Hartford's Ferry Outage- Unit # 3

Alliance Outage - Lessons Learned Session

Jan. 19 2010

Fort Milton Power Station, Unit #1

Alliance Outage – Lessons Learned Session

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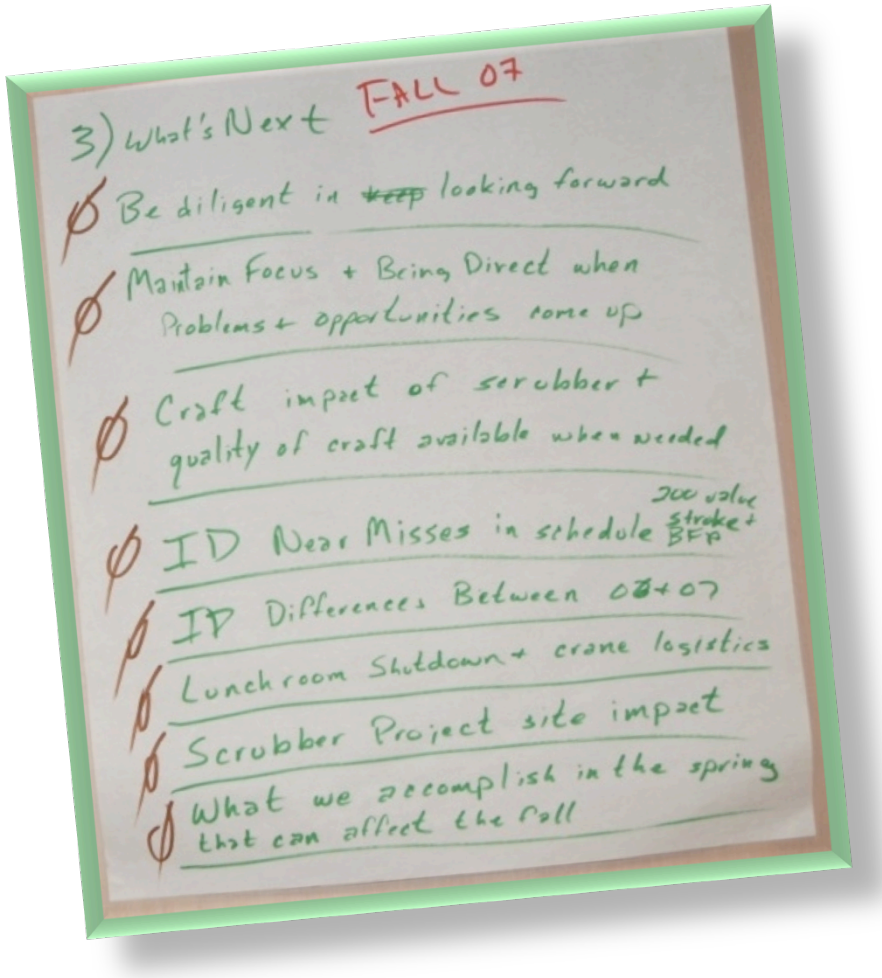
Fall Outage 2010 is Complete……

- Things we need to Think about for The Fall Outage. 07

- Getting Started ~~Soon~~ now!
- Man Power
- Logistics (crane set up, Coord. w/ WGI)
- Getting started on all B.d. work for UNIT #2 Boiler and Duct.
- Getting equipment and Elevators up and ordered.
- SAP work orders established during Planning Process.

"If we knew then what we know now..." (multiple groups)



- Rod control.
- Rod ovens.
- Surveying the cut lines.
- Balance Draft – Don't remove all lagging prior to outage.
- Shift start times.
- Pre-outage purchase of time and materials.
- Why was the air heater so plugged? We think it was the SO3 system.
- Project incentives from day.
- Even more pre-outage planning effort including contractor.
- Provide better egress for the crafts.
- Would not have four purchase orders.
  (1 Target and 1 T & M, outage and pre-outage)
- Focus on project controls – we need to have equal number of personnel for costs and schedule – not 4 people looking at schedule and 1-$\frac{1}{2}$ persons looking at costs.
- QA/QC process/ culture – define & better execute.
- Portable toilets – fix locations and servicing-we spent a lot of money on moving them.

The Administrative Support representatives were asked the following questions…

- *How can we improve outages with regards to safety, cost control, scheduling, security, and general paperwork flow?*

- *What was your single biggest "headache" that never seemed to disappear during the outage?*

ANSWERS

- There were constant changes!!!
  - CWA's
  - ETT/ Dirty timesheets
  - Cost changes
    - The biggest killer was four purchase orders.
    - There were a lot of issues dealing with the spreading of cost.
    - Visa purchases will be tied to a work order.
    - Knowing the mechanism to get the job done.
    - The Administrative Assistants had so much on their plates. They should have involvement only in the outage activities and not day to day operation.
    - We have to realize as coordinators – that we all need information and we have to realize that the Administrative Assistants have to support everyone.
    - The spread costs - It is difficult to look at the spreadsheet and then execute it in the system.
    - It all goes back to pre-planning.
    - In the future, it all goes to SAP -

What went well overall?

What things should we be doing again?

What things we should be sharing with the system?

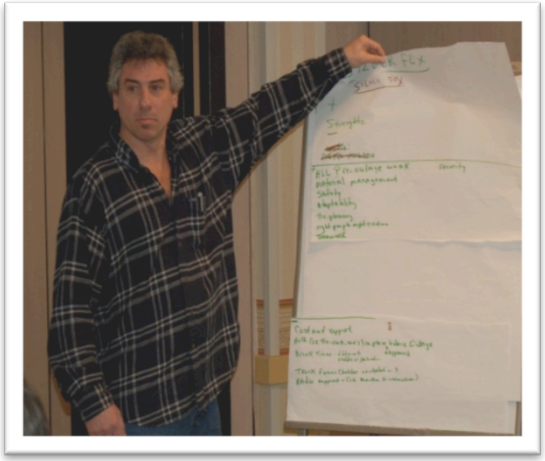
- Pre-outage planning work – all work done during the summer; we were weeks ahead of where we were before. It played a large part in our success.
- Supervisory/ Coordinator personnel / Contractors
  - Dedicated supers
  - The "Right" contractors
- Constructability review
- Materials management placement
- Dedicated Tag/ CS coordinator
- Site Logistics
- Safety Coordinators. (Walk downs, topic in meeting) – Zero tolerance, rescue.
- QC personnel work w/ vs. onsite OEM.
- 2 Elevators.
- Performance vacuum headers.
- The 3 days a week – 10:00 meeting – Begin with 5 days a week meeting Craft morale high (i.e. Break sheds.)
- Productivity even with number of apprentices.
- Penthouse roll back.
- Adaptability.
- Safety- only 2 recorded instances out of 420K hours.

