Lessons Learned @Calvert Cliffs

Plant Process Computer Replacement
Unit 2 Deployment

Brian Allen – Project Engineer

Scientech's
2013
Symposium

Background

CCNPP – Lusby, Maryland

Two Unit Combustion Engineering PWR

Unit 1 Commercial Operation 1975

License Expiration 2034

2737 MWt

Unit 2 Commercial Operation 1977

License Expiration 2036

2737MWt

Project Overview

- Replace existing PPCs (U1 & U2).
- Consolidate hardware & software.
- Redundancy (power, network & computers).
- 25 custom applications
- Qualified Data Historian

PPC Replacement Lessons Learned

- Have a fully resource loaded schedule.
  - Would not of had to push out 5 custom applications
  - Would had realized earlier that this was not a traditional business IT project.
  - Living document (Vacations, ACE, RCAR, IRT, Training, Symposium)

  - Doing a better job for Unit 1 Implementation.
  - More engaged IT support.
  - Finding the right resources was a challenge.
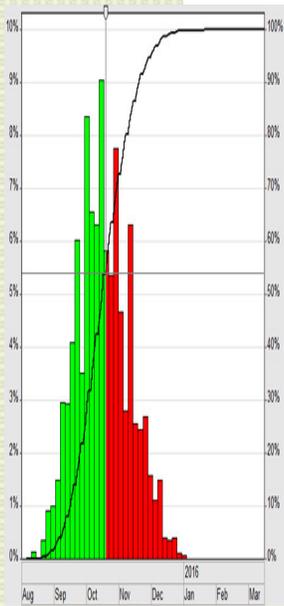
PPC Replacement Lessons Learned

- Control scope creep and scope changes.
  - Not well defined specifications.
  - Requirements not clear enough.
  - Design descriptions unclear.
  - Research/Science projects.
  - Learn to just say "NO!"
- Project has accommodated
  - Budget and schedule overruns.
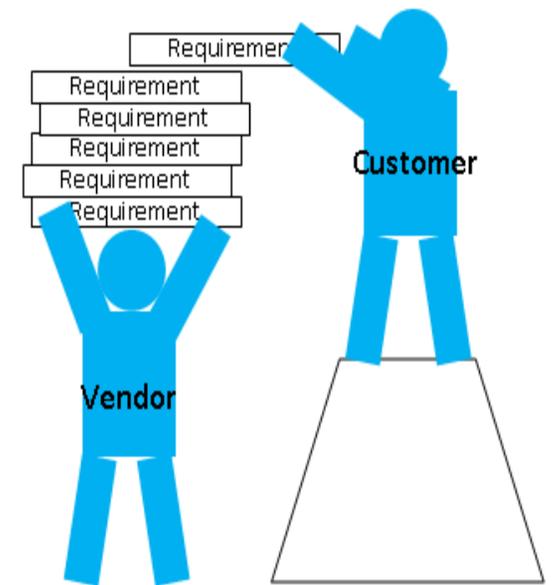
PPC Replacement Lessons Learned

- **Requirement Traceability Matrix (RTM)**
  - Did not get reviewed or approved until just before going into FAT.

  - Should be developed, reviewed & approved during the SRS development.
    - Very time consuming (see schedule)

PPC Replacement Lessons Learned

- Customer purchased hardware.
  - The project only looked at the cost savings.
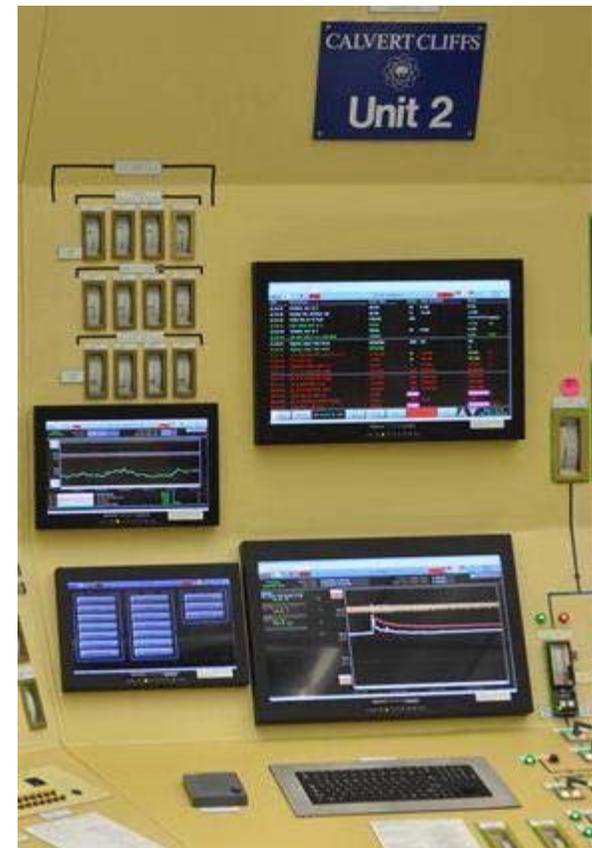 - Didn't account for managing the equipment

