Reinventing Old Grids – Taking Steps to Assess Against Risk Failure

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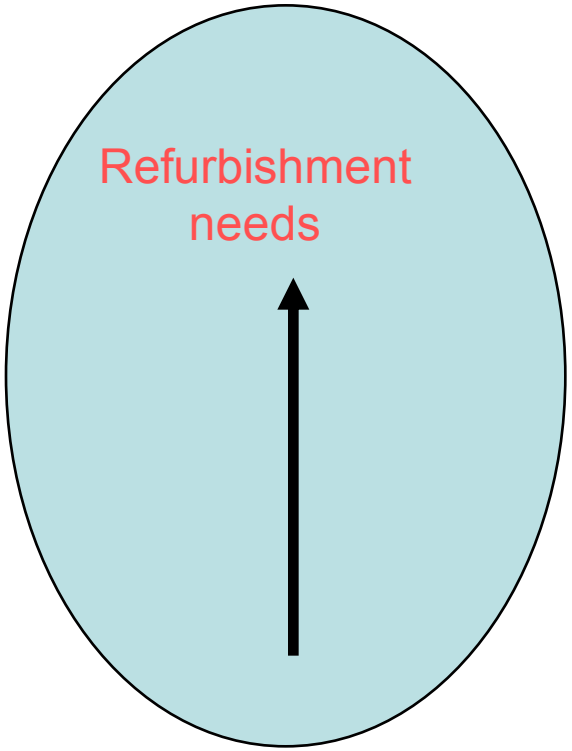
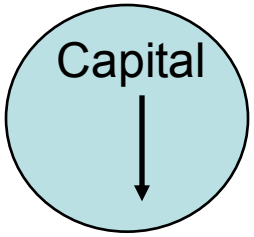
City Power