What went well... (continued)

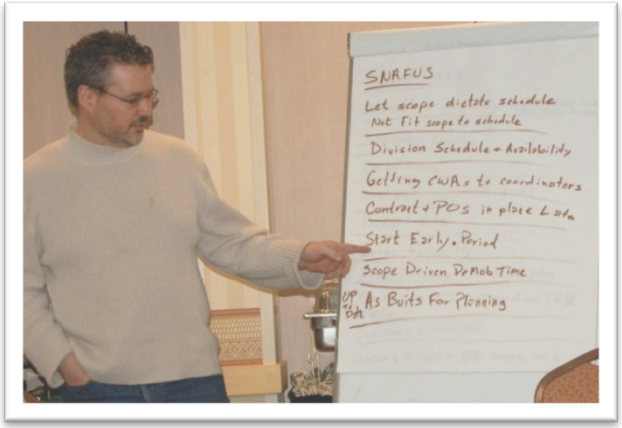
- Right people in the right places.
- Supervision was a positive.
- Security.
- B and W material marked well.
- Teamwork, Cooperation & communication good.
- Security
- Owner kept all promises to get CWAs, etc.
- Communication between coordinators and foreman
- Schedule scrutiny.
- Engineering of support systems and monorails.
- Weld support on Boiler Feed Pump.
- No rigging incidents.
- Supervision on all the jobs – good supervision for the craft.
- Subs were very proficient with the tasks that they were asked to do.
- Control room help – timely, help, etc.
- Professional – everyone seemed to be very professional – kept on track and understand importance.
- Logistics were a plus.
- The scope of job verses safety.
- Boiler draft conservation.

What didn't go well?

- Better pre-planning for scaffolding for T and M jobs.
- Need CWAs on preplanned job prior to the outage. Get CWAs to coordinators; need greater corporate support.
- Get material staged earlier – get items on site earlier.
- Scheduling effort – took a lot of time away from work effort.
- Manpower – resources were limited (i.e. welders).
- Ensure adequate personnel on both shifts qualified for tagging ~ need more safety type folks.
- Where SAP gets us this spring/ fall?
- Scrubber work verses #2 outage.
- Logistics for Unit #2
- Letting the scope dictate schedule not fit scope to schedule.
- Division schedule and availability.



How can we improve?



- Bring foremen earlier (Daily) for job update.
- Contract & POs in place late.
- Scope driven demo time.
- Not have up to date as builds for planning.
- CWA's and POs need to be in place prior to the outage.
- Break times for different crafts for different job locations.
- Truck fumes – bad air monitor readings in the boiler. Need better ventilation.
- Radio support – between coordinator and the contractors have the same frequency. Page system needs upgrade.
- 7 schedulers and 1 cost guy – need better alignment.
- Sample for lead/asbestos per job scope prior to the outage.

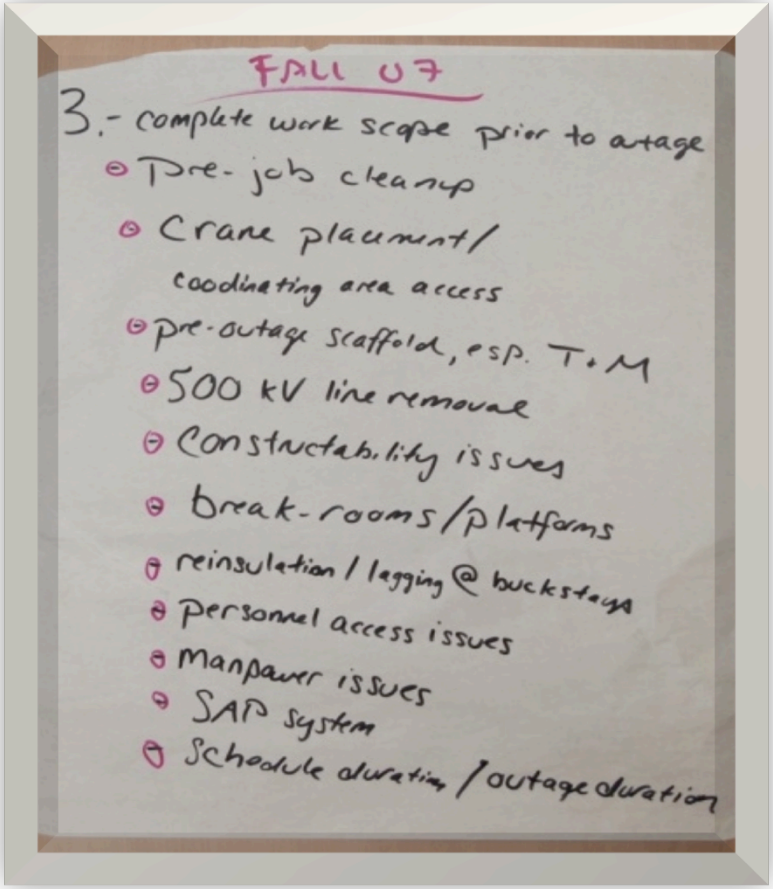
What were some of the near misses?

Where were we lucky?

