From: "Murray and Susan Thorson" <murray.thorson@frontier.com>
To: "Daniel Poneman" <daniel.poneman@hq.doe.gov>
CC: "Andrew Thibadeau" <andrewt@dnfsb.gov>, "Rick Schapira" <RICKS@dnfsb.gov...
Date: 7/18/2011 9:17 PM
Subject: Input in Response to DNFSB Recommendation 2011-1
Attachments: Input to Response to DNFSB Recommendation 2011-1 _ Thorson.pdf; Signature Page _Input to DNFSB Rec 2011-1_Thorson.pdf

The Honorable Daniel Poneman,

Please find the attached files as input in response to DNFSB Recommendation 2011-1. You should find both the original pdf file and a scanned signature page in this e-mail. I'll e-mail the full scanned letter separately (due to the file size). You or your staff are welcome to contact me to follow-up if desired. I am glad to help if I can.

Also, I would appreciated an e-mail reply back to confirm this was received.

Thank you,

Murray Thorson

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July 18, 2011

The Honorable Daniel Poneman
Deputy Secretary of Energy
U.S. Department of Energy 1000 Independence Avenue, SW
Washington, DC 20585-1000

Dear Deputy Secretary Poneman:

Subject: Input in Response to DNFSB Recommendation 2011-1

This letter is written to help with the review, response, and path forward to the DNFSB's Recommendation 2011-1 *Safety Culture at the Waste Treatment and Immobilization Plant*. I have read the recommendation and many of the various published responses from DOE and WTP. First, I want to say I greatly appreciate DOE's prompt and respectful addressing of this recommendation. I have hesitated to respond, but feel what I know and have seen is pertinent and should be disclosed. In general I believe the DNFSB's findings are on target. However, many or most people may not see this. Only those involved in repetitive struggles that pitted operability or safety against partially or completely frozen designs would likely see this. I witnessed reprisals for challenging the designs several times.

Background

First, I should share a little background. I worked at the WTP from December of 2001 through January 2010, when I transferred to the WRPS (Hanford tank farm contractor, Washington River Protection Solutions) group that reviews the operability of the WTP. At WRPS I have continued to review the WTP processes through today, though 50% of my time is on other projects. At the WTP I worked in the Research and Technology (R&T) group (2001 through 2010) and also the Process Engineering and Technology (PE&T) group (2007 through 2010) with most of my efforts focused around the pretreatment processes of ion exchange and the upstream feeds. In the R&T group I worked two levels below Dr. Walter Tamosaitis (Manger of R&T, subject of DNFSB's Recommendation 2011-1). My work title at WTP when I left was Senior Advising Engineer. I am a licensed professional chemical engineer with degrees in chemical engineering and biochemistry. I am a second generation Hanford worker. The last ten years I worked either at or in review of the WTP. Prior to that I worked 20 years in engineering and operations at a local fertilizer plant. My perspective is the WTP needs to operate safe and efficiently to convert the legacy wastes into safe storable waste forms. The generation before me at Hanford did what it took to create the US nuclear deterrent. My generation needs to efficiently cleanup the legacy wastes and processes.

Atmosphere of WTP Work

The work atmosphere at WTP where I worked in R&T was generally professional, safe, and frequently challenging, rewarding, and many times fun. Having worked 20 years at a local fertilizer plant I expected the transition to government contract work to possibly be boring due to the levels of review and lack of autonomy. Instead I fortuitously landed on a very productive project – finding a replacement for the WTP ion exchange resin. Between 2002 and 2008 I led the highly successful effort that resulted in the WTP changing ion exchange media to spherical resorcinol formaldehyde. The projected savings for the WTP (US taxpayer) was 3 billion dollars in 2008 dollars! What a project! It was fun.

But I was in an unusual situation. Until DOE authorized the change in resins in 2008, the project I worked on was not in the project baseline and had little input from design. Meanwhile, as I got involved in reviewing design issues, the struggle between test results that suggested changes might be needed and designs that were in-progress became apparent. In 2002 the WTP testing on the then baseline resin (SuperLig® 644), which I also helped with, was consider confirmatory. Our testing was to confirm the design. If it didn't, we recommended changes and redid testing until it did confirm the design. This was an extremely strange concept to me that reflected a lack of understanding of how testing needs to interface with design. In hindsight this was indicative of the architect engineering firm, the design authority on the project, Bechtel, not having much experience with design that had on-going testing. It reflected an attitude that even today is the source of many WTP problems. The design authority could decide what would work and does not need to deal with reality, such as test results, as long as they follow the approved procedures.