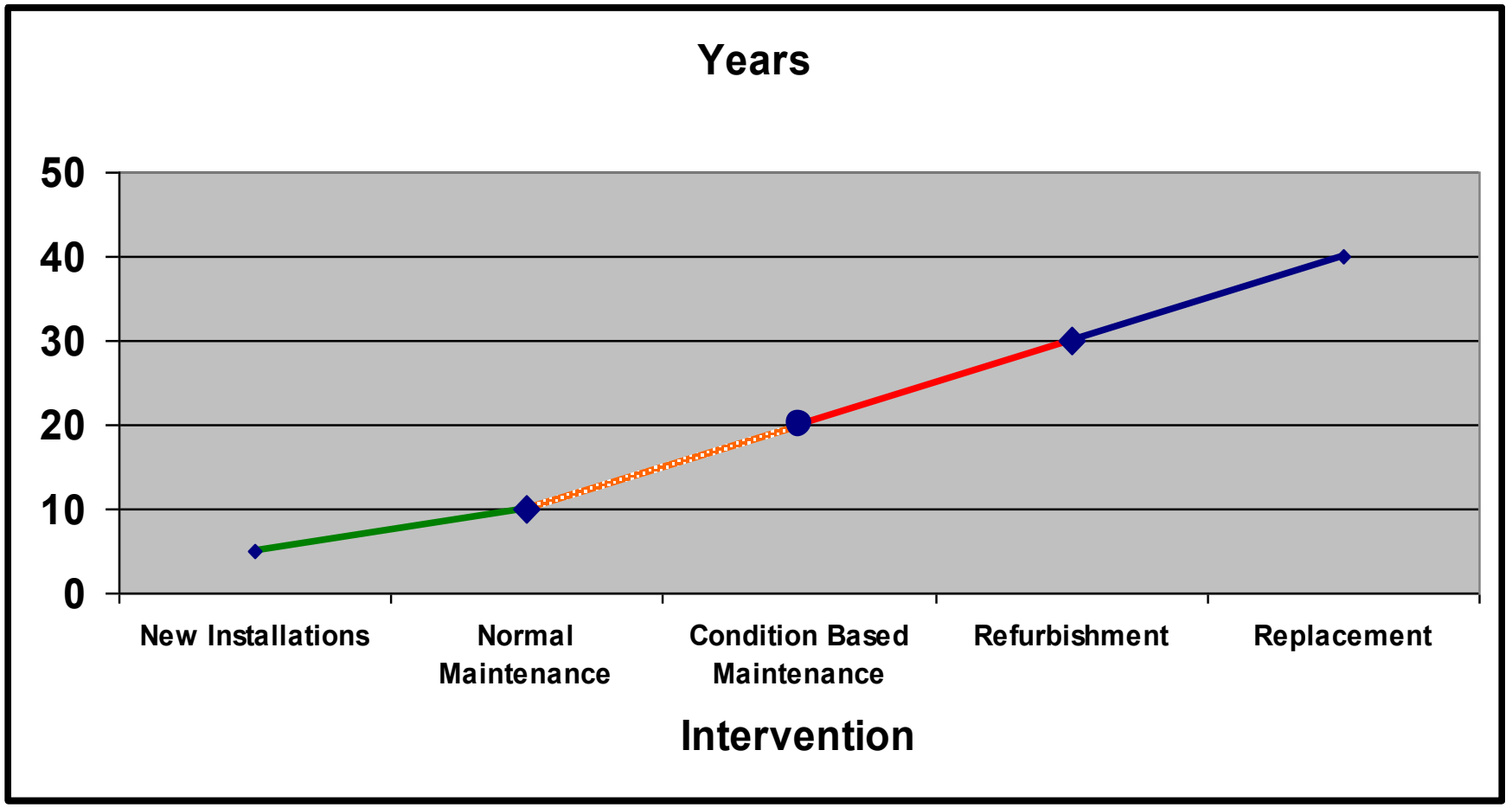
Needs vs Capital



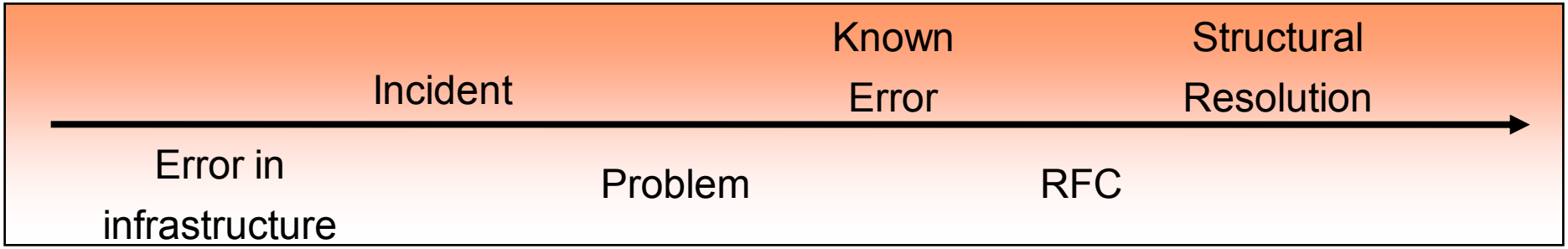
While replacing old grid systems with new ones is not a financially viable solution for all companies, it nonetheless entails the responsibility of ensuring that all ageing systems are still operationally viable and safe from risk failure. This presentation will explore the best methods of safeguarding against power cuts and black-outs on locations where continued electricity supply is of the essence

