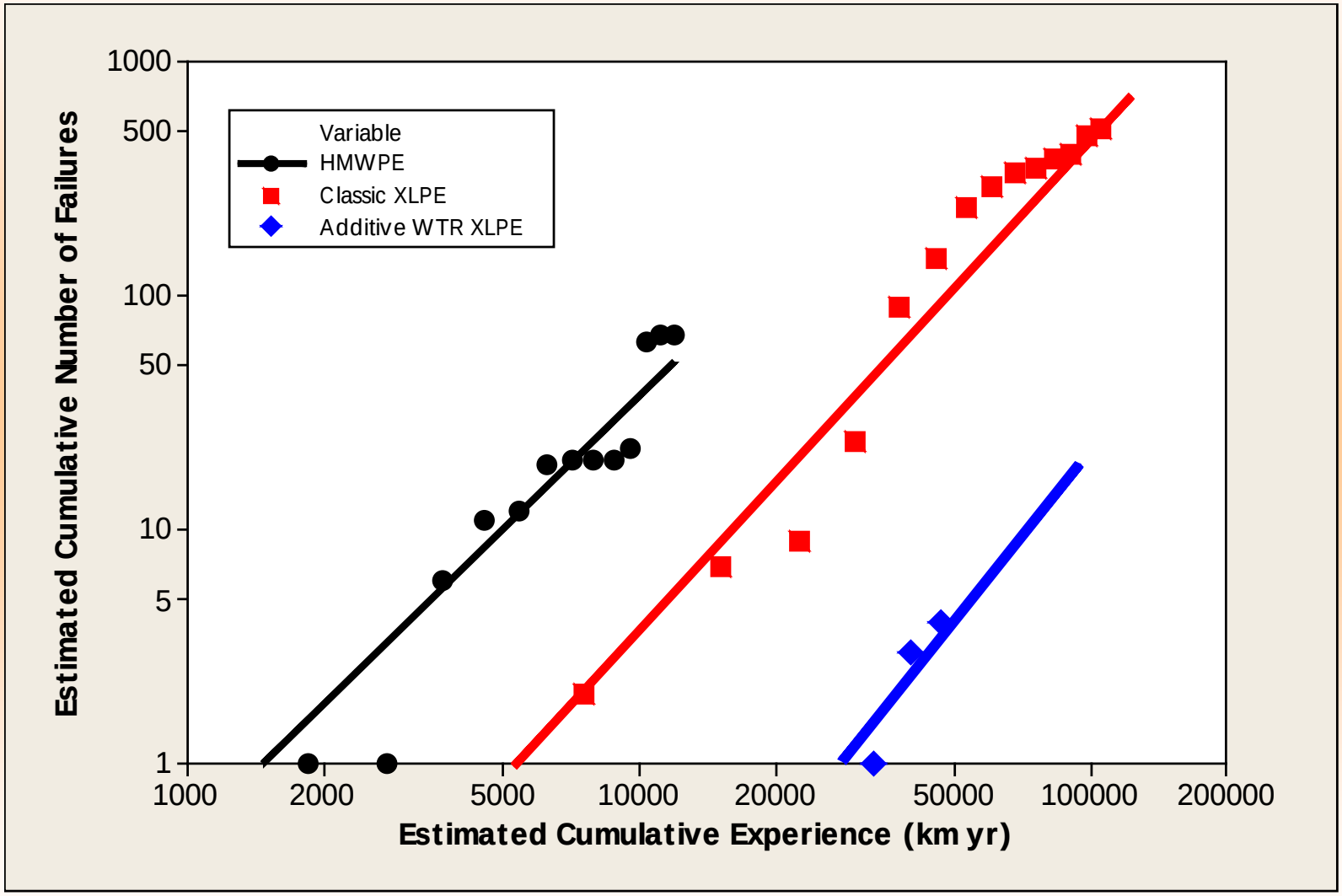
Splitting Areas and Devices Helps



Base Case Prediction is Possible



Predictions for TXU FIS from Jicable 2007



Effectiveness of Scenarios

- This style of Base Case shows:
  - What happens in near future in “do nothing” case
  - Indicates if more or Less resources are required
  - Shows if the resources are effective
- This style of Base Case does not help to
  - Understand what vintage contributes
  - Understand the impact of targeted resources
- For this analysis we need to know where the Failures In Service (FIS) came from