CONS:
Warehouse storage
Inventory manager (tracking)
Shipping cost for FAT
Manage software deployments
Purchase hardware not used

PROS:
Available on-site
Development lab
Parallel run
Decrease cost
Customer control platform
Customer hands on product
Develop deployment procedures

Before and After

PPC Replacement Lessons Learned

- Doesn't always have to be a negative. Positive lessons learned

PPC Replacement Lessons Learned

- Observe and be involved at the "Dry Run Factory Acceptance Test".

  - This proved to be essential

  - First look at the integrated system

  - Provided education on R*TIME

PPC Replacement Lessons Learned

- ## Configuration Management
  - To manage software changes:
    - a log book with SME review and vendor and customer signature before code is checked into PVCS.

- ## Job path manager (outage)
  - Coordinate activities.
  - Approvals for work during "no work" evolutions (reduced/lowered inventory).

PPC Replacement Lessons Learned

- Hardware setup at FAT should be the identical as the Unit Plant.
  - Simulations, virtual servers, software differences lead to rework and risk of coding errors.
  - Powertrax Interface – acceptable at FAT
    - Site experienced random server failovers
    - Resulted in code change
    - Lost man hours
    - Schedule slippage
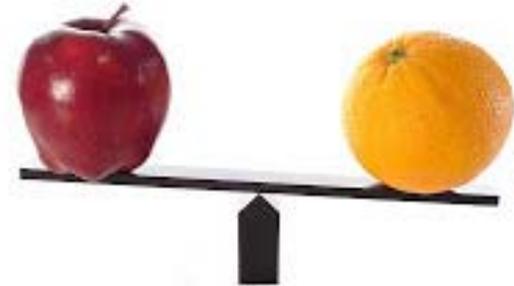
PPC Replacement Lessons Learned

- Do not make code changes during FAT unless all the changes are fully understood.
  - Plant Calorimetric – Latent coding error
    - Excessive system utilization and memory leak.
    - Change from archive as a repository for real time data to buffered current value data.
    - Only perform archive requests upon failover or start-up.
    - New design reviewed, approved and retested.
      - Used steady state data in a small window of time.

PPC Replacement Lessons Learned

- ## Plant Calorimetric (cont.)
  - Code error caused a retrieval of data from the incorrect time period.
    - Resulted in another code change
    - Rigorous retesting
    - Extent of condition
    - Operating Experience (OE)

PPC Replacement Lessons Learned

- The project will expose unknown features.
  - Duplicate Sequence Of Events (SOE)
  - Discovered during failover at SAT.
    - Priority concern
    - Vendor support on-site
  - Indentified the issue as SOE buffering on the DAS Host Interface Ports.
    - This is by design, unknown to spec author.
  - Scientech develop an interim solution.

