Plant Life Management experience at Tarapur Atomic Power Station (INDIA)

By

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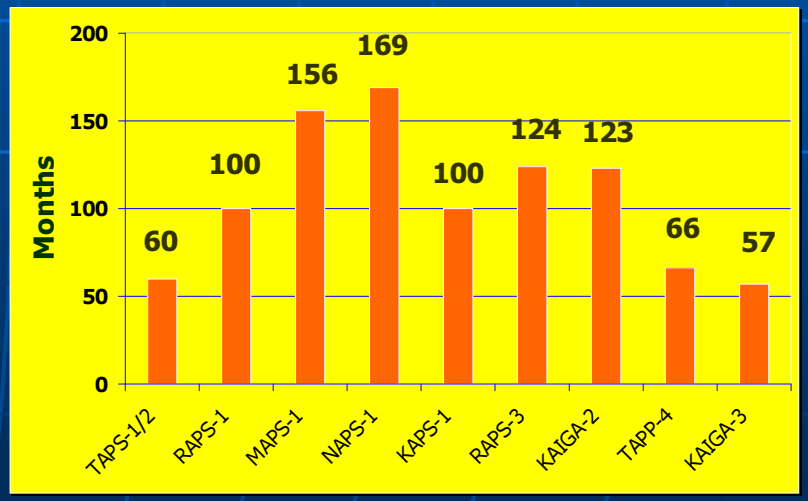
NPCIL Profile

- NPCIL is responsible for Design, Construction, Commissioning, Operation, Maintenance, Life management, and De-commissioning of Indian NPPs.
- 17 reactors in operation. Installed Capacity 4120 Mwe (3% share of energy)
- Oldest : TAPS-1,2 (Oct 1969)
- Latest : KAIGA-3 (May 2007)
- 6 reactors under construction (PHWR, LWR, FBR) Total 3380 Mwe



Optimum construction periods

Salient Features OF TAPS 1 & 2

- IGE turnkey project
- Construction started: MAY 1964
- Commercial operation: NOV 1969
- 38TH Year of operation.
- Rating : SINGLE CYCLE – 160 MW_e
  DUAL CYCLE – 210 MW_e
- Energy produced > 70 BU
- Present tariff: 93 paise /unit (< 2 cents)

Review of Life Management aspects for continued operation of TAPS

- Periodic Safety Review of TAPS initiated in 2000 as part of License Extension. This included:
  - Probabilistic Safety Assessment. (Level-1)
  - Review of Operational Performance.
  - Review of Ageing Management and residual life of SSCs.
  - Review of Design Basis of plant systems and Safety analysis, vis-à-vis the current requirements.
  - Seismic Re-evaluation.

Review Requirement & Objectives

- Review required because of:
  - Changes in applicable design codes
  - Availability of better analytical tools
  - Better understanding of degradation mechanisms
  - Comparing with current standards
- Objectives of review:
  - To identify and prioritize safety issues
  - To identify and implement corrective measures where necessary

Review of Life Management aspects for continued operation of TAPS

- Review Of Life Management
  - Present status of the SSCs
  - Identified modes of degradation
  - Monitoring methods
- Assessment of available margins taking account of
  - Results of revised Safety Analysis
  - Comparison of the current Codal with the earlier requirements followed for TAPS units
  - Various upgradations

Review Of Ageing

- Identification of key systems, structures and components(SSCs).
- Classified as
  - Major critical components
  - Important systems
  - Other critical components.
- Components further classified as
  - Not replaceable
  - Replaceable with re-engineering
  - Replaceable on routine basis.
- For each component mode of degradation identified, ageing assessment done and action plan indicated.

