Buffer Replacement Considerations

John Butler

NEI

NUCLEAR ENERGY INSTITUTE

Buffer Replacement

- Replacement of buffers considered as one means to minimize precipitant impact of strainer headloss

Buffer Candidates

1. Liquid Systems-
   a) Sodium Hydroxide (NaOH)
   b) NaOH at reduced concentration (2.5% vice current 10%)
   c) Sodium Metaborate (NaMB)
2. Granular Systems-
   a) Trisodium Phosphate crystalline
   b) Sodium Tetraborate (NaTB) crystalline

Lead Replacement Strategies

- Three primary replacement strategies
  - Replace TSP with NaTB
  - Replace NaOH with NaTB
  - Replace NaOH with TSP
- All three buffer materials are currently installed and in use at PWRs

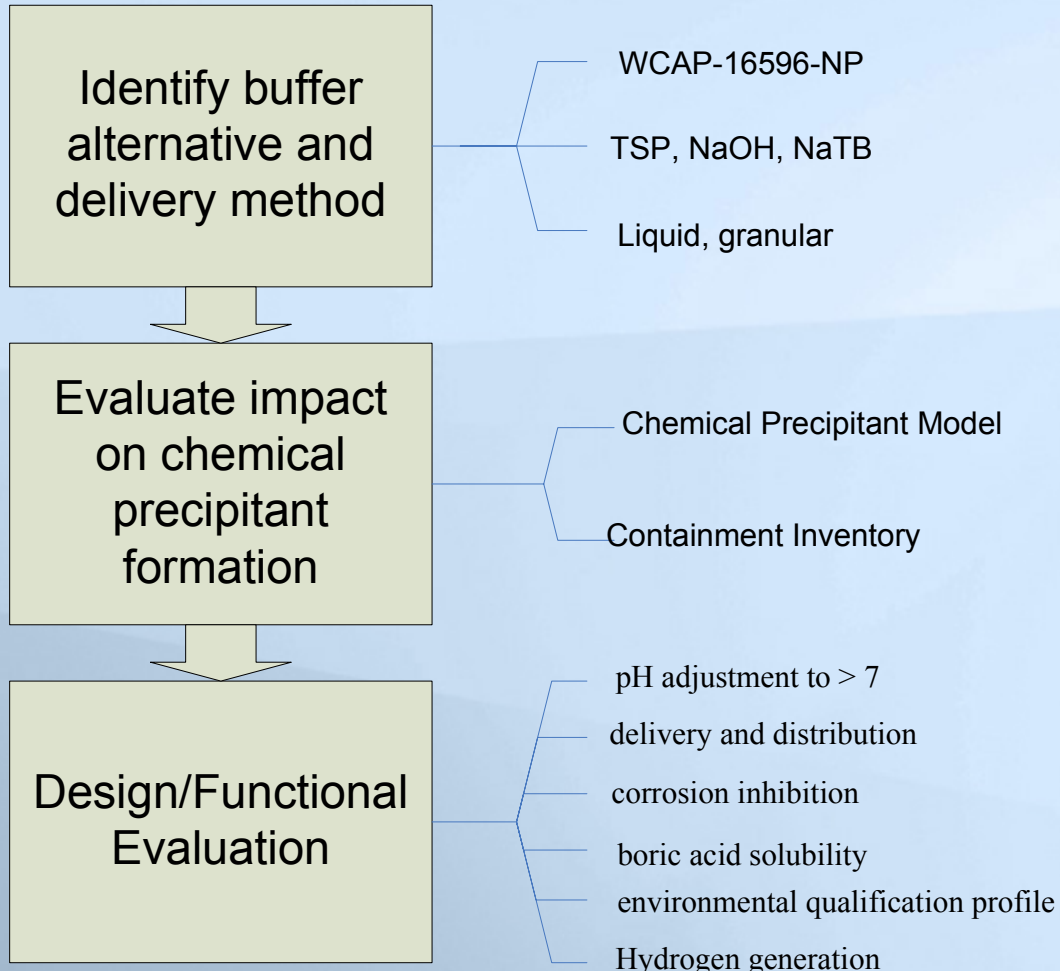
Role of Buffers in Design Bases

- Radiological Dose Control
  - pH > 7
- Inhibition of Stress Corrosion Cracking of Austenitic stainless steel
  - Long term environmental control
  - pH > 7

Functional Considerations

- System Design
- Radiological Consequences
- Equipment Environmental Qualification
- Hydrogen Generation
- Corrosion Control
- Plant Operation
- Plant Documentation

Evaluation of Alternatives



Analyses to Support Buffer Replacement LAR

- Buffer provides pH adjustment to > 7
- Comparable or better delivery and distribution
- Comparable or better corrosion inhibition characteristics for ferritic/austinitic structures
- Comparable or better impact on boric acid solubility
- Buffering characteristics within equipment environmental qualification profile
- Address changes in Hydrogen generation resulting from pH changes

Analyses to Support GSI-191 Resolution

- Technical basis demonstrates head loss, including chemical effects considerations, is less than available pump net positive suction head
- Any chemical effects on downstream components do not compromise long term core cooling

Industry Buffer Replacements

- OPPD Buffer Replacement
  - LAR to replace TSP with NaTB submitted August 21, 2006
  - SER and approval for one cycle issued November 13, 2006
- Buffer replacements being actively considered by approximately 11 sites