- Weather.
- 31 Circulating Water Pump.
- Safety Valves – 200-2 – direct impact on Hydro.
- Manpower – move to different jobs, etc.
- Line removal and replacement (back feed) – lucky with weather.
- 5th Floor roof stayed there.
- 200 Valves Stroke– need on site earlier
- 500 KV line relocation coordination – need more preplanning.
- Steel Interference with Superheat.
- Budget cuts.
- Crane Reliability.
- Steel delivery tied to late in the plan.
- Christmas trees and turn around on the turbine parts.
- Cut lines – reheat outlet header.
- Wrong clips and Balance Draft scope early.
- The auger building.
- Propylene lines.
- Start up valves – not getting them until the end of the outage.
- Tagging - Hotwell near miss.
- Balance Draft conversion duct work – almost didn't complete.
- Stack damper failure.
- Air heater.
- Control Room Lead – change of command.
- Turbine Blades – delivery was tight.
- CWP failure.
- Elevator availability

Looking Ahead to Fall 2011 Outage…

- **Complete work scope prior to outage.**
- Pre-job clean up.
- Crane placement/ coordinating area access.
- Pre-Outage scaffold, especially T & M.
- 500 KV line removal.
- Constructability issues.
- Break-rooms/ platforms.
- Re-insulation/lagging at buckstays.
- Personal access issues.
- **Manpower issues.**
- SAP System.
- Schedule duration/outage duration.
- **Getting started now!**
- Logistics (Crane set up and coordinate with WGI).
- Getting started on all balance draft work for Unit #2 boiler and duct.
- Getting equipment and elevators up and ordered.
- SAP work orders established during planning process.
- Be diligent in looking forward.
- **Maintain focus & being direct when problems and opportunities come up.**
- Craft impact of scrubber and quality of craft available when needed.
- Identify near misses in schedule – 200 Valve stroke, BFP.
- Identify differences between 2009 and 2010.
- Lunchroom shutdown and crane logistics.
- Scrubber project site impact.
- What we accomplish in the spring that can affect the fall.
- Better planning of work orders and Purchase orders.
- Streamline security activities & corporate support.



Alliance Agreement

Schedule

Schedule Bonus agreement for completing outage work ahead of schedule should be revised. Contractor should receive some portion of Bonus for completing contracted scope of work early although startup of unit is delayed due to other outage projects/work. Consider Bonus based on Turnover to Ops versus Close of Breaker.

Target Costs

Review use of Target Costs. Target Cost estimates should be more inclusive of **pre and post outage costs** due to the overlap of work scope into these time periods. This would also reduce the number of work orders required. The Unit #3 2006 outage had WOs for pre-outage, outage and post outage work covering the same work scope.

Target Costs should **include engineering and material costs** for the projects

Score Card Performance Results

Absenteeism during this outage should be evaluated. Performance goals to reduce rates observed during the Unit #3 outage should be added to the Unit #2 outage scorecard.

Define what qualifies as a tube weld.

Contractor indicates that they did not do anything differently due to the scorecard. Their approach to
safety, planning, quality and productivity did not change.

Time and Material Work

Sharing risk on non target cost work would further enhance the "everybody on the shame Ship" feeling of work prioritization. One way to accomplish this would be a risk/reward relationship on unit future performance.

Areas Where the Alliance Approach Worked well…

Outage Planning

Meetings were held with Contractor to identify **and resolve problems** encountered in previous outages.

Owners time and money was allocated for **advanced planning** and work scope for the outage. This streamlined the work flow of critical path work as well as no critical work by having a plan in place to deal with most of the infringing factors, such as, overhead line work and crane placement and utilization.

The kept all involved parties abreast of schedule, manpower, logistics and other pertinent info in a timely manner where bottlenecks could **AM on site joint meetings** be worked through effectively or avoided altogether.

Work on **critical path projects** received priority.

For the **controls installation**, it was very easy to have the mechanical part of the installation done since Emerson had contracted as a Sub. There was smooth coordination for the installation where last year, with a different mechanical contractor, things were a little more difficult.

Coordinators had a better idea of contractors activities and plans ahead of time. There were **no secrets**.

More **engineering was done up front** (PH monorails, Economizer supports). This prevented the confusion and work stoppage experienced in past outages on those projects.

Where problems were encountered during the outage, **both parties communicated** and worked well together to resolve the problems.

Resources

Owners made a **commitment of internal resources** ahead of time.

Resources continued…

Contractor had **more supervision** on site during the outage. They were able to bring this supervision on site earlier to assist with planning and execution of the work.

Contractor able to **mobilize sooner** and be ready for the outage.

Contractor was able to **realign their BM resources** to provide welder support on the BFPs. This may not have been possible if major portions of the work were being done Lump Sum.

Areas Where Alliance Approach Did Not Work Well or Could be Done Better

Continue to **stress the team effort**. It worked well during this outage.

We should look into **staggered start and break times** to relieve congestion in parking lot and elevators.

Although **pre-outage planning** was a success, more could be done.

Administration of the contract was more difficult and time consuming. Spread costs, rentals and CWAs were more difficult to handle.

Difficult to know how much **extra work** would be done. Had to wait to see how cost on Target Cost projects (cost of removal) and spread costs were developing before additional work could be released.

Concern that Contractor **more focused on cost** than on schedule.

General Alliance Comments

Define **responsibility for rework.** Contractor should complete all rework at no cost to owner.

Meeting with Contractor supervisors before the outage is a good idea so that everyone can get to know one another. Perhaps a company sponsored luncheon at the beginning of the outage.

As always, **communication between all parties** is key component. Although communications were good, we need to keep working on that.

Outage Planning/Scheduling

Overall the Unit #3 **outage planning** went well. Efforts to develop individual project schedules could have been started earlier. However, developing the schedule using the contractor, Owner project managers and Owner coordinators was very effective. This prevented the schedule from being too pessimistic or too optimistic.

Mobilizing early to install temporary supports, monorails and access platforms was effective. However, effort should be made to include these activities in the TC.

Outage planning should be started as early as possible.

Constructability reviews were done several times. These reviews identified many potential problems for which solutions were developed ahead of time.

Material management should be given a high priority. Contractor should consider having a material expediter.

Site Logistics, for locations of cranes, trailers, port-a-johns, etc should be reviewed and planned out early.