- A **Big Job** – 17000 FIS records

A Big Job

- What we are trying to do is estimate what has happened to the components installed in 1970, 1980 etc
- Then we can estimate curves for all vintages
  - Predict into the future
  - Model effect of different scenarios

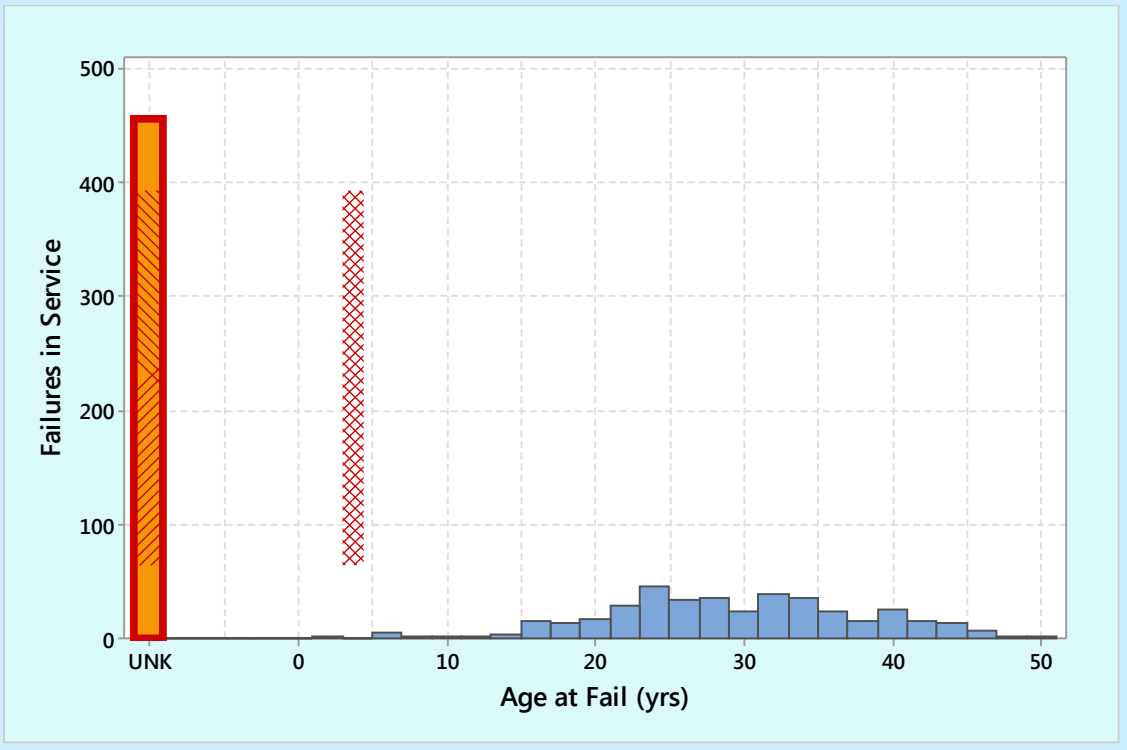
- A big job for 17000
- Not such a big job for
  - Records going forward today
  - Records from recent past (say 2 years)