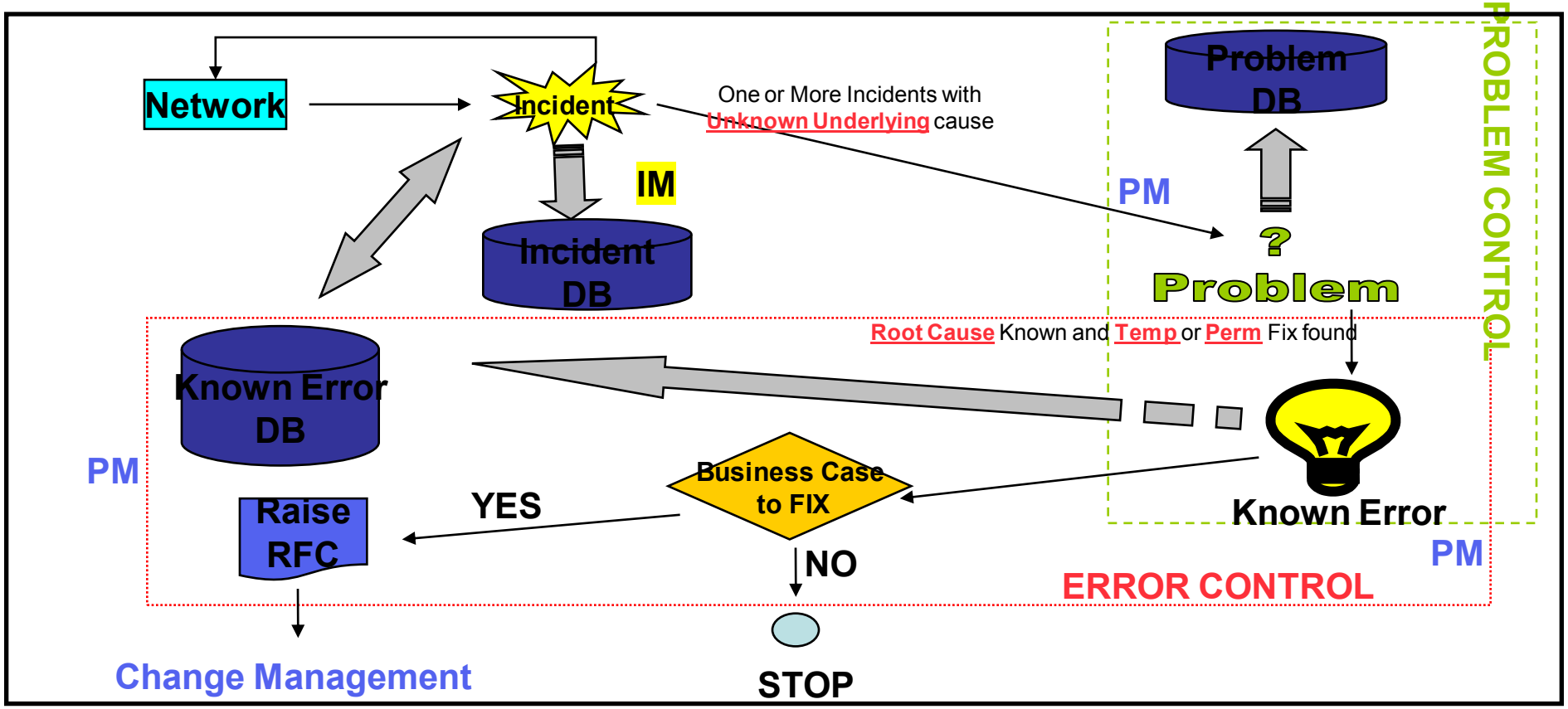


Equipment Life Cycle



Incident and Problem management process





What are the reasons for supply interruptions?

- *Faulty Transformers*
- *Faulty switchgear*
- *Faulty cables*
- *Overloaded network*
- *Theft and vandalism,*
- *Illegal connections*
- *3rd party damages*

- *Consumer faults*
- *Weather conditions*
- *Eskom outages*
- *Eskom load shedding*
- *Planned maintenance*
- *Emergency maintenance*
- *Vegetation interference*
- *Normal ageing*
- *Network design problems*
- *Operating procedures*

