



Simplifying Water Treatment Program for the Steam Generators

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Outline:

- Definition
- Simplified Steam/Water Cycle
- Monitoring Process
- Simplification Reasons
- Simplifying Process
- Summary

Definition:

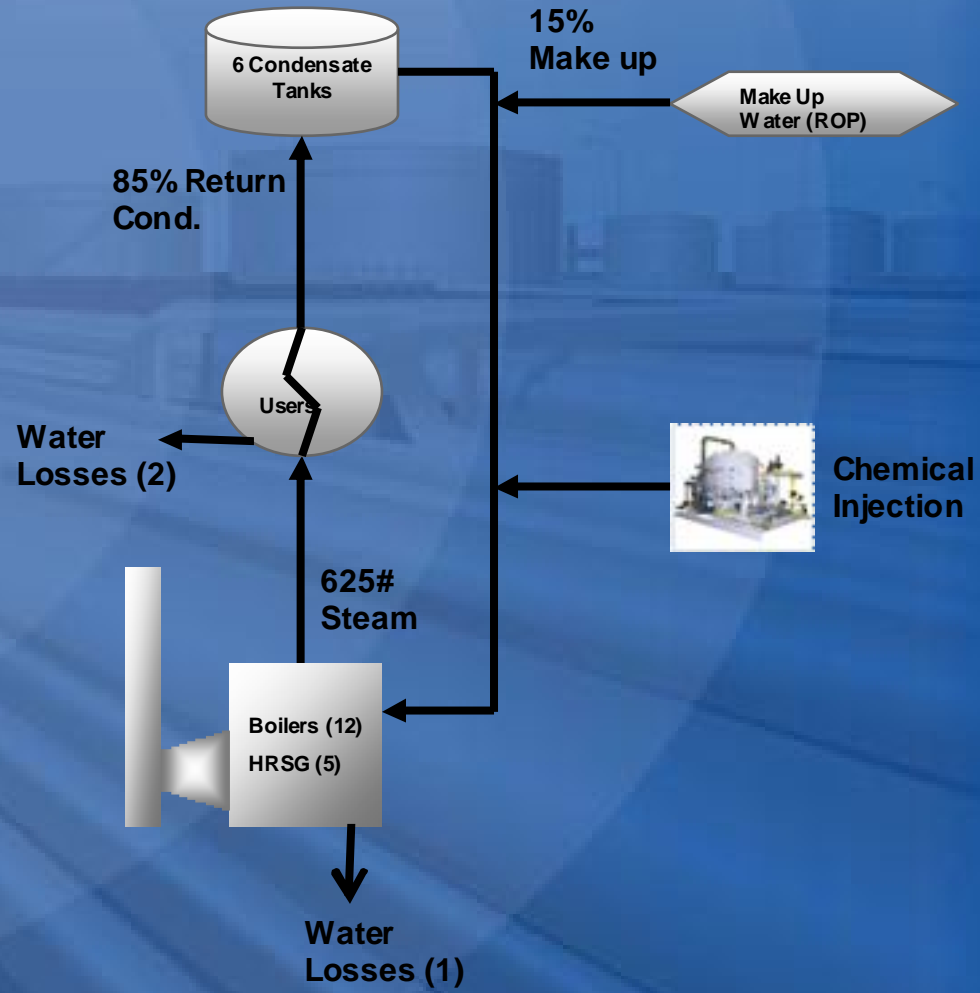
- **Water Treatment (WT):**

It is a set of processes that condition water and control the water's impact on its surroundings.

- **WT Simplification:**

It is a systematic approach aims to improve water treatment quality by make it's processes easier for controlling and monitoring.

Simplified Steam/Water Cycle:



Monitoring Processes:



Simplification Reasons:

1. Complexity of the control

- Out-Of-Spec frequency is high
- Blow down rate is high
- High chemical cost
- No automation, high human error

2. Change in water feed quality

- 100% make up of Reverse Osmosis

3. Reassessment of chemical additive quantities

- No consistent of chemical additive vs. BFW quality
- No consistent of chemical additives vs. steam quality

Simplifying Process:

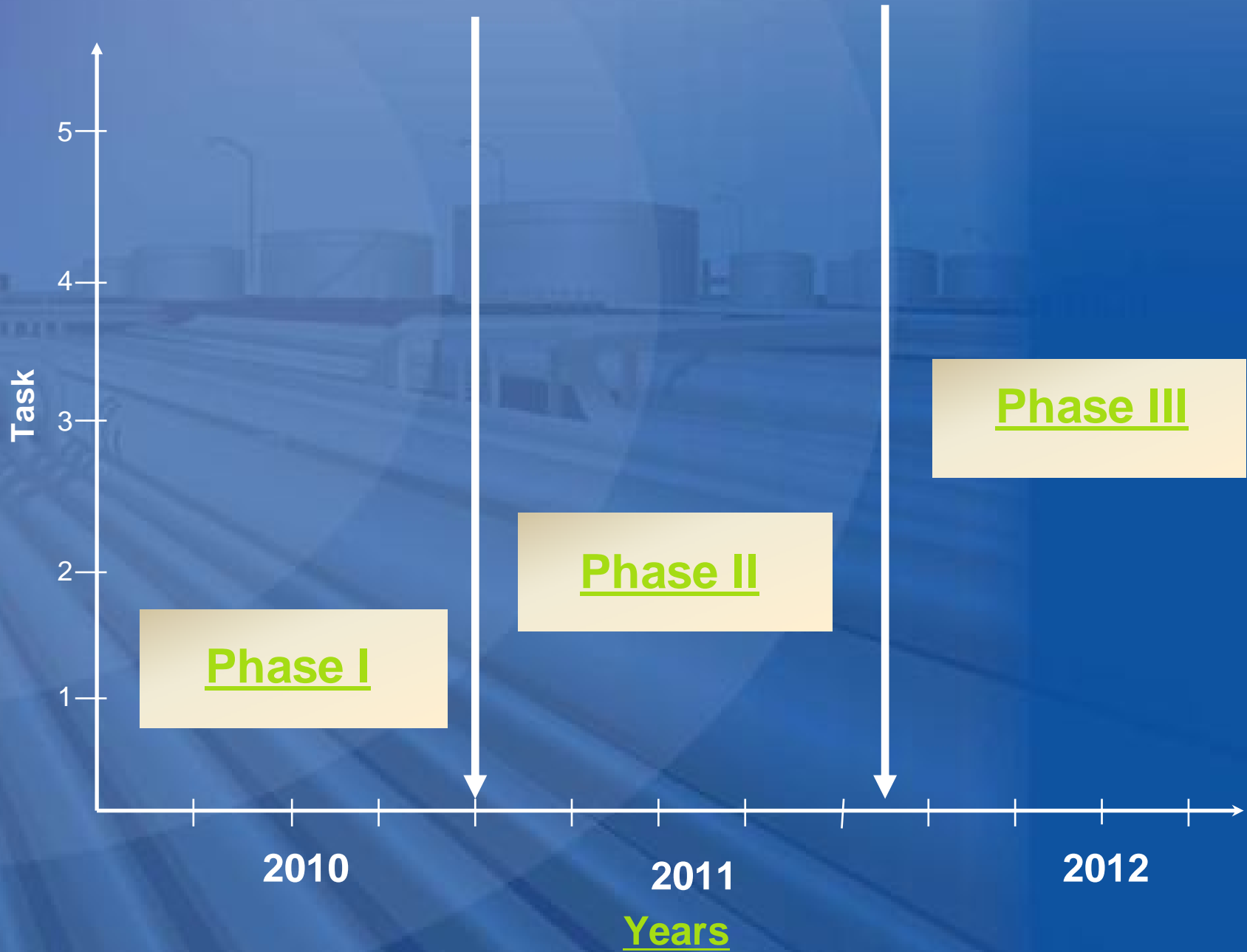
Objectives:

- Optimize types and numbers of chemical additives
- Maintain steam quality, reduce human interference and make cost saving
- Conserve natural resources, water & energy
- Reduce the plants' environmental footprint