Re Construction Approach

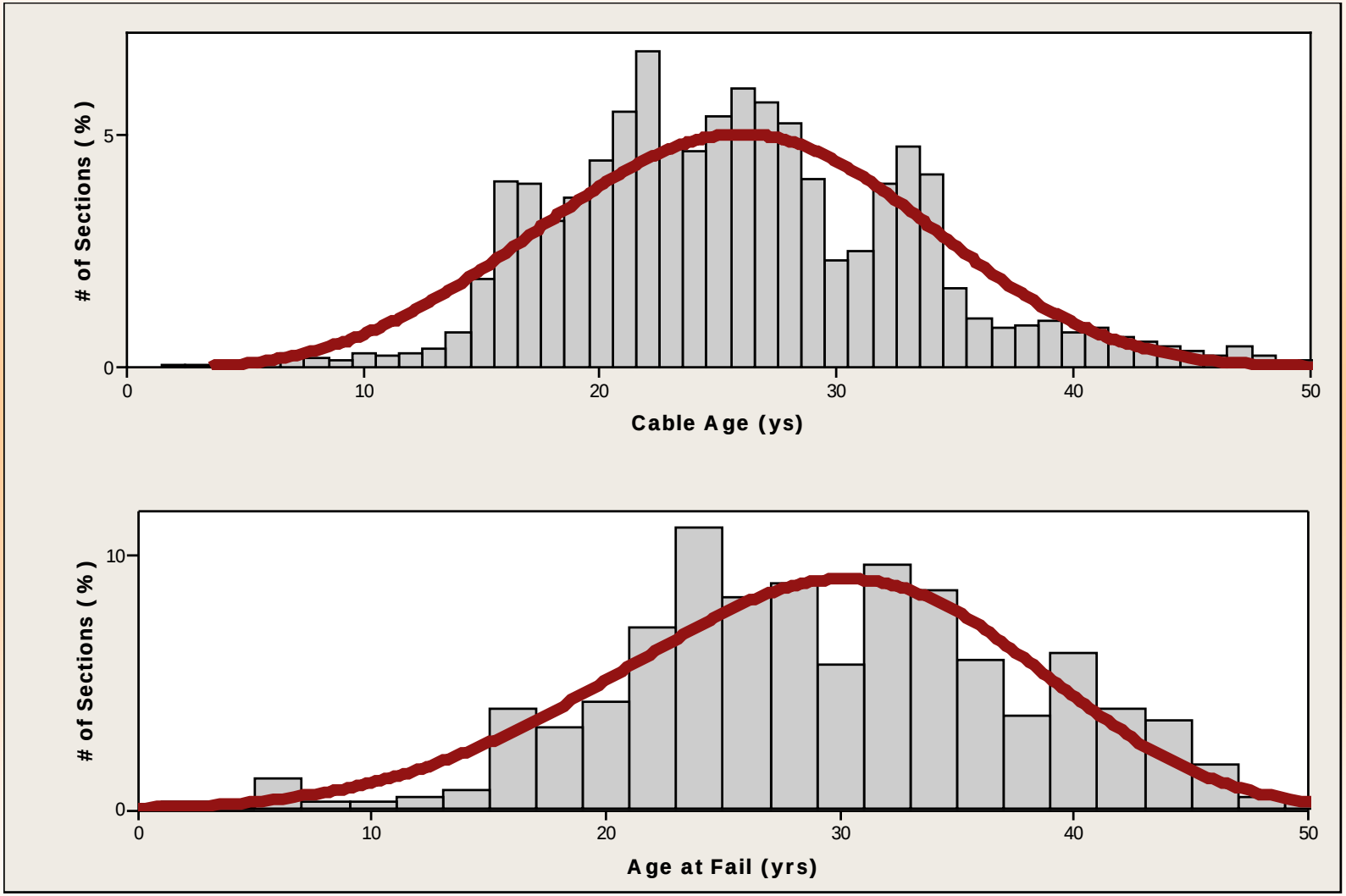
- Select a recent period of FIS – say 3 to 4 yrs
- Add age data using rules / approximations
  - Age of ancillary equipment
  - Construction date of neighbourhood
  - Returned Samples
  - Line Crew Interviews
- Develop Weibull Curve
- Sanity check against “bathtub”
- Use installation records to appropriately scale
- Input heuristic utility knowledge

Process

- Segregate: EPR, HMWPE, XLPE, WTRXLPE, PILC
- Est. Installed Base (Purchase (data) – Removal (heuristic))
- Estimated age at FIS, Confirm device (if possible)