In 2002 I was involved in a Hazard & Operability Analysis (HAZOP) review of the ion exchange column operation. This was my first HAZOP at the WTP, though I had been in many in my prior work in the fertilizer industry. The topic of gas retention in the resin bed came up. I pointed out that contrary to the design basis of the gas vent system, gas, if present in the liquid streams, due to surface tension would stick to resin chards (SuperLig®644) and the resin has sufficient net negative buoyancy to hold down a good quantity of gas. If gases were generated through radiolysis (not dissolved into the process streams) they would accumulate in the resin bed and be released in episodic events, usually upon lack of flow, as the gas accumulation exceeded the holding capability of the resin bed. I had already created a spreadsheet (unapproved calculation) and volunteered to send this to the WTP safety personnel so they could convert this into an official calculation. After this meeting, a peer engineer that was trying to help me warned me that what I said was very unwelcome by the management present. DOE personnel were present and I suggested the design concept of continuous steady release of generated gas was incorrect. He warned me - I would be wise to not speak up in the future. I was amazed that raising a safety concern in a HAZOP would be disapproved. It was about six years before I was invited to another WTP HAZOP, and in our next weekly R&T staff meeting it was made clear that R&T was not to create any calculations, etc. It was clear to me that someone had communicated their disapproval of my bringing up this safety issue and volunteering to supply the spreadsheet for others to verify as an official calculation. I had already started many Excel file spreadsheets to predict ion exchange performance.

Fortunately for me, R&T soon had a change in management to Dr. Tamosaitis as the head. Early on I asked him if I could create spreadsheets to predict process performance and he indicated not only was it OK but he expected it. This was a "breath of fresh air". Walter Tamosaitis backed and supported his R&T personnel when their data or analysis indicated results contrary to design assumptions. We were no longer conducting / executing purely confirmatory testing. If test results indicated the design would not work, then we would strategize how to present the information and present it properly.

Interplay with Design

Occasionally test results or analysis of design principles in my area (ion exchange and upstream feed) indicated the design assumptions or resultant designs would not work well or safely. As mentioned above, as early as 2002 the design assumption that gas would not accumulate in the resin bed became an issue. Similar issues arose in areas of:

- The design of the ion exchange column internals (2005 through 2010, when I left WTP)
- The means of preventing solids in the feed to ion exchange (2007 through 2010)
- The design of the hydrogen vent system off the ion exchange columns (2008 through today)

How these functional and safety concerns were resolved or dealt with says a lot about the culture of WTP and the impact upon those who consistently presented technically competent challenges with fixes to the design.

Starting with the ion exchange column design, in 2005 I was invited (as the R&T ion exchange expert) to attend the 60% design review meeting with the vendor that was producing the column design. The design had serious flaws, which I pointed out, such as inlet and outlet screens that would very quickly become occluded and plug. Late in 2005 I attended the 90% design review meeting with the vendor. Again there were serious flaws in the design which I addressed in a seven page memorandum to WTP Mechanical Systems with detailed recommendations to fix the design. (Mechanical Systems was responsible for the interactions with the vendor.) Flaws included that the screens would plug with solids, the column would not properly vent gases (a safety issue), and resin removal would not work properly. At that time the External Flowsheet Review Team (EFRT) was reviewing technical aspects of the WTP design and one of the reviewers sat in on my presentation of recommendations to WTP Mechanical Systems. The subsequent EFRT review indicated that critical equipment such as the ion exchange columns were not being designed in a manner to assure they worked properly. Basically the EFRT agreed with my criticisms of the design. This started a process that selected a consultant to determine the adequacy of the vendor's 90% design proposal. A contract was awarded in 2007 to a consultant - Dr. Zenz. By this time (2007), I was recognized as the WTP ion exchange expert and was also the PE&T principle engineer for ion exchange. Another engineer was the contract representative and I provided most of the technical assistance. Dr. Zenz by mid-2008 concurred with essentially all my recommendations, which meant the design needed to be changed, which was a highly undesirable outcome for Mechanical Systems. Also at about this time, testing at Dr. Zenz shop in New York was found to not meet WTP safety standards. I told Dr. Zenz to shut down the testing after consulting with my PE&T management. In the review after this, it was discovered that the contract mechanism that authorized Dr. Zenz work did not allow testing and though I was not the contract representative, since I