Development of the three to five year rolling plan

- Detailed Audits were conducted in order to ascertain the condition of the Network infrastructure
- Root cause analysis for Technical and non-Technical losses were conducted and revenue protection and generation projects identified
- From the above exercise the five year plan to address the, refurbishment and replacement needs was developed

Rehabilitation Process

- To start the network rehabilitation programme, City Power had to:
  - Appoint the competent service provider to analyse the condition of each equipment
  - These equipments were classified according the a certain class i.e. area, year, vector group, voltage transformation and the general condition
  - The rehabilitation strategy per classification was developed and the entire refurbishment programme was developed
  - The utility started to see the extent of the problem

Rehabilitation Process…

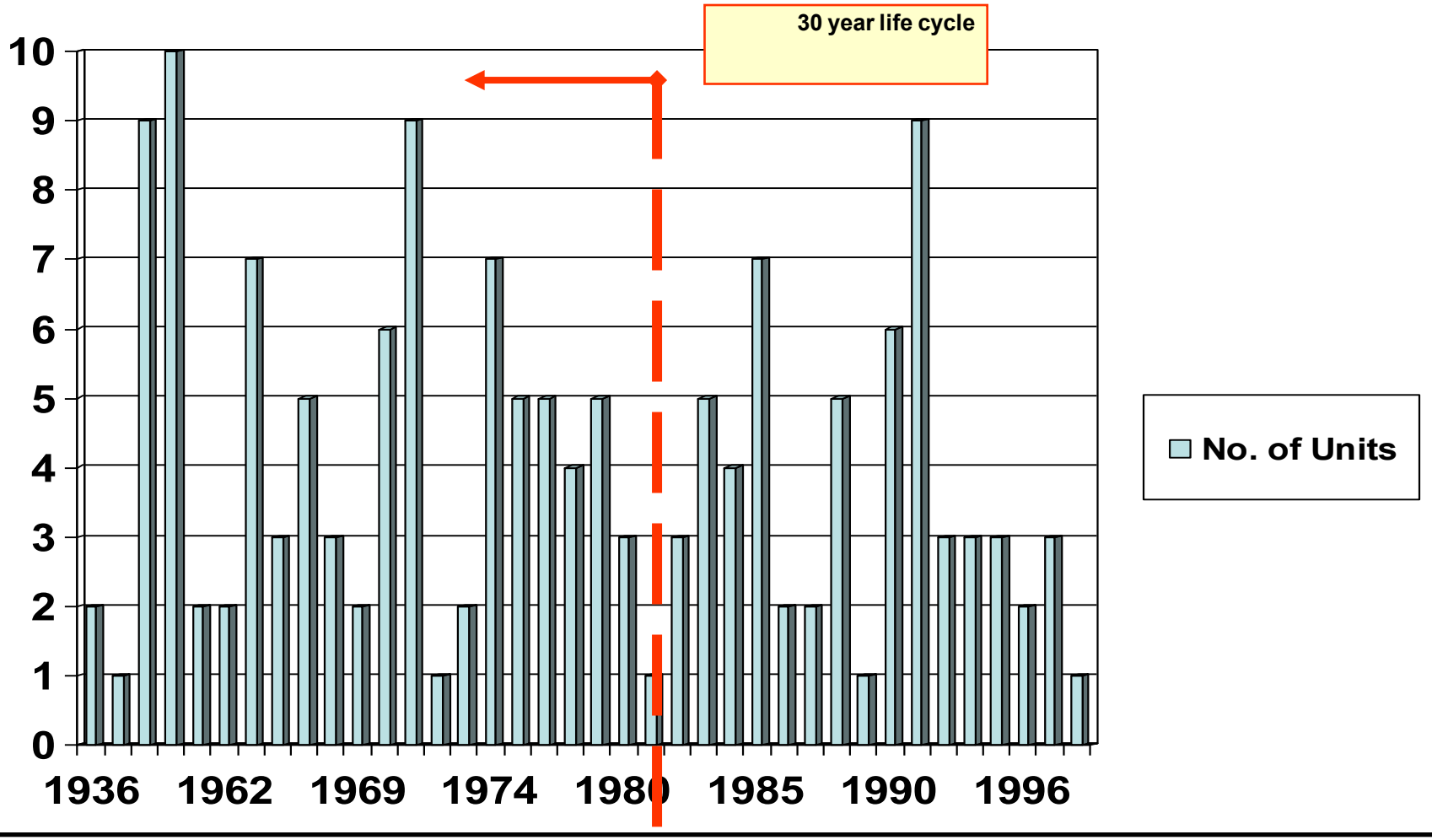
- From the analysis the following was developed
  - Strategic Spares philosophy
    - Policy was decided according to the number of unit types in service
    - Standadisation, e.g. phasing out of certain voltages and importance of certain parts of the network e.g. networks with customers that cannot be converted due to some unique machinery.
  - Financial Requirement
    - From the study, the capital requirement was drawn.
    - This budget was drawn in line with the refurbishment policy