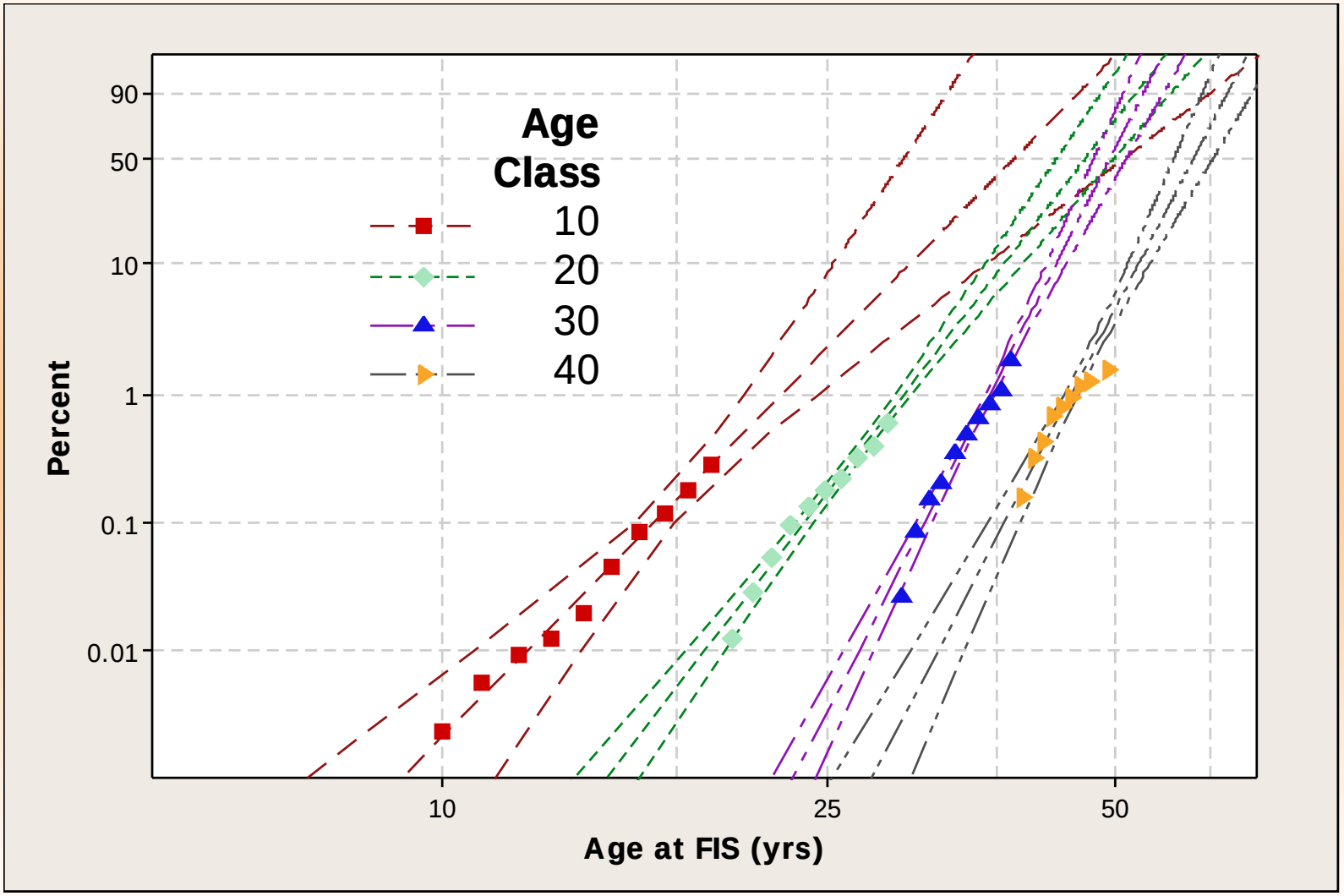
Installed Base and Failures In Service



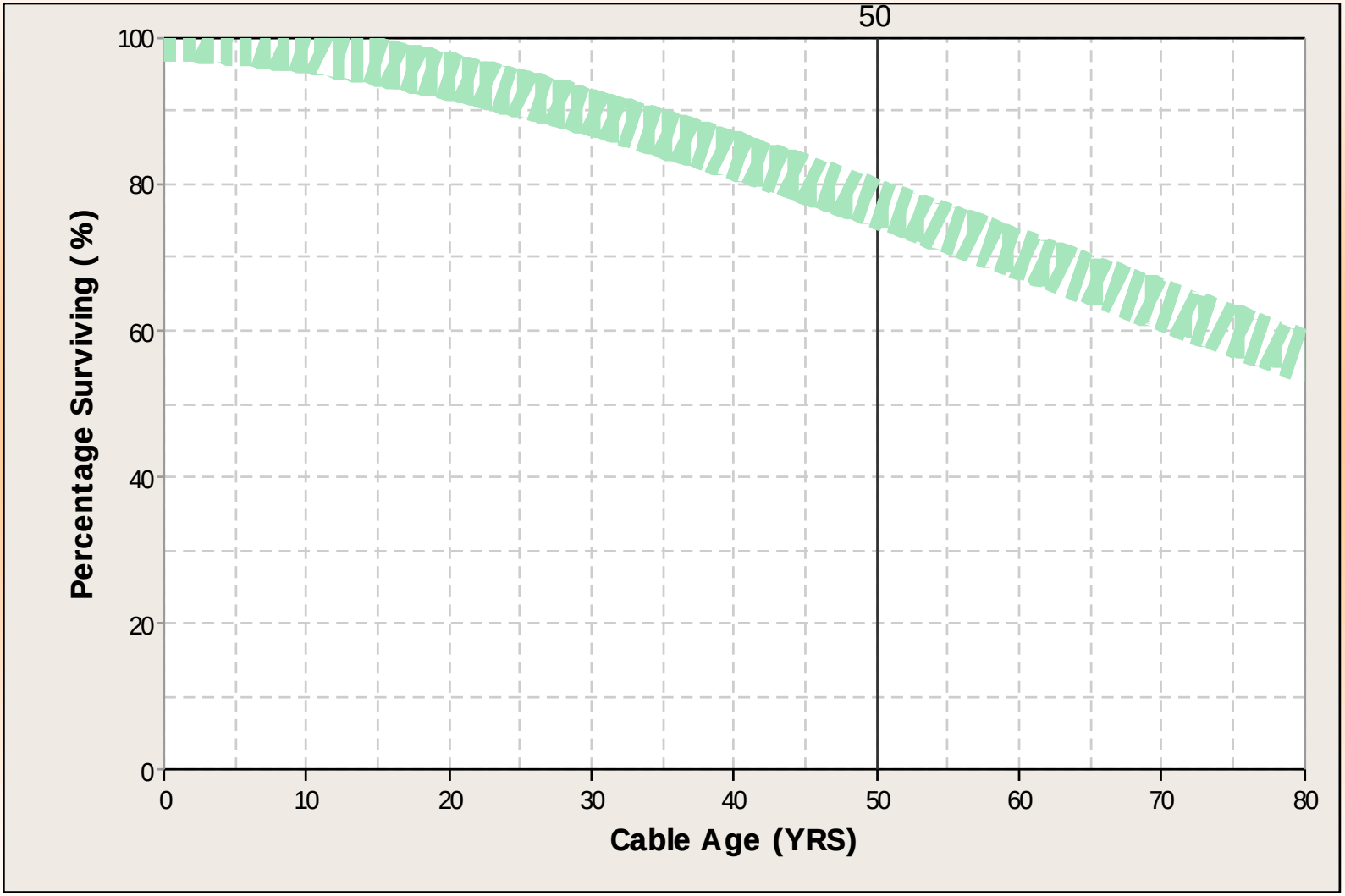
Utility Heuristic Knowledge

- All failures are repaired - No Replacement
- Good performance in early years
- Purchase records are reliable
- Few Hybrid/mixed circuits