Shared Costs Spreads

Spread costs were difficult to deal with. This process should be reviewed for next outage.

Shared **cost items should be identified** for Project Managers in the early stages of the project budget planning.

Scaffolding

Misc. scaffold costs should be **tracked more closely**. WOs and CWAs should be developed for major projects.

Work Orders/Contracts

Station should develop a **list of standard outage Work Orders.** This list would reduce the workload on those preparing WOs and speed the process of getting authorized work to the Contractor for planning and scheduling.

Owners needs to **get Outage contract in place earlier** to eliminate the situation where two sets of CWAs had to be written (pre-outage and outage). This problem was mostly a result of the last minute preparation of the Alliance Agreement. However, if planning is not done early, this would be a problem for the fall also.

AAs were overloaded in dealing with CWAs, ETT/Dirty Timesheets, Spread Costs, etc. In addition to the Outage work, they had day to day work at the plant to support. Additional help during the Outage should be considered.

Conversion to SAP will have a big impact on the next outage.

Coordinators

Recommend that a set of standard "**Expectations**" be developed for Coordinators outlining expected rolls and responsibilities of the Coordinators. Should include details for tracking and reviewing timesheets, material logs (checking deliveries), equipment logs: developing personal logs and turnover reports; tagging training; Safety checks on contract personnel; etc.

Coordinators, continued…

Coordinators need to be involved in the **Material and Equipment Logs**. Signoff recommended.

A dedicated Tagging/**Confined Space coordinator** was used very effectively.

Coordinators need to be more focused on status of **CWA actual vs. authorized costs.**

Outage Supervision

Paying for **Contractor Supervision on a fixed price basis** was effective in reducing administrative workload (timesheets, invoices, etc).

Should have timesheets submitted to assist with end of outage audit of supervision costs and subsequent refund of unused supervision allowance.

Contractor supervision and support personnel were always cordial and willing to do what was necessary to accomplish work scope. They offered cost and time saving solutions to help the job progress.

Consider bringing **foreman onto jobsite earlier** to become familiar with projects and personnel.

QA/QC

Should **QC** be removed from contractor's scope of work? Owners could cover QA & QC with one DTS type inspector.

Weld x-rays should be conducted on production welds as work is being done. This outage some areas of tube welding were completed (SSH, RHOH, HRH) before x-rays were made. Where problems existed, it was too late to make corrections.

Rod Control

- Contractor should be made responsible for **weld rod costs** in the Target Cost projects.
- Contractor should review **distribution of weld rod**. Issuing full cans to individuals should be discouraged unless oven exists to hold full can. Should tool room be set up for SSH and RHOH on Unit #2 close to the work to minimize travel for weld rod.

Rod Control, continued…

Contractor is looking at having **a welder meeting** after the initial site orientation/safety meeting.

QA/QC on tube panels (water wall, mix pass, slope) should be completed prior to starting membrane welds.

Repairs to welds that **failed x-ray** should be completed prior to completing membrane welds.

Due to the Code required RT shots that needed to be performed on the SSH inlet and intermediate manifolds, along with the final reheat outlet header girth welds and hot reheat lead welds, most of the available RT windows were used by Contractor to perform the partial and final RT shots. This prevented Owner from performing RT shots of the tube welds to determine the quality of work being performed in the penthouse, until later in the outage. Note that the rear reheat tube welds were running a reject rate of 17%.

RT windows need to be scheduled to allow Owner to perform RT of on-going work to know if there are any problems.

Welding rod control was very poor. Welding rods were kept in metal buckets, unplugged / inoperable / cold rod ovens, open containers, laying on scaffolding, etc. This problem was repeatedly brought to the attention of Contractor supervision. Contractor supposedly developed a "plan" prior to the outage to address these problems (these same problems existed during the Hartford U-2 spring 2006 outage - past history of the same issue), and this "plan" was never implemented.

The Contractor needs to be held accountable for **proper weld rod control** and if welding rod is not controlled the way that it should be; action should be taken with Contractor personnel - supervision and/or QC / welding technicians.

Welders not following the proper welding procedures, such as performing the required pre-heat for the material being welded. Numerous instances were brought to the attention of Contractor personnel and welding technicians with no apparent action being taken, as the same problems continued to exist throughout the outage. This problem existed with both pressure part butt welding (furnace and penthouse tube work) as well as pressure part attachments (balanced draft conversion work).

The Contractor needs to be held accountable for their welders and having their welders follow the welding procedures developed for the material being welded. Should this problem continue, action should be taken with Contractor personnel - supervision and/or QC / welding technicians.

Project Budgets/Cost Control/Invoicing

Contractors **shop invoices were not detailed.** No idea of what was being shipped and invoiced for.

Station Engineering Manager/Outage Coordinator should be responsible for all aspects of the **Outage Budget** including Maintenance, Special Maintenance and Capital.

We had four individuals tracking the Outage Schedule and only **one individual assigned to track project costs**. This was insufficient for the amount of work completed during this outage.

Procedures

Standard Pre-Bid Notes should be revised to reflect the new numbering system for the standard bid documents.

Craft Quality/Availability/Attitude

Attitude of craft workers notably positive as reported by Coordinators.

Productivity of craft labor was very good at critical stages of projects (demo, installation of elements) when needed to keep projects on schedule.

Contractor was not able to staff projects with **desired number of BMJs**. This was especially true on non critical path projects. Use of apprentices was common place especially on non code weld projects.

Apprentices need more time to garner knowledge and job skills necessary to become journeymen. However the apprentices were viewed as very productive.

Concern going forward for **availability of Boilermakers**.

Contractor Safety

Only two recorded incidents his outage and no Zero Tolerance violations recorded

Contractor using JSAs for each project. Use of JSAs could be contributing to low number of recordables.

Having the Station Safety Coordinator conduct the **weekly walk downs**, creating a list of safety corrections needed and reporting at daily meeting was effective.

Sample for lead and asbestos per job scope prior to outage if possible.

Ensure adequate **personnel qualified for tagging** on both shifts.