SOE Buffered Messages

Time	Point Name	Description	State	Tag
4/16/2013 Database: CC2				
8:28:45.284	2RPSTU7BS	THERM MARGIN LOW PRESS CH B	1	NORMAL
8:30:30.877	2RPSTU5BS	STEAM GEN LOW PRESSURE CH B	0	TRIP
8:30:53.492	2RPSTU5BS	STEAM GEN LOW PRESSURE CH B	1	NORMAL
8:30:55.111	2RPSTU7BS	THERM MARGIN LOW PRESS CH B	0	TRIP
8:31:02.829	2RPSTU7BS	THERM MARGIN LOW PRESS CH B	1	NORMAL
8:32:36.035	2RPSTU7BS	THERM MARGIN LOW PRESS CH B	0	TRIP
8:32:59.581	2RPSTU7BS	THERM MARGIN LOW PRESS CH B	1	NORMAL
8:34:36.123	2RPSTU5BS	STEAM GEN LOW PRESSURE CH B	0	TRIP
8:36:01.624	2RPSTU5BS	STEAM GEN LOW PRESSURE CH B	1	NORMAL
8:36:03.324	2RPSTU7BS	THERM MARGIN LOW PRESS CH B	0	TRIP
8:36:14.292	2RPSTU7BS	THERM MARGIN LOW PRESS CH B	1	NORMAL
8:41:54.687	2RPSTU7BS	THERM MARGIN LOW PRESS CH B	0	TRIP
8:44:22.698	2RPSTU5BS	STEAM GEN LOW PRESSURE CH B	0	TRIP
8:44:58.744	2RPSTU5BS	STEAM GEN LOW PRESSURE CH B	1	NORMAL
8:47:40.040	2RPSTU7BS	THERM MARGIN LOW PRESS CH B	1	NORMAL
8:49:36.936	2RPSTU7BS	THERM MARGIN LOW PRESS CH B	0	TRIP
8:50:46.519	2RPSTU5BS	STEAM GEN LOW PRESSURE CH B	0	TRIP
8:51:17.762	2RPSTU5BS	STEAM GEN LOW PRESSURE CH B	1	NORMAL
8:52:43.222	2RPSTU7BS	THERM MARGIN LOW PRESS CH B	1	NORMAL
8:56:27.138	2RPSTU7BS	THERM MARGIN LOW PRESS CH B	0	TRIP
8:56:27.144	2RPSTU7BS	STEAM GEN LOW PRESSURE CH B	0	TRIP
8:56:30.886	2RPSTU7BS	THERM MARGIN LOW PRESS CH B	1	NORMAL
8:56:59.570	2RPSTU7BS	THERM MARGIN LOW PRESS CH B	0	TRIP
8:57:01.066	2RPSTU7BS	THERM MARGIN LOW PRESS CH B	1	NORMAL
8:57:01.352	2RPSTU7BS	THERM MARGIN LOW PRESS CH B	0	TRIP
8:57:21.301	2RPSTU5BS	STEAM GEN LOW PRESSURE CH B	1	NORMAL
8:57:21.344	2RPSTU7BS	THERM MARGIN LOW PRESS CH B	1	NORMAL
8:57:24.097	2RPSTU7BS	THERM MARGIN LOW PRESS CH B	0	TRIP
8:57:24.107	2RPSTU5BS	STEAM GEN LOW PRESSURE CH B	0	TRIP
8:57:24.451	2RPSTU5BS	STEAM GEN LOW PRESSURE CH B	1	NORMAL
8:57:24.505	2RPSTU7BS	THERM MARGIN LOW PRESS CH B	1	NORMAL
17-April-2013				
Database: CC2				
1:18:20.317	2PS8226S	(BUF) HYDR FLUID LO PRESS TRIP SY	1	TRIP
1:18:37.932	2PS8226S	(BUF) HYDR FLUID LO PRESS TRIP SY	0	NORMAL
8:15:27.195	2RPSTU7BS	(BUF) THERM MARGIN LOW PRESS CH B	0	TRIP
8:15:27.205	2RPSTU5BS	(BUF) STEAM GEN LOW PRESSURE CH B	0	TRIP
8:17:23.394	2RPSTU5BS	(BUF) STEAM GEN LOW PRESSURE CH B	1	NORMAL
8:17:23.437	2RPSTU7BS	(BUF) THERM MARGIN LOW PRESS CH B	1	NORMAL
8:18:54.200	2RPSTU7BS	(BUF) THERM MARGIN LOW PRESS CH B	0	TRIP
8:18:54.217	2RPSTU5BS	(BUF) STEAM GEN LOW PRESSURE CH B	0	TRIP
8:20:18.327	2RPSTU5BS	(BUF) STEAM GEN LOW PRESSURE CH B	1	NORMAL
8:20:18.393	2RPSTU7BS	(BUF) THERM MARGIN LOW PRESS CH B	1	NORMAL
8:28:20.965	2RPSTU7BS	(BUF) THERM MARGIN LOW PRESS CH B	0	TRIP
8:28:45.284	2RPSTU7BS	(BUF) THERM MARGIN LOW PRESS CH B	1	NORMAL
8:30:30.877	2RPSTU5BS	(BUF) STEAM GEN LOW PRESSURE CH B	0	TRIP
8:30:53.492	2RPSTU5BS	(BUF) STEAM GEN LOW PRESSURE CH B	1	NORMAL
8:30:55.111	2RPSTU7BS	(BUF) THERM MARGIN LOW PRESS CH B	0	TRIP
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8:47:40.040	2RPSTU7BS	(BUF) THERM MARGIN LOW PRESS CH B	1	NORMAL
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➢ Since DAS buffers SOEs until requested by the PPC.