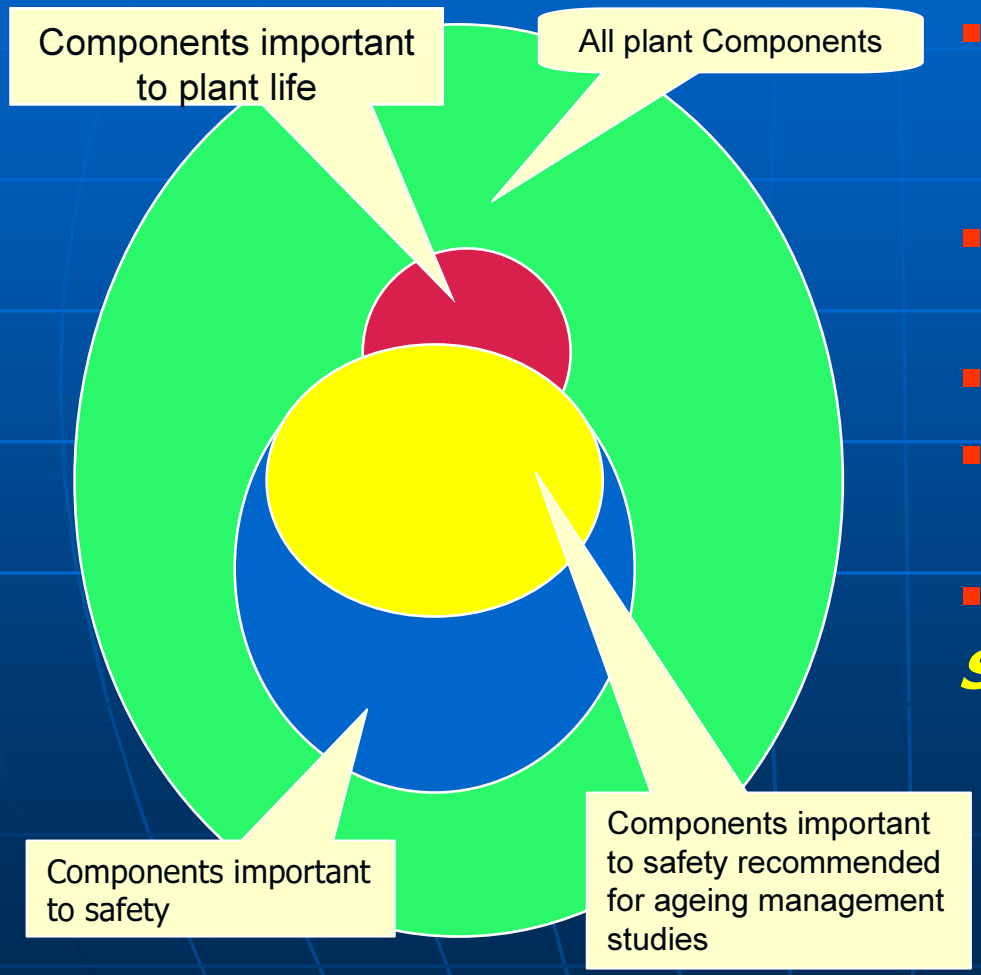
PLIM in TAPS-1,2

- Information pertaining to the sscs is systematically documented and analysed
  - Present status of health
  - Known degradation mechanisms
  - Adequacy of present monitoring methods and practices
- Action plans evolved
  - For ageing studies
  - Residual life assessment
  - Need for development activities for inspection / health assessment of presently un-inspectable areas
  - Equipment replacement.

PLIM Objective

- Improvement of safety performance of TAPS-1,2
- Maximising operating life without compromising safety
- Harmonizing various good practices
- Address various aspects to be considered during different stages of plant, starting from the conceptual design as well as the organizational aspects.
  - Reference Documents:
  - AERB safety guide on Life Management of NPPs.AERB/NPP-SG-O-14