Secondary Superheat Replacement

Confusion during outage over **opening in PH roof** to facilitate removal and installation of SSH Assemblies. Last minute beam removal and re-supporting caused delay in assembly installation. Additional engineering up front could have reduced costs of this opening and shortened the installation schedule.

Removal of the roof tubes (rag out as well as final cutting, milling and prepping) resulted in quite a bit of **debris (slag, cutting wheel grit, shavings) being put into the tubes** that could not be adequately removed by any means other than vacuum trucks.

The Contractor should plan, schedule and budget for having vacuum services vacuum out all roof tubes prior to installing the new roof tube sections

Strong backs were used on the weld joints of the SSH inlet and intermediate manifold headers to maintain alignment. Some of these strong backs were subsequently coped out by the welders to allow greater access to the weld joint. This did not present any apparent problem at the inlet header weld joint, but it may have contributed to the intermediate weld joint not being properly aligned at some locations (the sections of the intermediate headers were running downhill toward the weld joint). The coping of the strong backs appears to have weakened them so they would not adequately maintain the alignment of the joint during welding. Note that previous problems with the alignment of this joint was brought to the attention of Contractor prior to the outage

Secondary Superheat Replacement (continued)

The Contractor needs to assure that the strong backs are of proper size and strength to hold the joint in proper alignment during welding, and they need to also assure that the joints are being properly fit prior to welding and after tacking in position.

During the Hartford U-1 Fall 2009 outage, the SSH **inlet header bowed** up at the ends when the SSH inlet assemblies were removed from the unit (less weight on the inlet header holding it in position). Due to this movement, precautions were taken during the Hartford U-3 Fall 2009 outage to prevent this header from moving. Thus, header lock-downs were installed at each end of the inlet header (anchoring the inlet header to the furnace sidewall outlet headers) and along the length of the header (anchoring the inlet header to the rear-most furnace roof tube support beam). During the outage, the inlet header still experienced some slight upward movement as the inlet assemblies were removed.

> Review the design of the header lock-downs that were installed during the Hartford U-3 Fall 2009 outage and make improvements that will prevent movement of the SSH inlet header during the Hartford U-2 Fall 2011 outage.

The **scallop bar** that is located immediately to the rear of the rear-most furnace roof tube support beam (this scallop bar is used to seal the tight roof casing to the membrane section of roof tubes) was in poor condition on Hartford U-3. This scallop bar was ordered during the outage, and due to fabrication and delivery, could have impacted the work schedule.

> This scallop bar should be inspected as soon as possible once Hartford U-2 comes off-line and, if required, be ordered at that time to assure that it is on-site prior to needing the material.

Sealing foam, sprayed in between the non-membrane roof tubes from the hot side, was used to prevent any ACM from falling down into the furnace during the high crown seal ACM abatement. The cured foam is flammable and was catching fire as roof tubes, tie bars, etc. were being cut free from the penthouse side.

> Station fire-watches when any cutting is being performed on the roof tubes or any of the attachments whenever the foam is present.

Secondary Superheat Replacement (continued)

Some delays were encountered due to the location of the **penthouse roof access hole** in relation to the boiler support steel and the SSH inlet header in the penthouse. Sections of the boiler support steel were not removed until after removal of assemblies was in progress. Earlier removal of this steel would have facilitated removal of the assemblies

If the method of replacing the SSH assemblies will be the same during the Hartford U-2 Fall 2011 outage, then the boiler support steel should be removed earlier in the outage so that removal of the SSH assemblies can be accomplished quicker and safer.

During pre-cutting of the roof tubes, tie bars and associated attachments, one section **of roof tube was dropped** at the SSH outlet bank. Fortunately, this tube was caught by rigging that was installed on a couple of outlet assemblies and it did cause any damage. A second tube was dropped as an outlet module was removed through the roof (the tube caught the edge of the roof).

Care needs to be taken to assure the tubes are lashed off to prevent sections from falling and causing personal injury or equipment damage. Lashing of the tubes needs to be done before any pre-cutting begins.

The "**floating" hanger plates** that are located on the top of the SSH outlet headers and support the outlet assemblies are only held in position by the weight of the outlet assemblies. During removal of the outlet assemblies, one of these hangers was lifted and rotated as the outlet assembly was being lifted. Should the hanger have continued to rotate, it could have fallen down between the outlet headers and caused personnel injury or equipment damage.

All of the "floating" hanger plates should be tied together using angle or channel. This will keep the hanger plates in the proper location as well as prevent hangers from accidentally rotating and dropping down between the outlet headers.

Secondary Superheat Replacement (continued)

The SSH outlet headers and tube stubs are made from a 9% Cr material that requires a minimum preheat of 400^{O}F prior to striking any arc to the material, and subsequent PWHT, otherwise cracking could result. As a precaution, Contractor was to cover **the outlet headers and tube stubs to prevent inadvertent arc strikes** on the 9% Cr material. Prior to covering the headers and tube stubs, several arc strikes occurred, as well as one gouge due to an air arc. After Contractor was reminded several times, the 9% Cr material did get covered. However, the welders were then removing the covering and exposing the tubes during welding of the outlet assemblies. Contractor was notified of this situation multiple times. Numerous arc strikes continued to occur, with 104 tubes (out of 620) having one or more arc strikes present. Several arc strikes were also present on the outlet headers themselves.

The Contractor needs to be held accountable for their welders and their actions. Numerous warnings / notifications about conditions such as this should not be needed. Should problems like this continue, action should be taken with Contractor personnel - supervision and/or QC / welding technicians.

When the **inlet assemblies were hanging** in the unit during installation (prior to welding the manifold headers), they were supported by one hanger rod on the inlet manifold and one hanger rod on the intermediate manifold. This method of hanging the assemblies could result in bending / bowing of tubing as well as the seal plates.

Have B&W review this method of hanging these assemblies to determine if this could result in permanent bending / bowing of tubing as well as the seal plates. Should B&W determine if this is possible, notify the Contractor to develop an alternate method of hanging the assemblies prior to welding out the manifold headers.