➢ And during PPC automatic failover, the DAS will notify the PPC that SOEs are pending.
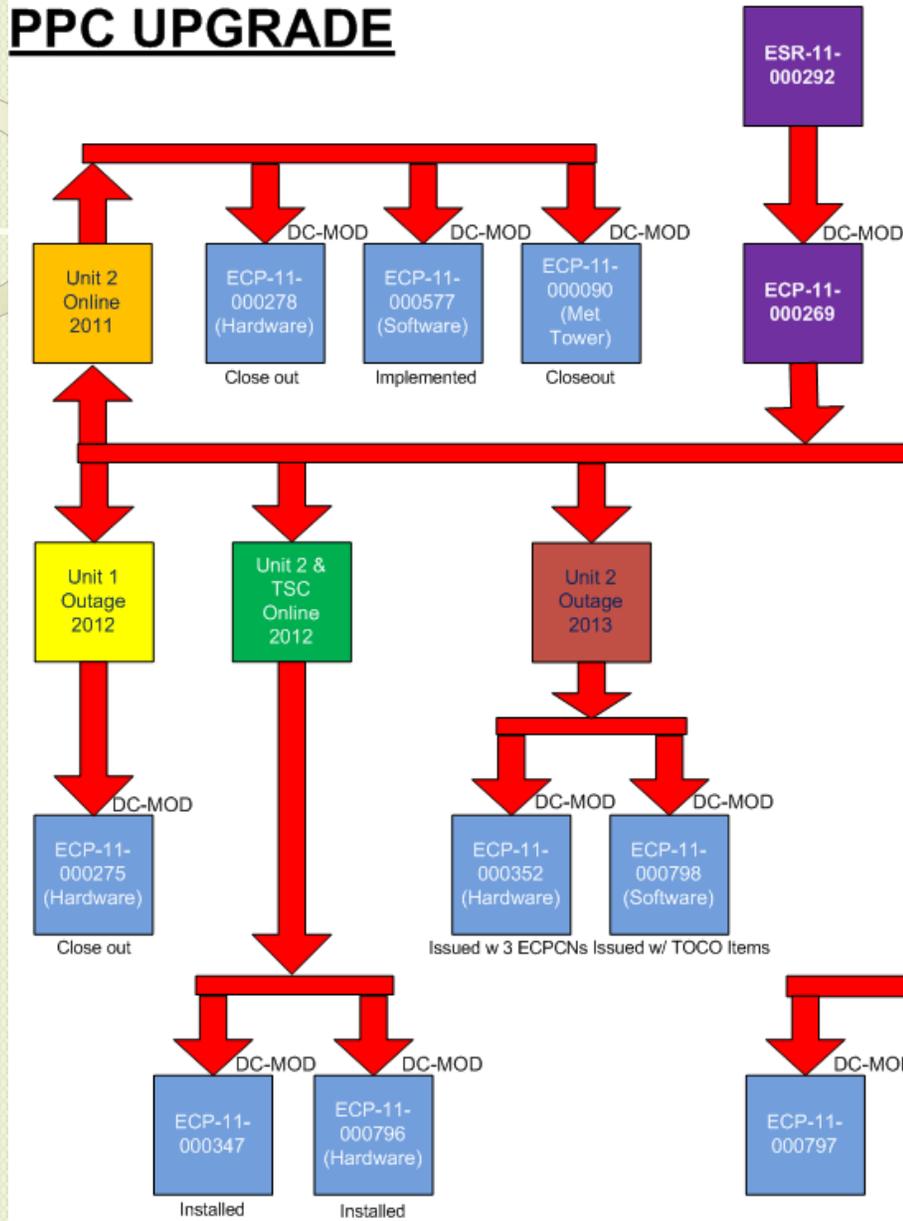
➢ The first requested SOEs are labeled as (BUF).