Capital Infrastructure Backlog (High Level)

Transformer Refurbishment

- Detailed assessments were conducted 3 years ago to ascertain the external and internal condition of transformers
- Significant number of high risk transformers identified in terms of standard assessment parameters (moisture, DP, gases, acidity etc.)
- A refurbishment programme was put in place to replace and refurbish these transformers
- Annual condition assessment is done to continually monitor the transformer condition

Transformer Assessment

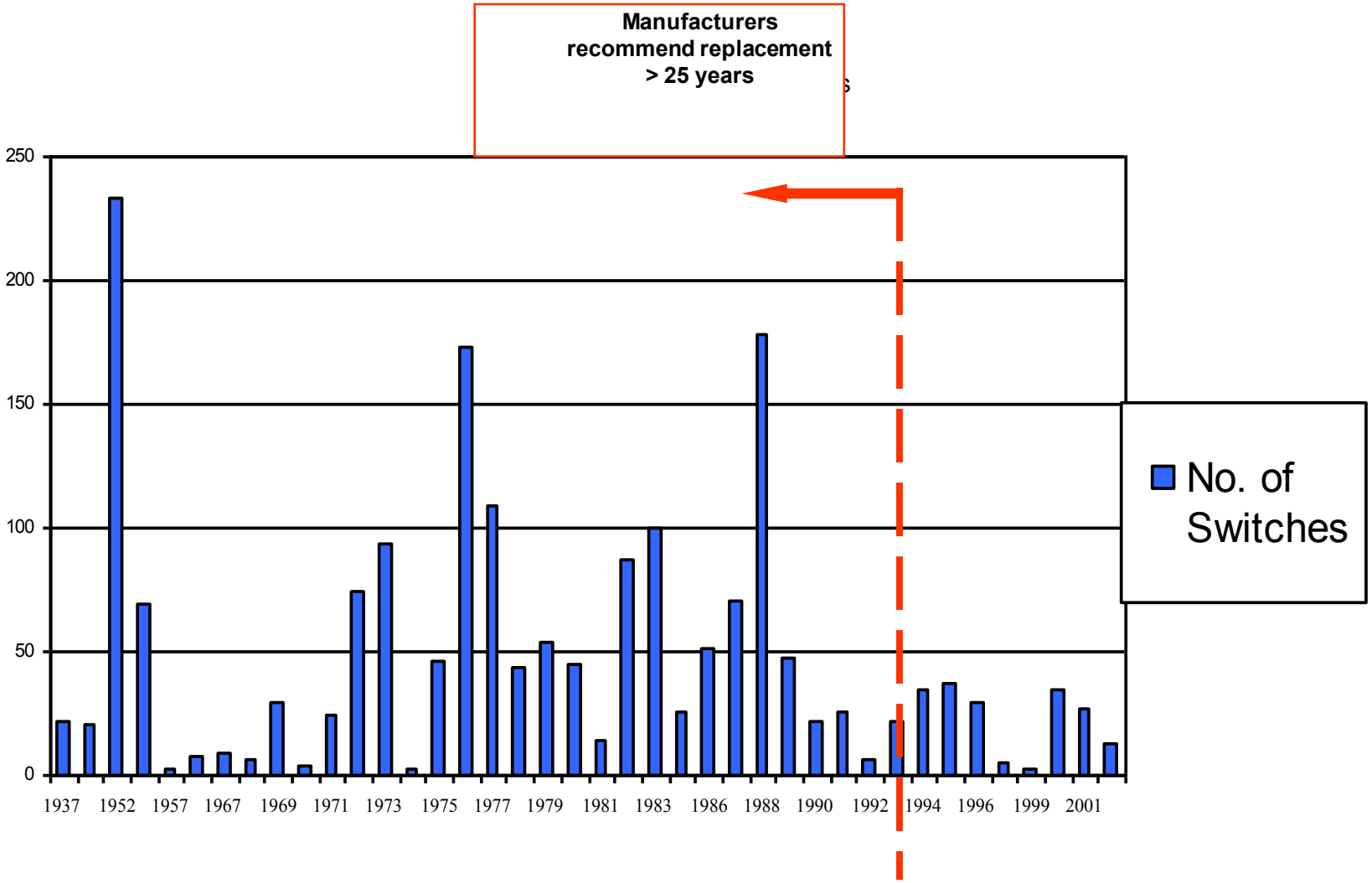


2003/4 Audit Findings on Major Equipment: Switchgear

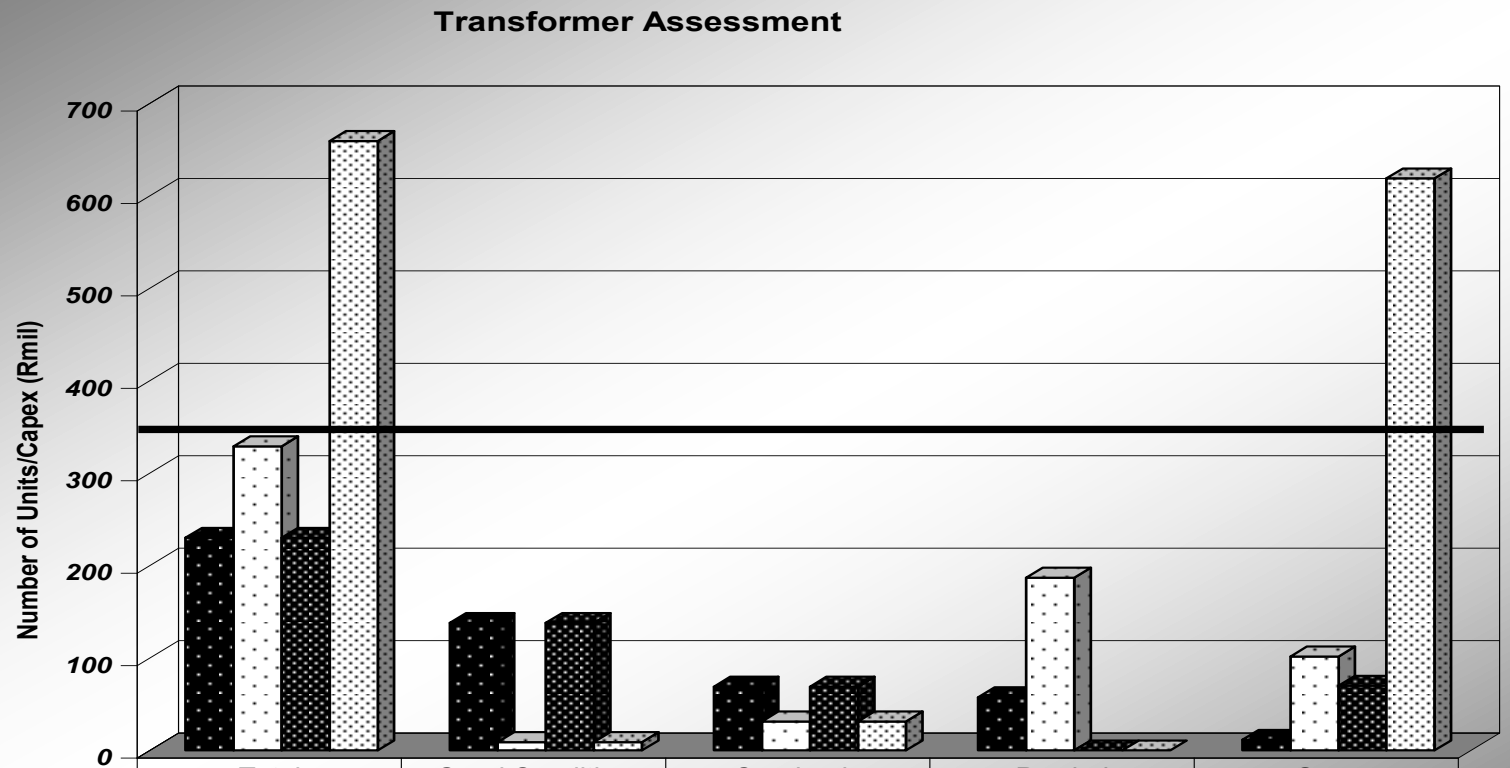
Condition of the Switchgear at different Voltages:

- Significant number of high risk switchgears were identified in terms of standard assessment parameters (Make and Types, kA ratings (fault levels) condition etc.)
- The majority of Switches were old and unsafe to operate and had exceeded their life expectancy. i.e. in excess of 25 years
- The network protection was old and unreliable, resulting in high number of outages due to nuisance tripping
- Limited SCADA coverage at HV level and no coverage at lower voltage levels
- A capital programme was put in place to replace, refurbish and upgrade switchgear and secondary plant

Switchgear Assessment

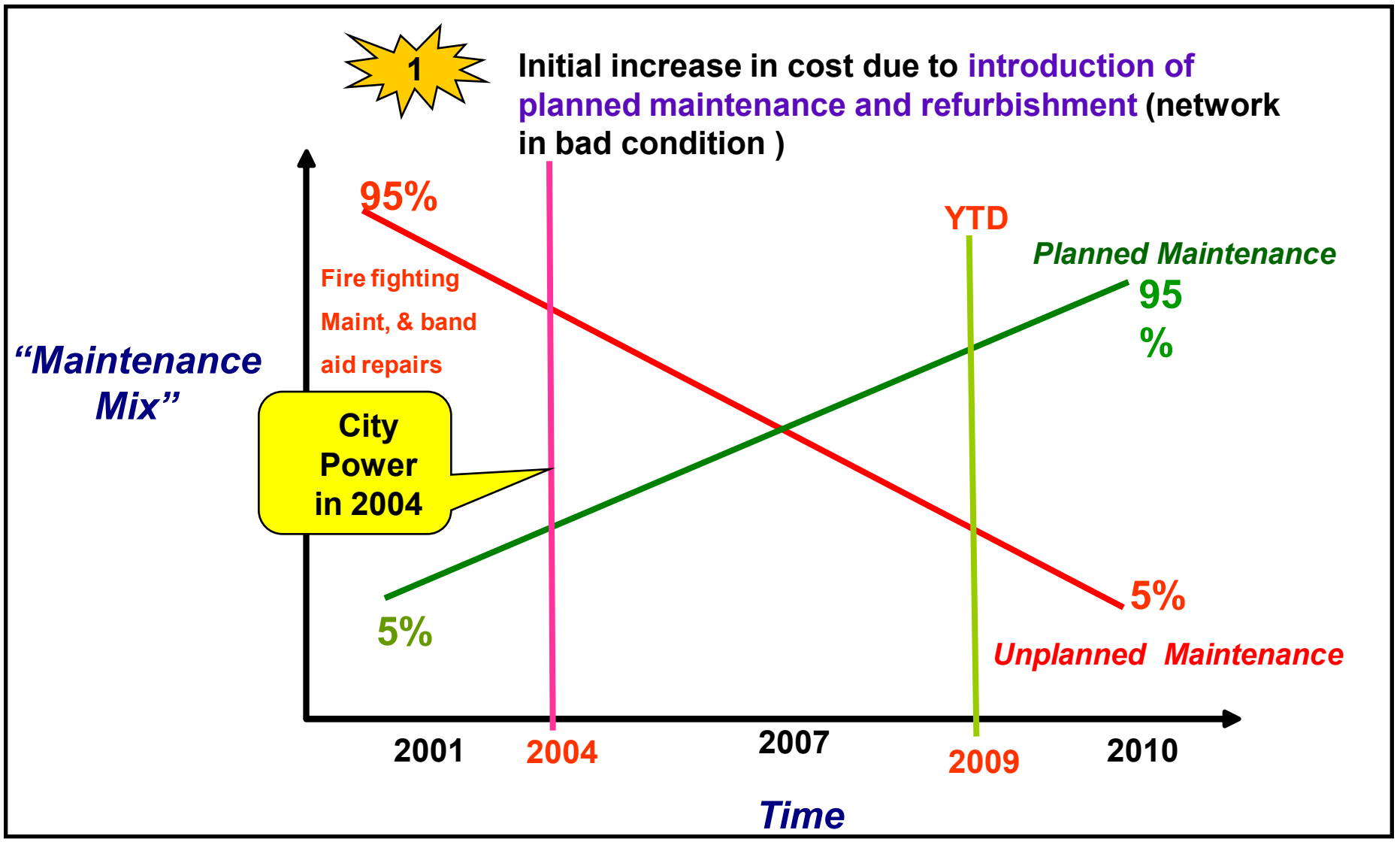


Capital requirement (trfr)



	Total	Good Condition	Overhauls	Rewind	Srap
No. of Units (Rewind)	230	138	69	58	12
Req. Capex (Rewind)	328.90	8.97	31.40	186.88	101.66
No. of Units (No Rewind)	230	138	69	0	70
Req. Capex (No Rewind)	659.17	8.97	31.40	0.00	618.80

Maintenance and refurbishment Strategy



Challenges

The refurbishment programme comes with its own challenges.

It's important that the parties concerned deal with these challenges upfront.

- The common challenges are:
  - **Warranty**
    - **service provider find it difficult to give warranty to the equipment as a whole but can only give a limited warranty to only those portions that the work was done.**
    - the old components can sometimes lead to the failure of the refurbished equipment.
    - Forces the service provider to look at a complete overhaul of that particular equipment.
    - service provider concerned has to be certified by the original equipment manufacturer of that particular equipment.

Challenges…

The game comes with its own politics that cannot be ignored.

- **Design**
  - Most organizations are reluctant to hand their designs to a third party organisation citing breach of intellectual property policy
  - Original manufacturers lose the old designs as new technologies come to the market
  - Forces the service providers to come with a modified design to fit in with the old equipment.
  - Some OEM's no longer exist and to refurbish these equipment pose a big challenge.
- **Factory Capacity**
  - Most OEM's prefer to deal with the production of new equipments rather than embarking more on refurbishing existing equipments.
  - This has led to the need of companies only looking at the refurbishment programmes.
  - These companies have to ensure that they establish good relationship with the OEM's for support and design sharing.

Conclusion

- Keep good records on root cause analysis
- Continuous condition assessment/monitoring on equipment
- Apply appropriate maintenance approach
- Create good prioritisation criteria as a decision making tool to refurbish/replace