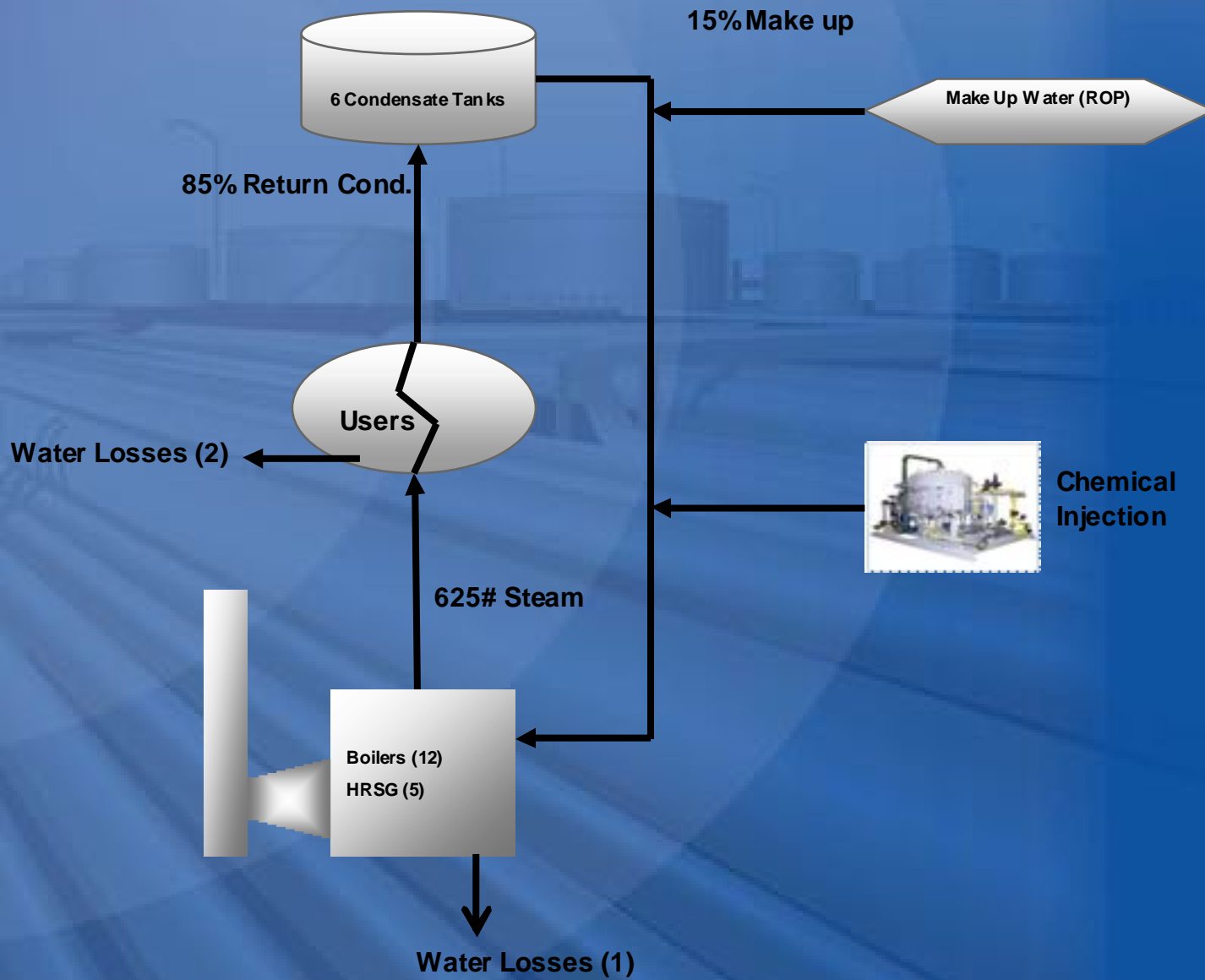
Phases:

- Phase I: Data collection, analysis and startup of chemical optimization
- Phase II: Chemical additive reduction
- Phase III: Automation with Documentation

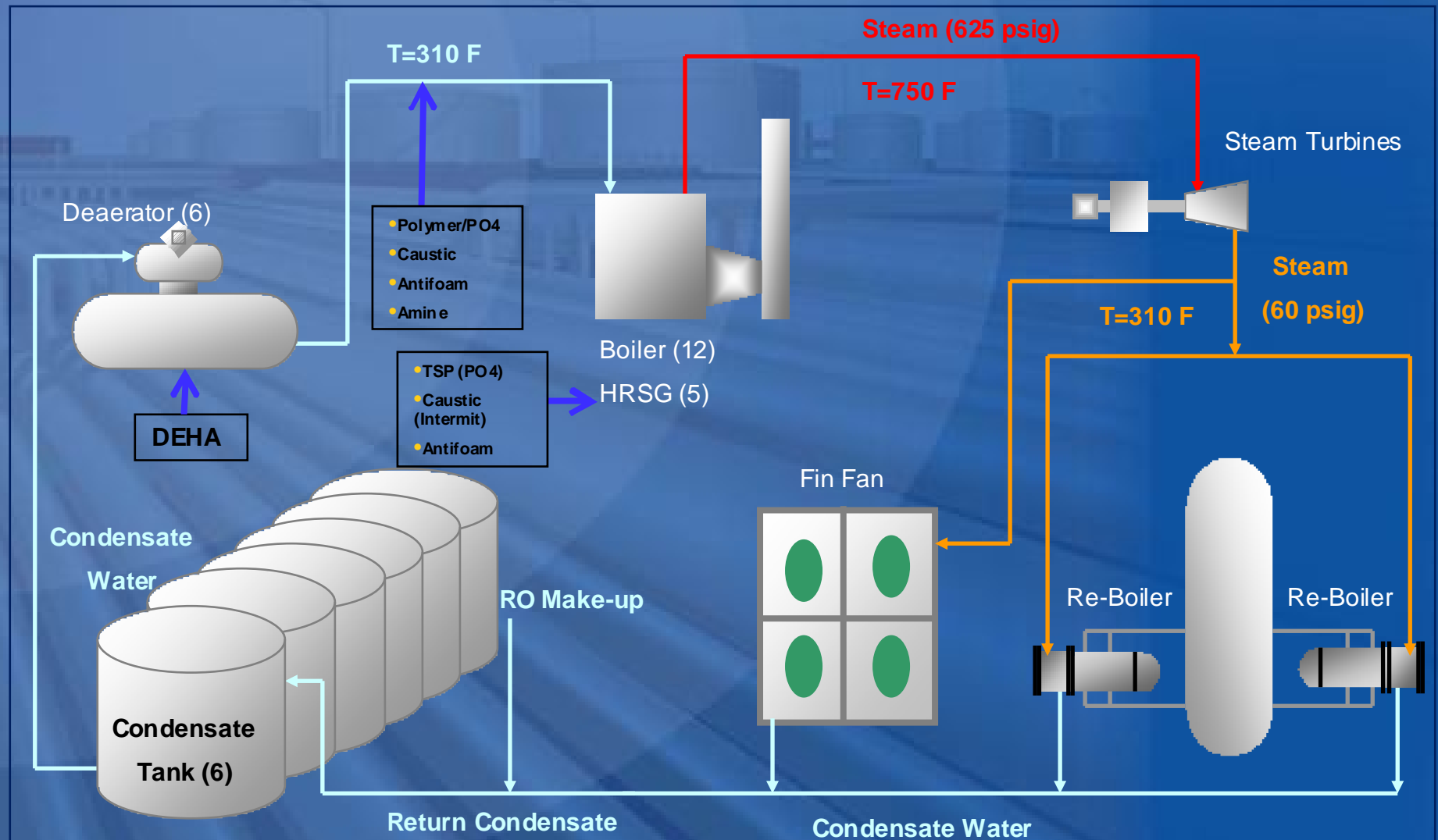
Simplification Process:



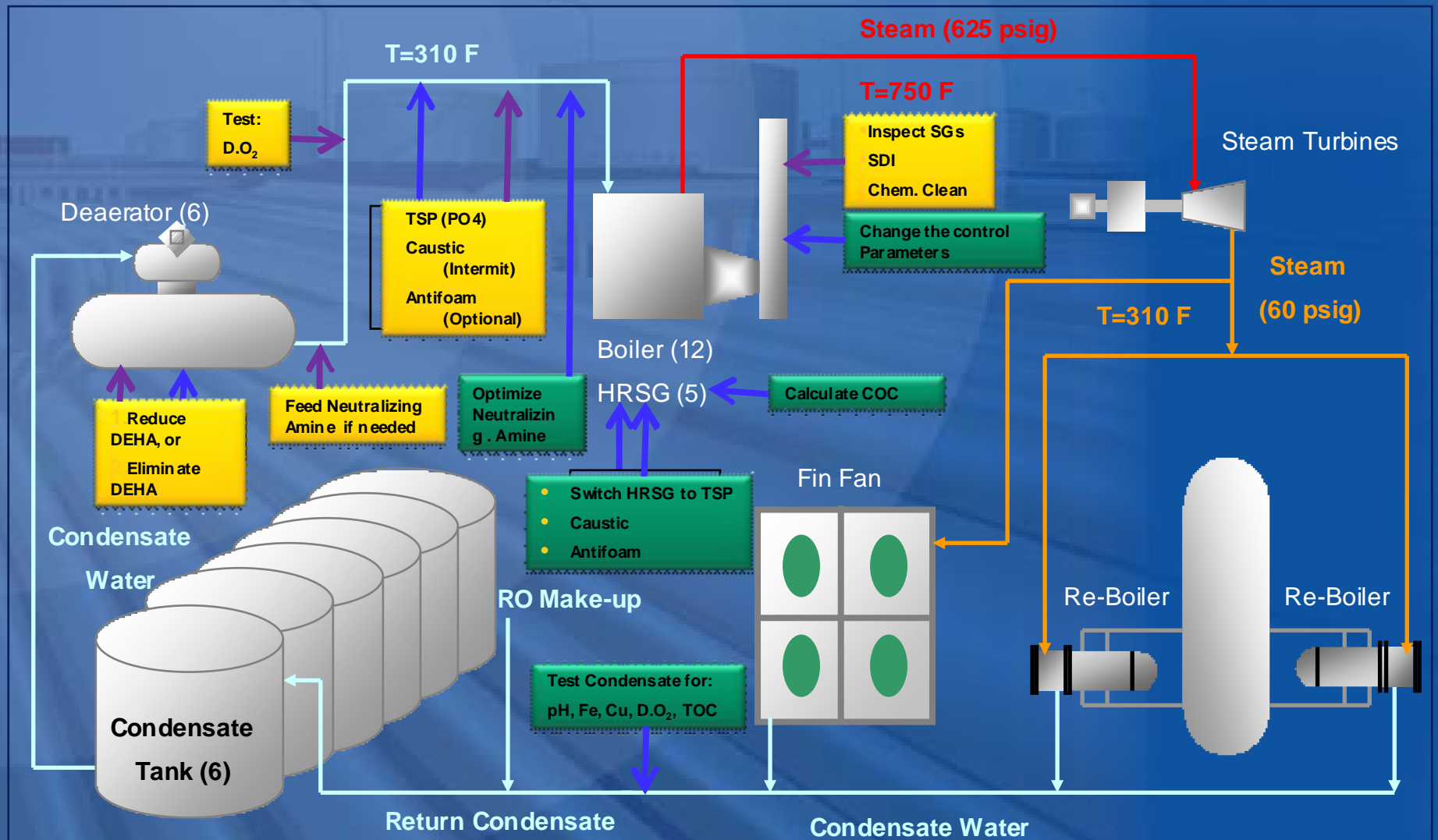
Simplified Steam/Water Cycle:



WHERE?