It appeared as though a few of the inlet assembly inlet manifolds were fit and welded while the **assemblies were not hanging plumb** (pulled in a left to right direction). This resulted in the inlet manifold being rotated as compared to what it should have been. This condition resulted in a large gap on one side of the assembly compared to the roof tubes. One inlet manifold was cut free and repositioned due to the amount of rotation present.

Assure all assemblies are hanging free prior to fitting and welding the manifold headers and tube butt welds.

Secondary Superheat Replacement (continued)

There were 4 **toggles welded on the inlet assembly lifting beam** that penetrate the inlet assemblies and that are supposed to ride on the tie bars that were field welded between the inlet assembly tubes. During some of the lifts, it was observed that not all of the toggles were up against the tie bars - either the tie bars are not level or the toggles are not level. Therefore, there is some uneven load going into the high crown seal and ultimately into the header stubs

Assure that the toggles on the lifting beams and the tie bars that are welded between the inlet assembly tubes are level / in the same plane so that the load of the assembly is evenly distributed.

Some questions arose during the installation of the SSH assemblies in relation to **material fabrication** such as manifold header installation onto the inlet assemblies, tube spacing, etc.

Perform shop visits during the fabrication of the material for U-2 to observe how the material is being fabricated and to determine if any problems exist.

The **long retracts** (retracts 1 - 12) were operated late in the outage. During this operational check, it was determined that several problems existed with these retracts that needed to be addressed prior to unit operation. Work was still being performed on these retracts when the unit was in operation.

Develop a better plan to perform the operational check of these retracts so the required work can be performed, and the results verified, prior to unit operation.

Reheat Outlet Headers Replacement

The **hanger rods** that connect the front reheat pendant assembly support loops to the front reheat outlet header, required replacement due to the threads being galled and not being able to be un-screwed from the nuts and clevis'. New rods, nuts and clevis' had to be ordered during the Hartford 3 Fall 2009 outage.

Reheat Outlet Headers Replacement (continued)

Either contact B&W and have them supply this material, or order this material from another vendor, so that this material will be on-site for the Hartford U-2 Fall 2011 outage.

Identified an issue with getting a **standard mandrel and expander** into some of the front outlet header terminal tubes due to the cut line being so close to the existing tube bends. A modified expander was required for some of these tubes, while a "wizard" was required for the remainder of these tubes. Ovality of the tubes was also a concern for obtaining proper fit-up. This problem was present on tube rows 3 and 4.

B&W needs to be contacted so they can correct this cut line during the fabrication of the U-2 material. Should B&W not be able to make the appropriate cut line change, the Contractor should be advised of this condition and assure they have the appropriate tooling on site.

There was **little to no movement of the pendant reheat assemblies** as the tubes were being cut. This showed that the assembly support system that was installed was adequate in supporting the weight of the assemblies.

Use the same assembly support system during the U-2 reheat outlet header replacement during the Fall 2011 outage.

Initially, **measurements to the new header hanger locations** did not work out from each side of the unit. It was determined that the existing side wall hanger rods are not installed per original drawings - they are adequate as installed, but for measurement purposes, they are not correct. Measurements were then taken from the boiler support steel and the new hanger location measurements then worked out well.

Be aware of this condition during the U-2 outlet header replacement during the Fall 2011 outage.

Reheat Outlet Headers Replacement (continued)

During fitting of the rear header, it was noted that the right half of the header had large **tube gaps** at the rear side and tight gaps at the front side, and the left half of the header had large gaps at the front side and tight gaps at the rear side. Some of the large gaps were approaching 1/2". Based on these gaps, it appears as though the rear header halves were not in proper rotational alignment when they were welded together.

> Assure the sections of the outlet headers are properly oriented and aligned prior to fitting and welding.

Two **reheat water hydro tests** were attempted and were unsuccessful due to leakage at the turbine reheat stop valves.

> Arrangements should be made for the U-2 Fall 2011 outage that will allow the turbine reheat stop valves to be gagged and prevent water leakage through the valves.

Horizontal Reheat Replacement

Engineering, installation and removal of the **Economizer Support System** went smoothly. Actual deflection of the Economizer Section was less than ½" as compared to the calculated 1" to 1 ½" expected. As a result, there was no requirement to jack the Economizer Section back into place as expected to meet B&Ws recommendation to limit the Economizer Section deflection to ½".

By supporting the Economizer Section from below, the Contractor was able to remove all stringer tubes in the Horizontal Reheat section. This allowed for a straight run in removing and installing the new sections.

Boiler BDC

Owners should assign a **project manager for the BDC** to follow any work assigned to the contractor relating to the Scrubber project. Owner personnel assigned to the Scrubber project do not have the time to deal with the day to day administrative, commercial and technical issues that develop on a project of this size..

Contractor did a good job of organizing and controlling the distribution of the thousands of material pieces needed for this work. This organizing saved considerable lost craft time and material reorder.

Unit #1 and #2

- Recommend that **material for Unit #1** and to a lesser extent, the material for Unit #2, be ordered now to allow the contractor to take advantage of any planned or forced outages that may occur prior to the Unit tie-in dates. A definite plan is needed for Unit #1.
- Do an **inspection of Units #1 and #2 Windbox** to identify modifications to original design done during panel replacements.
- Contractor should be instructed to **salvage the "Confined Space" signs** when removing insulation and lagging from the boiler, APH, Ductwork, etc.
- **Do not remove all the lagging prior to the outage**.

Duct BDC

Stiffening of the Unit #2 and Unit #1 **inlet duct crotch areas** should be done during the Spring 2011 outages.

Stiffening of the Unit #2 and Unit #1 inlet and outlet ducts should be continued during off peak BM demand times to limit BM requirements during outages.

General Comments/Recommendations

Numerous holes were cut in the penthouse roof for access, rigging, etc. Several times during rainy weather, **water was entering the penthouse** and running down onto pressure parts that were being welded. Fortunately, PWHT was not in progress at that time. The rain water also ended up in the furnace area, which adversely impacted the work being performed in that area also.