➢ This is an interim solution. Will be corrected later.
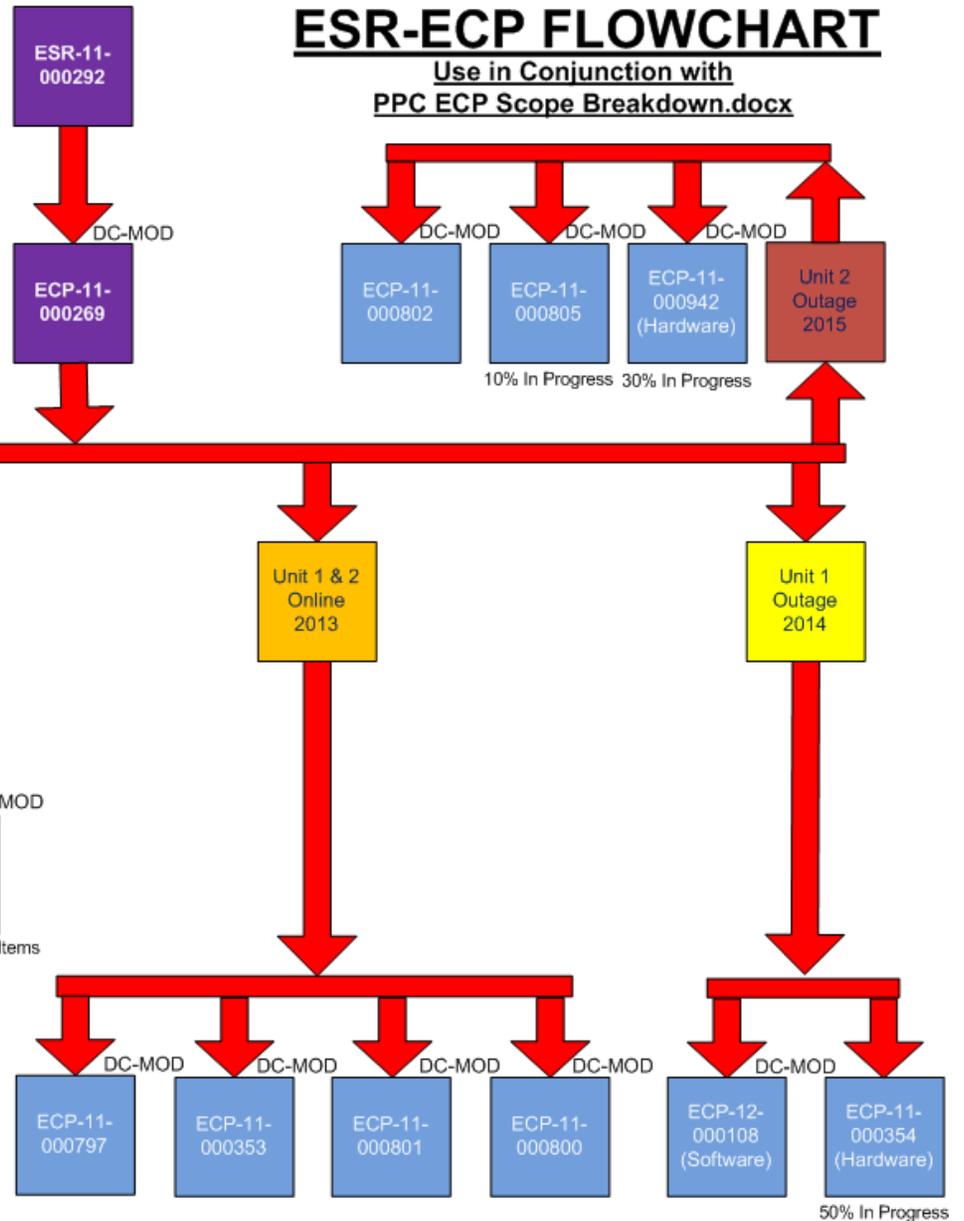
PPC Replacement Lessons Learned

PPC Replacement Lessons Learned

- Engineering reviews and meeting (10%, 50%, 90%)
  - Problem getting quorum
    - Constant hounding by administrator.
    - If you feed them, they will come.

  - Having many disciplines on the project is a plus.

PPC Replacement Lessons Learned

- Questions