Whisper? - continued



Phase III:

- Automate testing of steam/water and feed of chemicals
– ETC: 1st Q 2012
- Develop a training program – ETC: 2nd Q 2012
- Exchange results with others – ETC: 2nd Q 2012
- Update the Water treatment contract conditions of APOD – ETC: 3rd Q 2012
- Utilize applicant software to predict/simulate cases in W/T – ETC: 4th Q 2012



Summary:

1. Save natural resources (gas and water)
2. Save \$0.3MM annually on chemical costs.
3. Make chemical control easy through simplifying treatment
4. Align water treatment with International Standards
5. Transfer valuable knowledge and hands-on experience



THANK YOU

Questions?



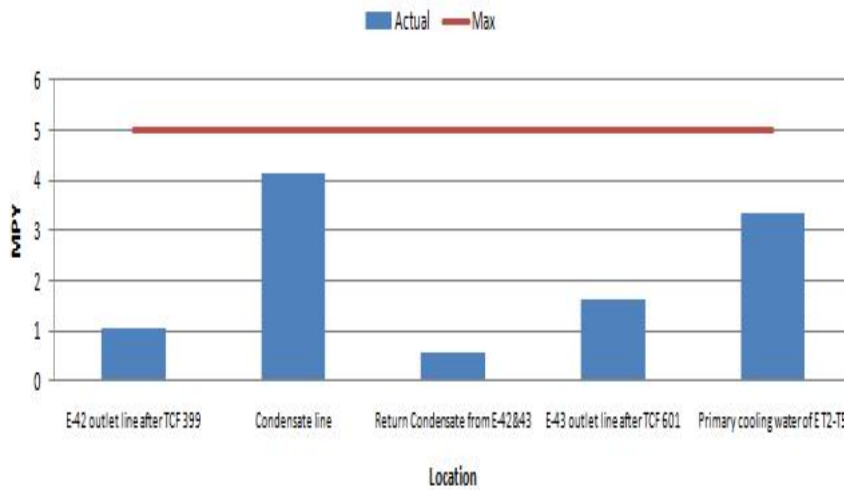


Outcome of Phase I – 2010:

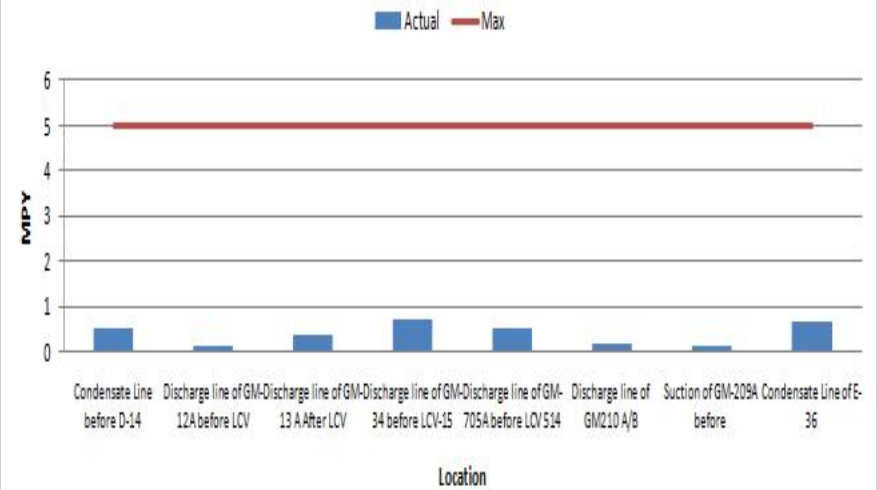
- Better stability of control with TSP at all HRSGs
- 98% of survey analysis results are within spec
- Steam quality is with spec with no sign of carryover
- Tangible cost saving was \$22 M in 2010

Corrosion Rate – 2010:

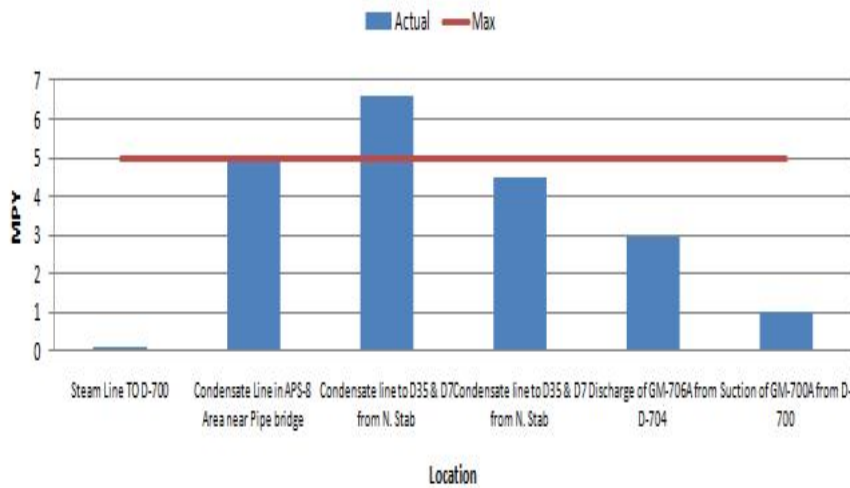
South Corrosion Rate (MPY) of Steam Generation, Plt. #100 (SSP)