The Contractor needs to install proper and adequate dams, covers and **weather protection** so that rain, snow, etc. does not enter the penthouse and/or furnace area and impact the work being performed.

The locations of the headers, piping and **cut lines were all surveyed** during the outage. Surveying showed the exact locations of the pressure parts associated with the work and their relationship with each other. This proved to be quite valuable in developing cut lines and assuring that the cut lines were located to allow the "best fit" of the components.

The Contractor should perform surveys of the pressure parts and cut lines prior to performing work.

Hartford should investigate better **egress of crafts** now that the parking lot has been move further up the hill.

Location and servicing of the **Port-a-Johns** should be reviewed to identify ways to reduce costs.

Having two exterior **elevators** (Unit #3 and #2) was a benefit in getting craft back to work site faster after breaks.

Plan early for removal and replacement of **500 KV lines**. Involve T&D in planning.

Truck fumes in between Unit #3 and Unit #2 precips was a problem. Fumes were turning up in various work areas and shutting jobs down until air quality improved. Need to address this prior to the Unit #2 outage.

General Comments/Recommendations (concluded)

Radios used by coordinators and contractors should have the same frequency.

Page system should be upgraded.

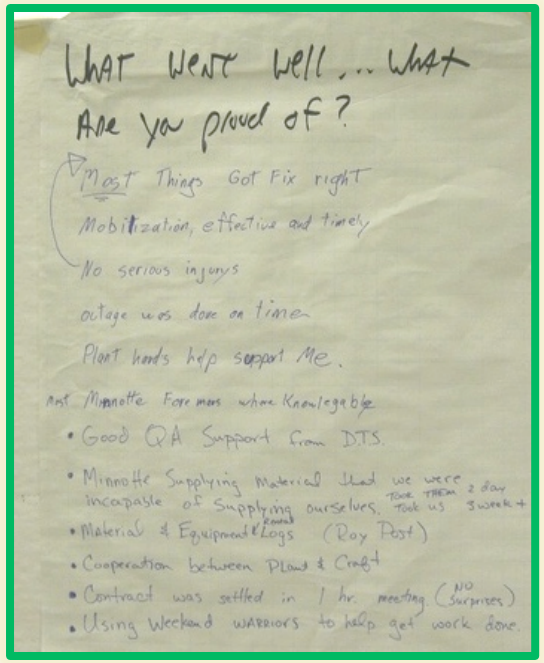
Additional planning should be placed on the **Start Up Valves** to ensure that they are ready for start up.

What Went As Expected, What Went Right

The team was separated into four groups with each group documenting their comments on the following subjects:

- Most things were fixed right. Air Pre-heater Basket Project, Burner Panel Project, LP Heater Project, Cooling Tower Project.
- Smooth on burner panel work even though it is was the first time this project had been performed.
- Mobilization - effective and timely.
- No serious injuries.
- Completed on time.
- Plant hands supported contract work at a moment's notice.
- Most Contractor foremen were knowledgeable.
- Good pipe fitters, especially Billy Elliot
- Good QA support from DTS.
- Pre-staging vital to success
- Enough time to plan.
- Material and equipment rental logs went well. Monthly charge broke into week charges.
- Contract settlement in 1 hour meeting with no surprises. Work out problems when small and at the lowest level.
- Use weekend warriors from FGD project. 1st weekend was good. After that it became sporadic due to OT availability and weather.

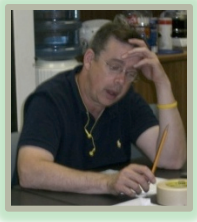
What Went As Expected, What Went Right



- Continue using a phased/prioritized work scope approach.
- Unit has been reliable concerning outage-related projects.
- Established better working relationships.
- Effective planning between Contractor and Owner using team approach. Fort Milton personnel were noted to be helpful and cooperative
- Frequency of weld RT - 10% minimum then increase as problem areas identified. More QA visuals are needed. PT may be included at hold points on code welds.
- Old world constrained number of QA's onsite. Alliance allows for more QA. Welder tracking needs to be brought back to standard. Weld quality walk down will be used in the future.
- Material expeditor needed on Owner side? Need to discuss with Don Server.
- Ask for corporate procurement support onsite to resolve rate issues, etc.
- Marley submitted schedule. GE did submit a viable schedule but required constant attention. Internal schedule issues included supervisor updates, results planning/material procurement methods (offline with Chris Lassa.)
- DTS and Warren Jobs valuable asset.
- Roy Hall did well on the rentals/materials.
- Flexibility of Alliance contract allowed for interactive decisions on scope during execution of outage.