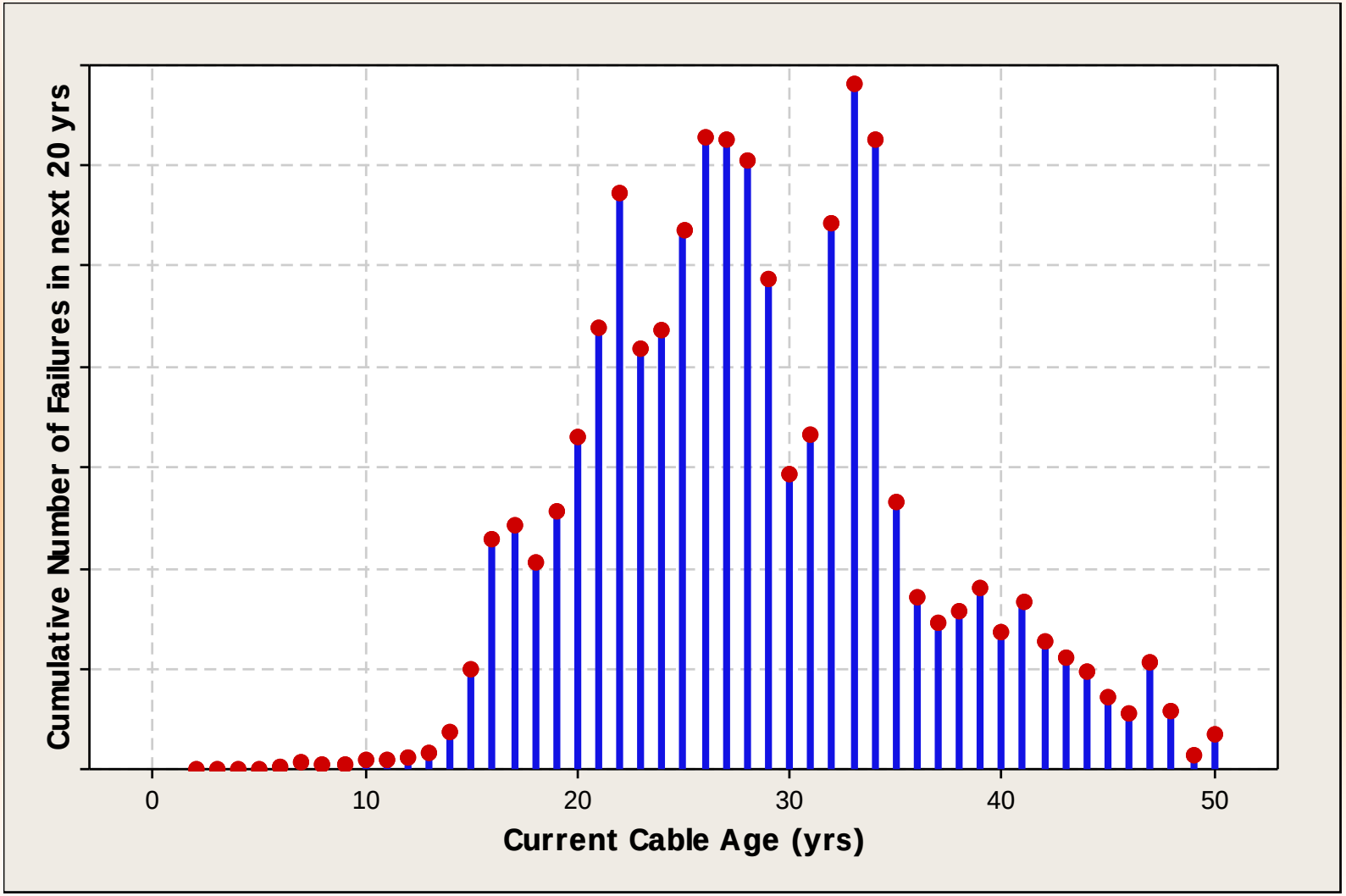
Age Segregated Failures



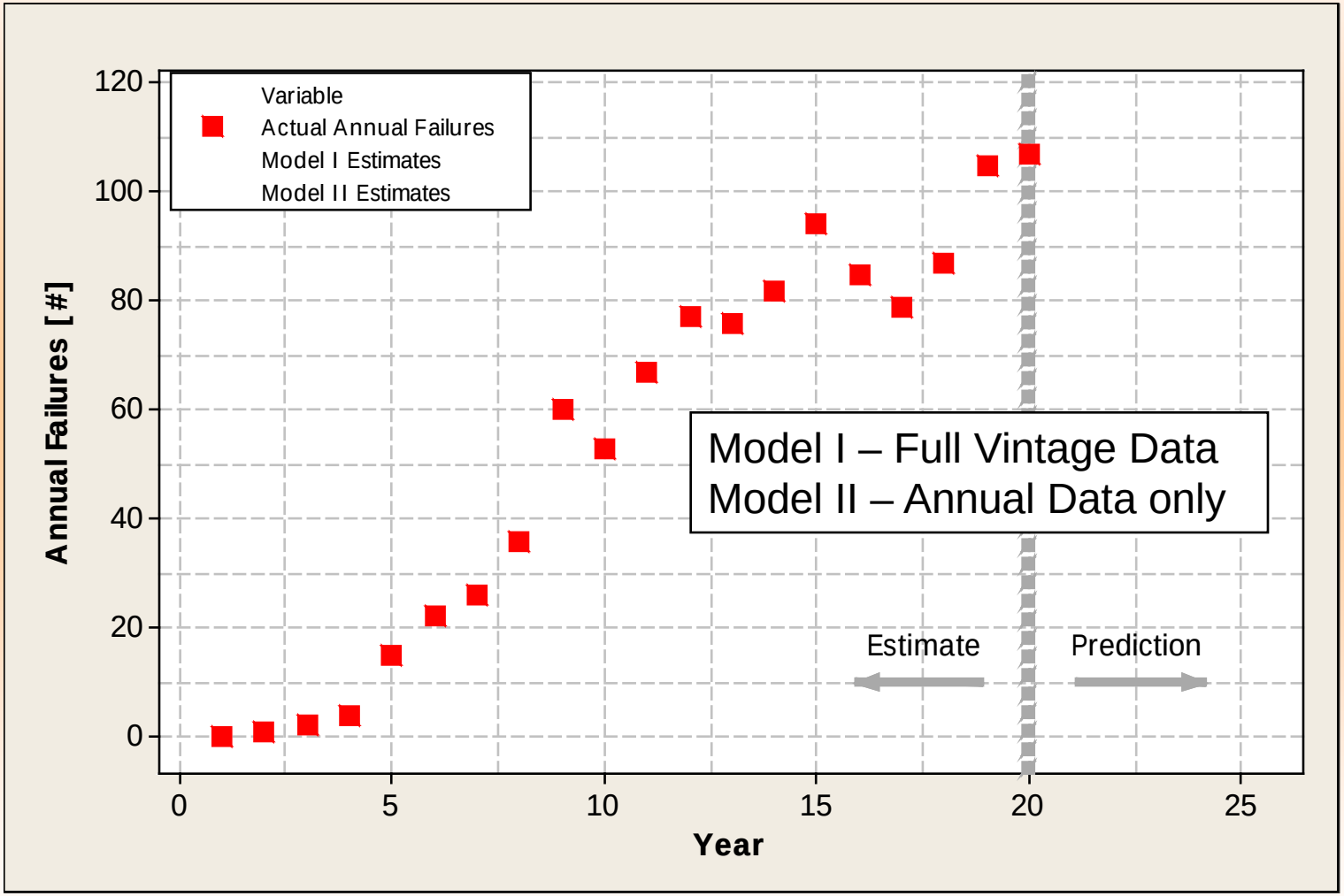
Estimated Combined Survival Curve



Failure In Service Prognosis

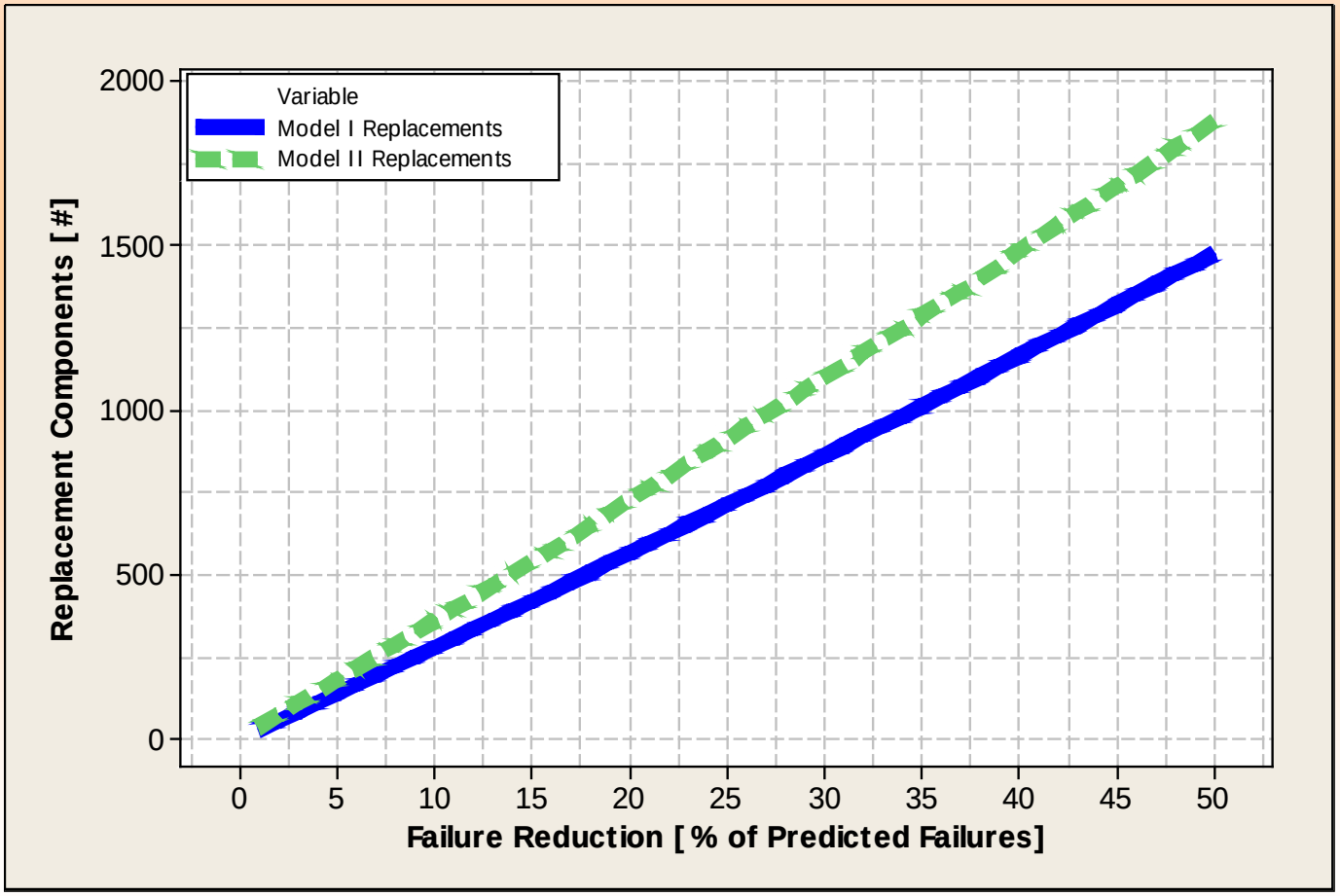


Multi-Year Prediction (Synthesized Data)



Replacement Rates

- More complete information gives less “fuzzy” estimates
- Perceived efficiency is lower without vintage data



Conclusions

- Many issues to consider at start:
  - Oldest portions of system that remain may be the "best" versions of those technologies
  - Vintage data is rarely available for analysis
  - Can start to improve record keeping at any time
- Commonly available utility data offers limited help for predicting system performance
- Able to combine heuristic knowledge and available service performance data to make reasonable estimates going forward.