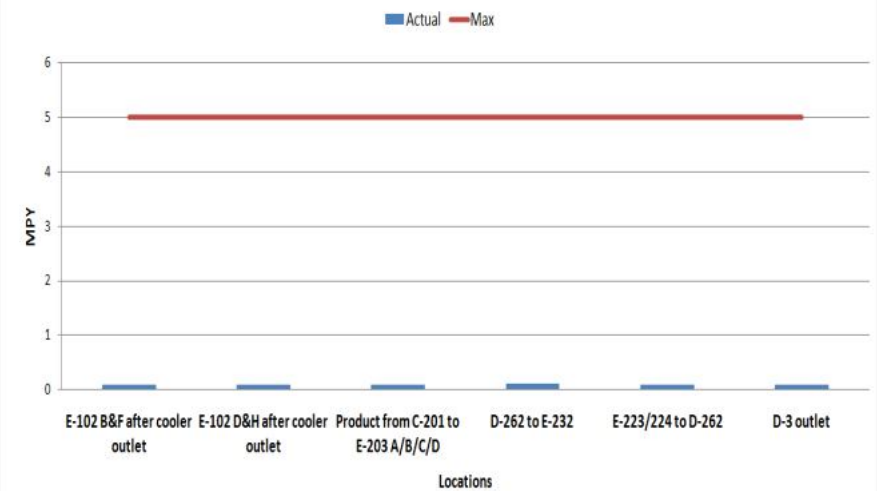
North Corrosion Rate (MPY) of Steam Generation, Plt. #111-1 (PP)



North Corrosion Rate (MPY) of Steam Generation, Plt. #111-2 (AWP)