What Didn't Go As Well As Expected

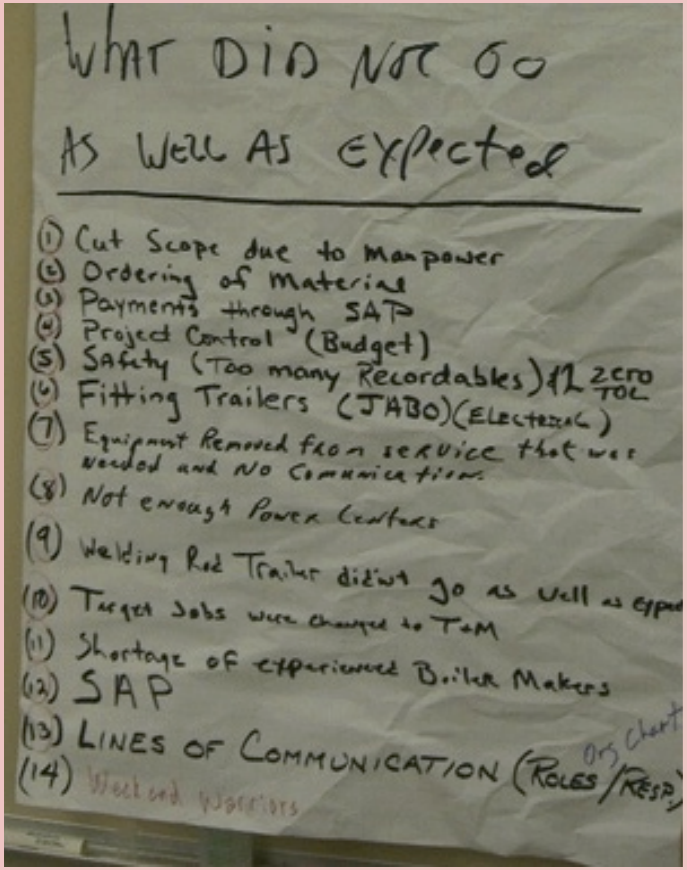
- Cut scope due to manpower issues; specifically the burner panels and waterwall panels.
- Material ordering an issue through Owner Supply Chain. Plan ahead to minimize material issues.
- Disbursement accounting an issue concerning invoice payment.
- Contractor carried debt for a long period of time until SES portal was functional.
- Project control and budget was not good versus actuals. Contributing factors included SAP implementation.
- Safety issues were a problem. Contributing factors included permit/inexperienced craft labor.
- Material Trailers were an issue. Need list of issues and problem material vendors. Proper and timely stocking is main concern (Electrical Fittings, Piping Fittings and Weld Rods.)
- Equipment removed from service that was needed.
- Not enough power centers at precipitator and other areas.
- Target changed to T&M. Material became such an issue that they were changed to T&M. Other factors include labor related to panel replacements.
- Small jobs should not be targeted. Only major jobs should be target based on value vs. risk.
- Scheduling Outages with overlaps is a huge mistake.
- Lack of experienced boilermakers - related to safety issues. Fired certified welders because of refusal to wear hard hat. Confusion related to OSHA regulations concerning use of hard hats with welding hoods/face shields.
- Lines of communication need to be defined earlier with internal structure. Created double work. Contractor Roles & Responsibility need to be communicated. Assignment of coordinators late in game a problem. Needs to be defined early as possible. Pre-outage meetings helped defined structure. Contractor needs org chart for Spring outage in 2011.
- Assign secure storage area for coordinators and their material.





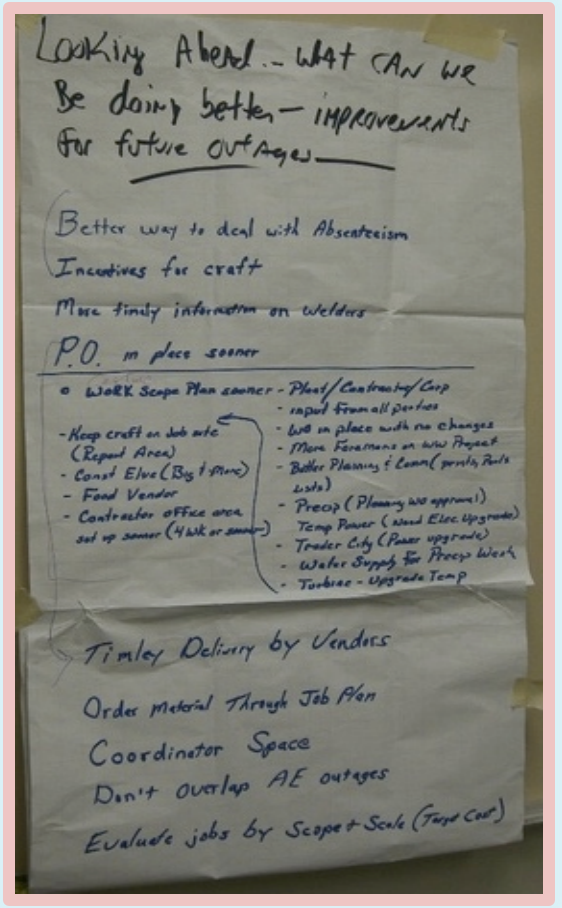
What Didn't Go As Well As Expected

- Power centers need to be added to Capital project list prior to end of year.
- Waterwall leaks after outage - form team form improvement. WSI caused failure? - Check records. Reheat hydro with HP wash contractor should be part of plan in the future.
- **Coordinator - hard copy timesheet.** Admin enter SES – need to discuss success of SES at Fort Milton versus issues/constraints at other stations.
- Implement SAP Timesheet upload from Contractor.
- **GE shall be ERS.**
- Scaffold and insulation contractors should be sub of Contractor with work being bid to qualified vendors. Firm Price as much as possible.
- Instrumentation with internal labor and GE became an end of outage schedule issue.
- Use proper material procurement for instrumentation.
- Document target jobs then publish. Procedures need to be developed for each job; i.e., fan balance, test and check out. Define boundaries and details; i.e. similar to bid spec data.
- Use SAP and P3 as the repository of information.
- Scope documents should reside in SAP.



Looking Into The Future…

- Better way to deal with absenteeism. Absenteeism policy (3 day policy) is flexible at this point due to craft availability.
- Incentive for crafts for non-absence (Safety luncheons? This could be done by contractor and station). Corporate is looking into absenteeism incentives.
- More timely information on coordination concerning welders and work progress. Related to welder tracking issues.
- Require purchase orders sooner. This will require improved work identification/prioritization then planning will define values for PO's.
- Work scope planned sooner using input from the following
  - Station
  - Contractor
  - Corporate
- Craft needs to have a place on the unit to report to in the morning, and take breaks during the shift. (Report point at work location)
- There is a need for larger elevators and more elevators.



Looking Into The Future...

- Food vendor should be a part of the outage.
- Contractor office area need installed sooner.
- No craft on operating unit elevator unless emergencies
- Timely delivery by material vendors will need to be discussed with Supply Chain.
- Order materials through job plan. PLAN AHEAD.
- Coordinator common space - need a new area. Present one is congested and hinder communication.
- Don't overlap outages.
- Evaluate jobs pre-outage at a safety and work plan level.
- Input from all parties is needed.
- More foreman may be required on waterwall jobs.
- Better planning and communication for material/labor.
- Precipitator planning prior to work order approval.
- Temp power needs upgrades to permanent panels at various locations.
- Trailer City - needs upgrade.
- P3 - Activity for scope review on P3 timeline.