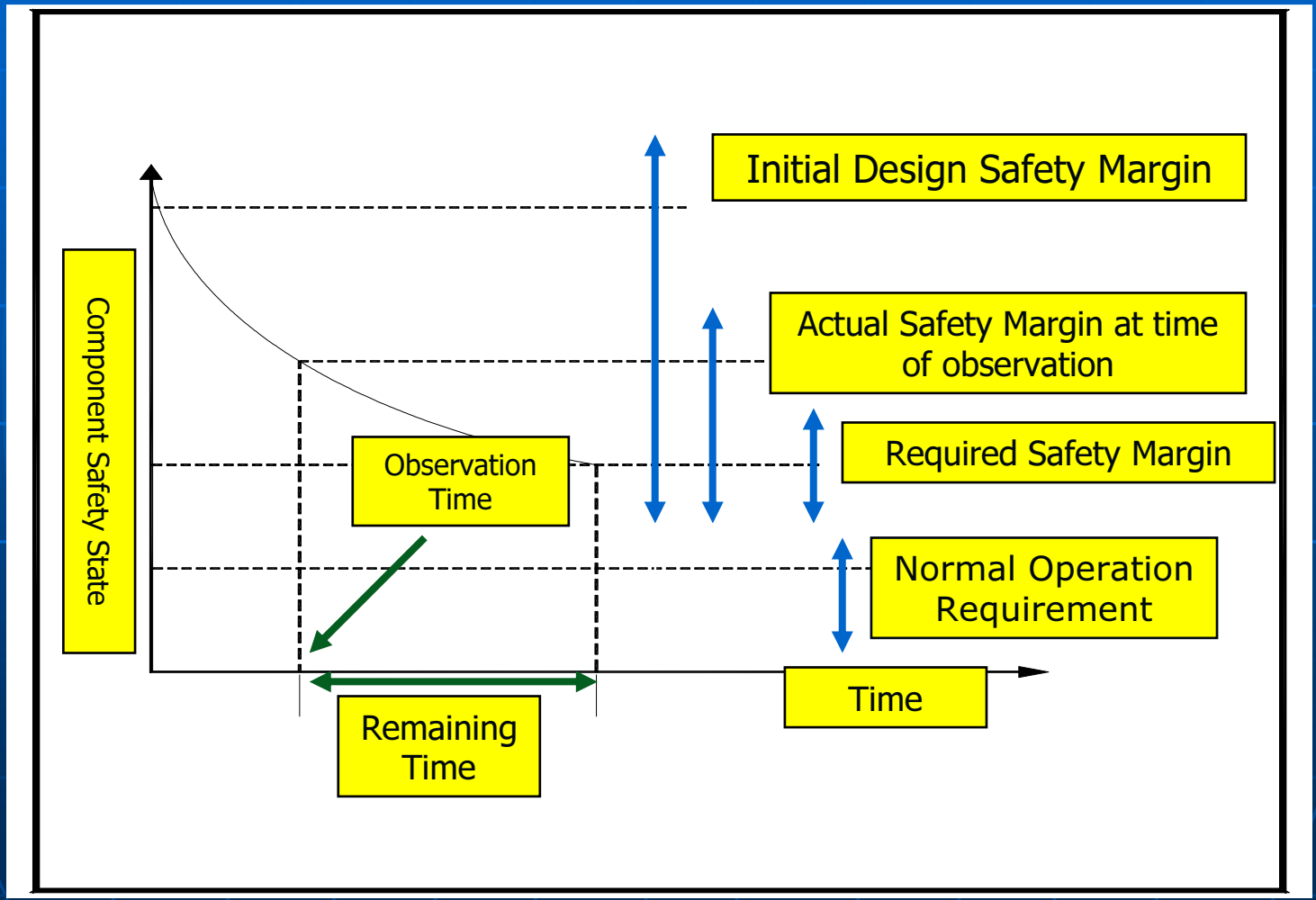
Selection of SSC



- Screening & Categorising of SSC (Replaceable/Non-replaceable)
- Prioritization of Safety Issues
- Condition Monitoring & ISI
- Measures to Mitigate Ageing
- License Renewal

Safety Goal: " 'Plant reference safety level is expected to be maintained during extended period of operation as per the original design"

Safety State Of Components And Safety Margin As Function Of Time



Components of PLIM

- Maintenance Programme
- Surveillance Programme
- In-service Inspection Programme
- Performance Review Programme
- Programme related to life management

PLIM Study Findings

- Condition of RPV & internals is satisfactory .
- Fast neutron fluence at the end of 40 EFPY will be less than threshold value for causing IASCC. RPVs have operated for around 21 EFPY.
- Generic issue of IGSCC with SS 304 piping has been addressed
- Condition of containment is satisfactory.
- Important systems are in good condition.
- AMP for power & control cables based on RLA findings.
- Replacement of equipments done based on condition monitoring:

  SSW pumps, CRD pumps, EC tubes , FW heaters, C/U heat exchangers, Station batteries, etc

Continuous Upgradation (Based On Operating Experience.)

- Augmentation of battery banks.
- Additional start-up transformer
- Station Black Out DG
- Augmentation of compressed air system.
- Augmentation of Reactor clean-up system.
- Augmentation of condensate demin. system
- Thermal insulation upgradation
- Augmentation of Spent Fuel Storage Facility.

Upgradations done for Life Extension

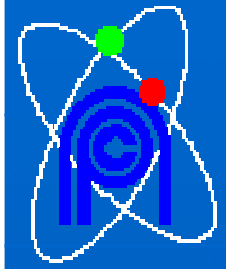
- Retrofitting 3 x 100% capacity EDGs in Seismically qualified Bldg.
- Segregation of Electrical Distribution system
- Additional CRD pump for augmenting Emergency Feed

- Segregation of Reactor Shutdown Cooling system
- Provision of Supplementary Control Room
- Segregation of Fuel Pool Cooling system
- Seismic upgrades

License to Operate extended till 2011

Conclusion

- Plant Life Management is a necessity on account of safety as well as economy.
- With an effective PLIM programme in place, life of NPPs can be maximized while maintaining acceptable level of safety.
- The scope of Life Management will increase as NPPs grow old and the safety standards evolve.
- The endeavor at NPCIL is to ensure that the safety standards of all NPPs remain at an acceptable level, through effective ageing management.



Thank You All !