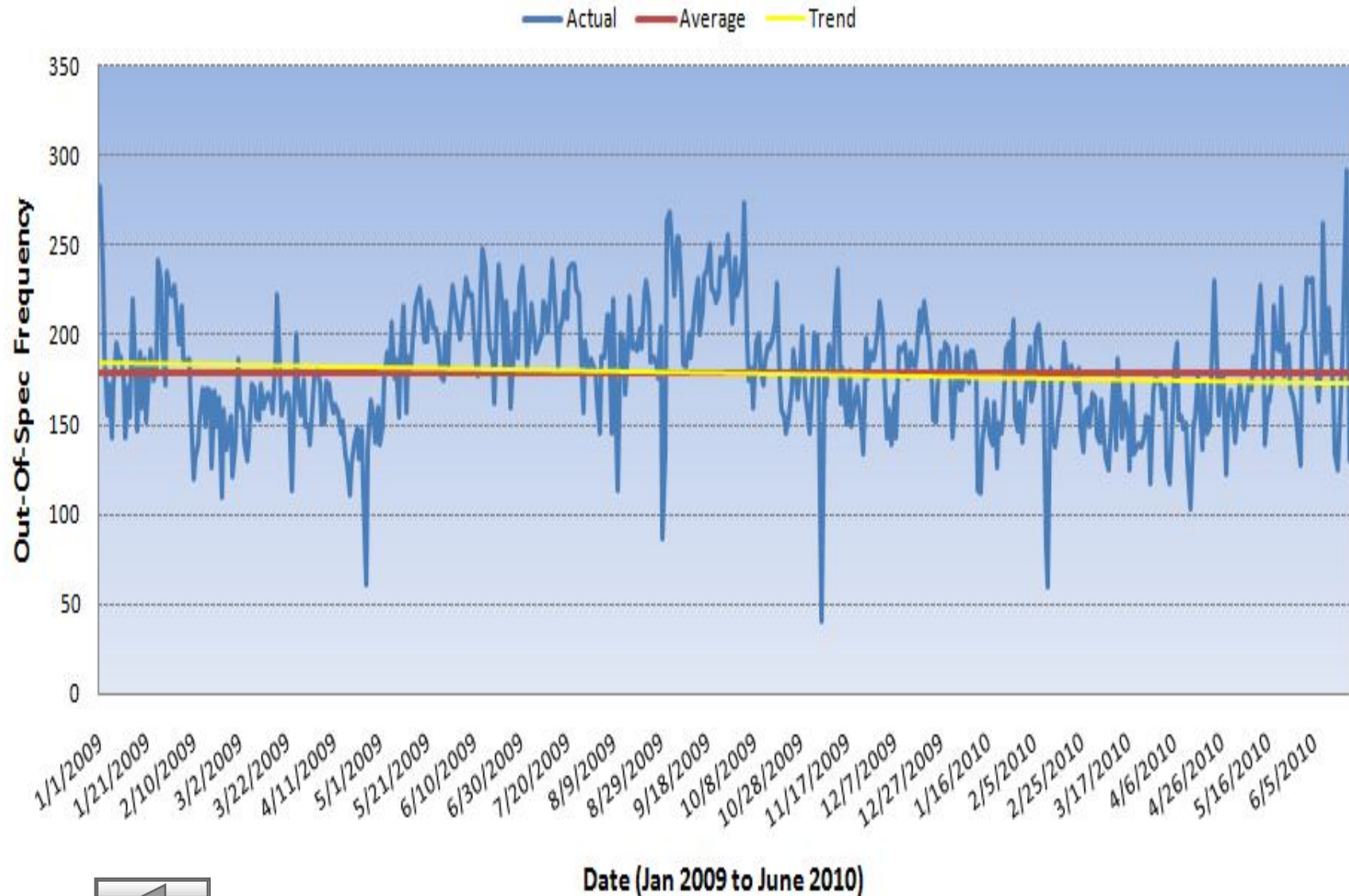


South Return Corrosion Rate (MPY) of Steam Generations, Plts. 461, 462, 499



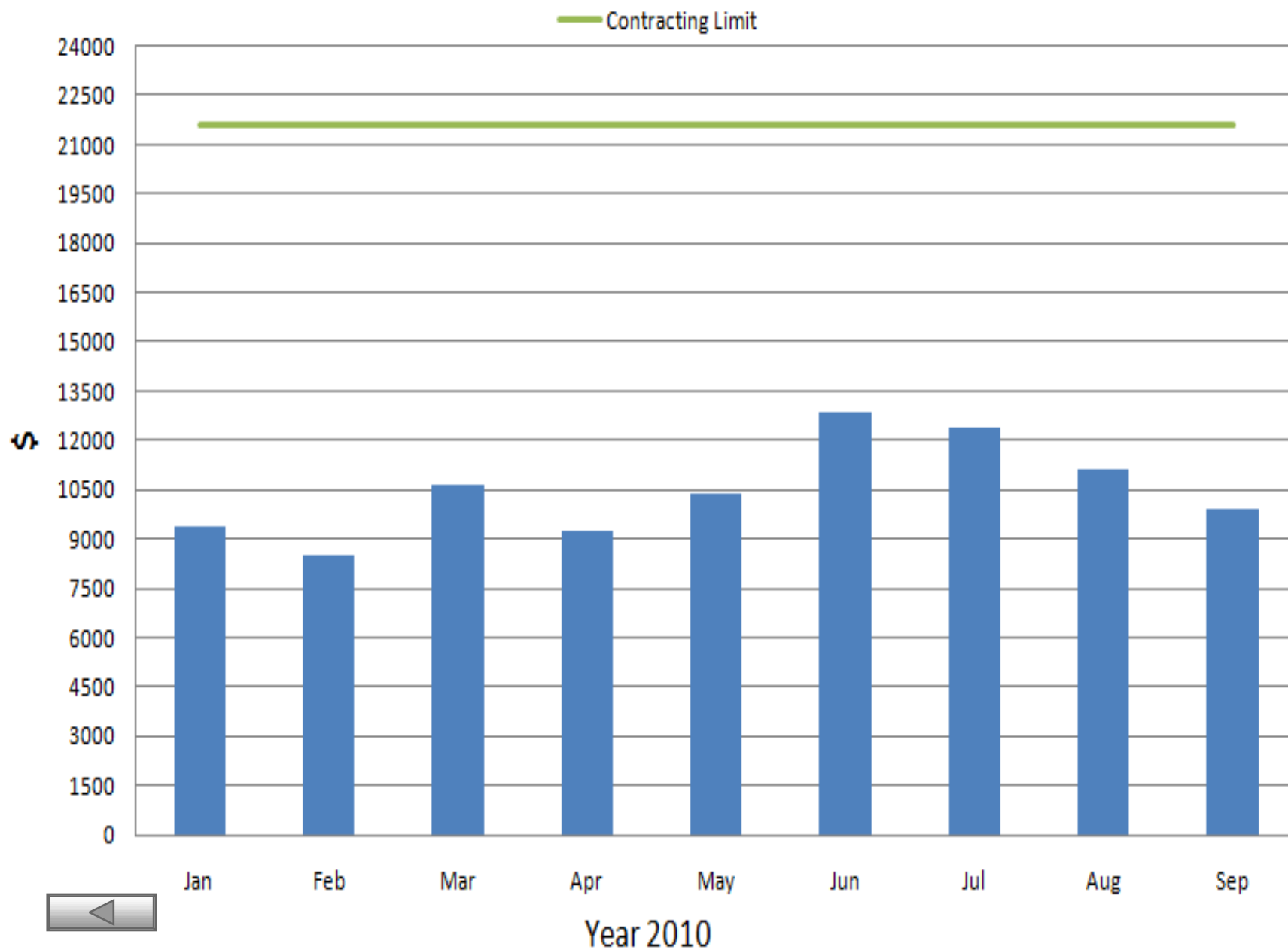
Out-Of-Spec Frequency:

Out Of Specification Frquency Trend in Water Treatment at All Plants of APOD



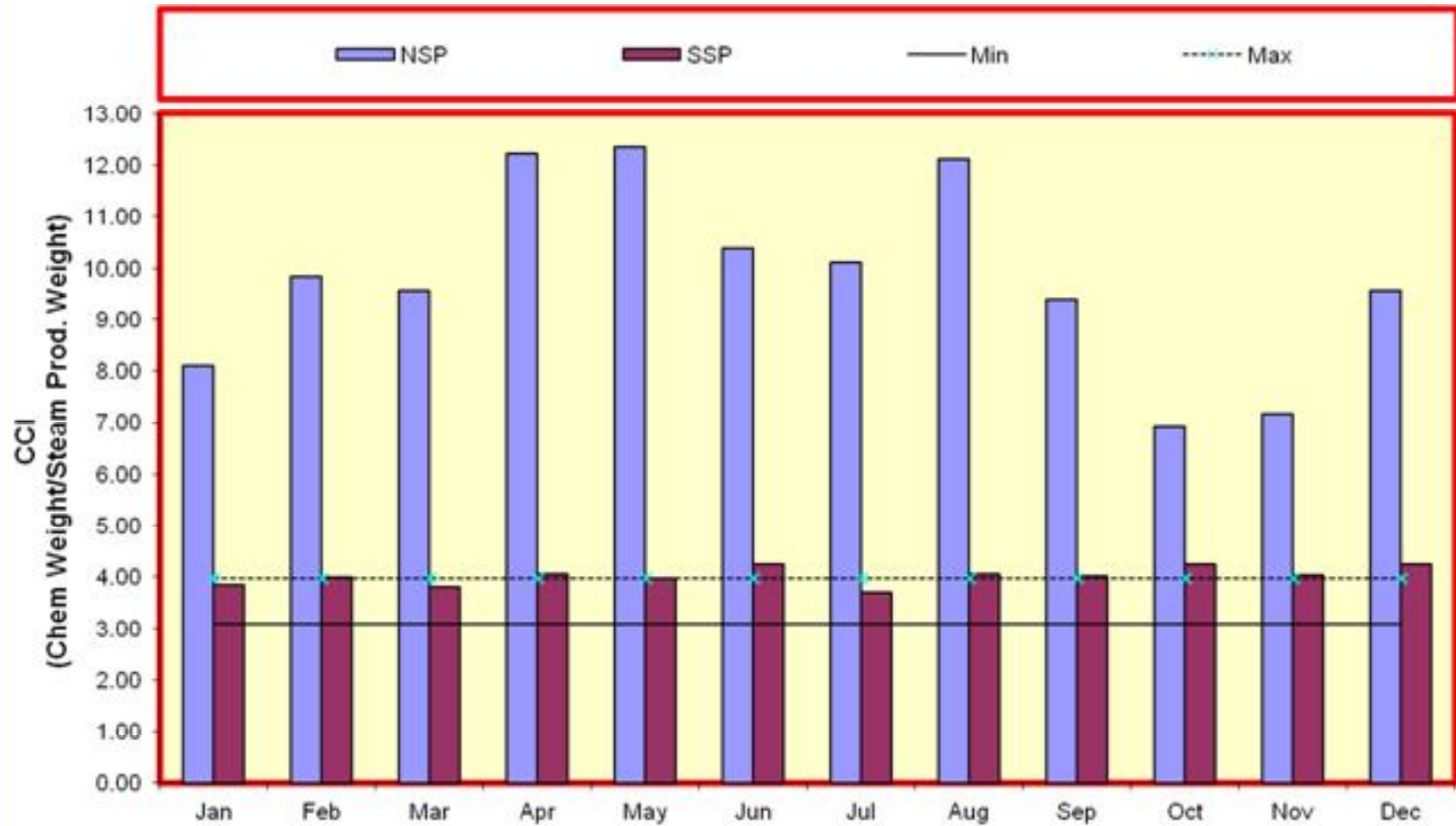
Annual Cost – 2010:

Actual Steam Generation Chemical Cost



Chemical Index - 2010:

Chemical Consumption Index (CCI) Steam Generation Plants



Year 2010



Chemical Cost Saving in Phase I:

Area		Action	Actual Cost & Saving (\$/Y)		
			Before	After	Saving
1	South Steam Plant	Optimize Amine (Morpholine) addition	43,000	33,444	9,556
2	HRSG of NGL, Plant #499	Change the scale Inhibitor type from Polymer/TSP to TSP	7,132	2,101	5,031
3	HRSG of Power Plant		10,698	3,152	7,546
Total Cost \$					22,133