had helped consult on technical matters, I was told I was to be reprimanded for using the wrong contract tool. At this stage I called "foul" – I was not the assigned engineer for the contract, was not involved in the contract, and only provided consulting as requested to help. My process engineering management informed me they had reviewed all my e-mails and knew I had been advising Dr. Zenz and therefore I shared the Responsible Engineer role (a title assigned to the engineer responsible for the contract execution). I pointed out WTP procedures required written notification of who was the Responsible Engineer, I had not received this, and it could not be assigned retroactively. It was a violation of WTP procedures to assign me retroactively as the Responsible Engineer. I was told to "take it like a man" or things would get a lot worse for not only me but for the real assigned Responsible Engineer, so I did not say any more and was held responsible. I believe my PE&T process engineering manager did this to please those that were upset because my consultation with Dr. Zenz resulted in him concurring that the design needed to be fixed. The design flaws included that the resin bed support screen had no means to assure full gas removal in upflow and therefore represented a hazard of gas phase detonation that might not be contained by the column (vessel rupture with contents spewing over the pretreatment hot cell). I was being reprimanded, in violation of WTP procedures (by retroactively assigning me as the Responsible Engineer). I believe this was in retaliation for interfering with the design (staring in 2005 when I wrote the letter to Mechanical Systems and when the EFRT concurred with the need for a more rigorous design process). <u>This starts a consistent theme – those who interfere consistently with solid technical bases so that design is delayed or has to be changed are likely to be professionally punished or intimidated (though the direct linkage will not be made to avoid countermanding anti-retaliation polices)</u>.

In 2007 I recognized and presented to PE&T management that the WTP flow sheet was flawed in that it allowed diverse filtrate streams to mix in a large vessel upstream of ion exchange (CXP-1) that had no mixing and had a design basis of being solids free. Mixture of the diverse streams were certain to create large precipitates of sodium phosphates and oxalates that could accumulate dangerous quantities of hydrogen gas, would accumulate on the vessel bottom to large quantities, and would avalanche into the piping to ion exchange where they would plug the ion exchange column and could cause various other serious safety and performance risks such as black cell piping leaks. I proposed several potential fixes to the problem, all requiring analysis and likely equipment changes to fix. This item was added to the "WTP PE&T risk register" but no other action was taken other than I wrote numerous trends (tools to request money to study and fix the problem) and spent time studying the problem and potential fixes. WTP took the approach that resolving this problem was not in their contract scope. WTP would approve the trend only if DOE used their own management reserve (money) to fund. DOE took the approach that correcting this was WTP's scope and should be funded out of WTP management reserve, not DOE management reserve. DOE would not approve the trend using DOE's management reserve. In the end, after more than a year of submitting trends, no funding was approved to address this serious safety and functional throughput problem. It was obvious this issue would not be resolved. In early spring 2009 another WTP engineer and I met with the DOE pretreatment facility engineer and other DOE personnel at the local DOE office to explain the gravity of this precipitate issue. We met after work so we would not be on company time and didn't need WTP permission. We were in "dangerous waters" and knew it. (Meeting with ORP to discuss a serious safety problem that WTP was not addressing

without permission could have severe career consequences.) To the credit of the DOE facility engineer, he realized the seriousness of the issue and took it to his DOE management. Shortly after that, the head of the local DOE-ORP met with the heads of BNI management and chastised them for knowing about this grave problem but not addressing it. (Apparently the debate about whose management reserve would fund this was not sufficient excuse to not address the problem.) This started an intense ten man WTP effort to address the precipitates and consequences. Six months into the study an independant review team was assembled and reviewed the output of the work to date. They unanimously concurred the problem was severe, CXP-1 could not be used in this service, and the solution that I and one other engineer proposed was the best fix – an estimated $11M piping and process strategy modification that would dramatically improve facility throughput and eliminate the risk of precipitates causing safety and throughput problems. The projected mission length improvement at 70% equipment availability relative to doing nothing was 14 years. Relative to the next best alternative, the mission length reduction was 5 years at 70% availability. Each year reduction was an approximate $1 billion savings in operations costs in today's dollars. This was a giant improvement. Even today if you review the history of the WTP mission length projections, you should notice the impact of the "Equipment Option" as this became known. However, all was not well. The other engineer and I that worked the Equipment Option had worked long hours and done whatever it took within our procedures to make this a success, which it surely was, but WTP management was very displeased. They had to spend what ballooned by early 2010 in their estimates and additions to $50M to $60M of WTP management reserve to fix the problem - a problem that they doubted was real in the first place (though by this time all the technical experts agreed precipitates in the ion exchange feed would be a real and serious problem apart from significant changes).

I had been the proponent of fixing the ion exchange feed precipitates issue for two years - the first to recognize the problem, the first to publicize it, and the author of a presentation / paper, numerous e-mails, and trends on it. I had studied it intensely. Then WTP's management was chastised for ignoring the problem for two years. When the organization was rolled out to address it (April 2009), I was relegated to only managing the accompanying testing in spite of then being the site expert on the issue. I did not stick to my organizational roll in the subsequent months, but helped coordinate the various efforts, planned the best fix, etc. Now WTP would be forced to use their management reserve to fix the problem. This was not what they wanted and I was told that. I "connected the dots" and started looking for a new job. An opening at WRPS was published for an engineer to review the WTP flowsheet. Even though this was a lower grade job, I applied for and took this new job. I thought here I could work on improving the WTP process and be free of WTP retaliation. I was wrong.

By early 2010, I was recognized by the local DOE as the WTP process ion exchange and feed precipitate issue expert at Hanford – the co-author of the Equipment Option. As WTP management continued to proposed alternatives to the Equipment Option and at DOE's request, I reviewed these proposals. I pointed out flaws and suggested fixes to ORP. At ORP's request I attended meetings at WTP as WTP rolled out their proposed implementation of the Equipment Option. In June 2010 with short notice and at ORP's request, I attended WTP's latest rollout meeting. I made sure I sat next to ORP personnel and let others know I was present at ORP's request. (Basically I knew WTP would not want me present as I

might advise ORP of potential problems.) After this meeting, I e-mailed pertinent preliminary resin test results to those requesting it at the meeting. (Testing funded with EM-30 funds, but not WTP funds, so WTP personnel were unaware of the tests.) The next day an e-mail was sent from my prior WTP PE&T manager to my new WRPS manager, three levels above me, and copied to most of my prior higher level management at WTP through the WTP head of URS requesting help from WRPS to stop direct interactions between me and WTP design engineering staff. I had committed the offense of forwarding the requested test results and at the meeting sharing my opinions about WTP's implementation of the Equipment Option. These were the very actions DOE had asked me to do. After review by my new management, I was told I had done nothing wrong, but in the future I was not to help or directly interface with WTP design engineering staff, though I could pass any help/suggestions through DOE and attend any WTP meetings requested by DOE. Basically I could be a consultant to DOE, but not to WTP. I saw the WTP response (June 9th e-mail to my current and prior management asking to stop my interaction with WTP) as an attempt to punish me for interfering with the WTP design. As a new employee at WRPS with management that did not know me, a scathing e-mail from their peers at WTP about me would certainly hurt. Also all my former WTP management would see this with my reputation potentially tarnished. This was retaliation for what I had done (in WTP's opinion) - interfere with design. DOE verbally and in a follow-up e-mail, copied to the key WTP personnel at the meeting, thanked me for my useful help at the meeting and my follow-up e-mail. There was never any apology to me from WTP or, to my knowledge, any follow-up e-mail to undo the inappropriate critical e-mail to my current and past management. This is another example - those that repetitively challenge the WTP design in a way that is technically sound and may result in potential delay or changes in design may be subject to professional and personal retaliation.

In 2008 I helped with review of plans for the ion exchange gas or hydrogen vent system. This system is critical for prevention of gas phase detonation of gases that might evolve from the high radiation fields in the ion exchange columns. It is an important component in the WTP safety system. The design appeared to be seriously flawed where small changes in process conditions would be incorrectly interpreted as a gas release with a resultant disruptive corrective action that then would cause more process upsets and more false gas indications, etc. The design looked to me to be hopelessly flawed. The response from design was I should approve the paper work and they could address the design details later. I approved these documents but never saw "later". When it became obvious that no fix was planned, I met with my process engineering PE&T management pointing out the vent system will never work well - it would be too sensitive to false indications, etc. I was tasked to mathematically prove it would not work, which I did in 2009 with two issued WTP documents. Eventually the concept of a draft (redline) trap and purge system was explained as a potential fix, though the design details were not shown. Still procurement of the design I thought to be proven as inadequate proceeded. After I left WTP, the WRPS 2010 WTP review effort indicated the proposed hydrogen vent system would make the plant extremely difficult to operate and should be fixed. WTP management concurred and indicated the redline trap and purge system would address it. However this proposed fix has not been shared with the WRPS review group nor, to the best of my knowledge, with DOE. It may work or may not. WTP at one time stanchly defended the current design as being adequate. Then, after two years of my review efforts, they concurred it wasn't adequate. The slowness in acknowledging and addressing the problem

seems disproportionate to the importance of this safety feature. (Pretreatment will not run safely without a safe, operable, and reliable ion exchange gas vent system.)

Fallout from Leaving WTP

In fall of 2009 I interviewed for and was offered a transfer to WRPS (still within URS management, my parent company). The job involves operational readiness evaluations for the WTP. My WTP management first blocked the transfer, saying I had a conflict of interest - by working in a WTP review function I might review ion exchange work that I had previously worked with at WTP. Meanwhile, the WRPS management saw no conflict of interest, but if necessary they would have others review ion exchange, etc. (Several other persons in the WRPS WTP review group have previously worked at the WTP, yet none of these were claimed to have a conflict of interest. Also at that time none of them worked for URS, so URS management could not control their job choices.) Finally, I am told, the head of WRPS met with the head of WTP URS disputing the conflict of interest claim. Eventually, I was allowed to leave. My new WRPS supervision, who had been attending the WTP chemical process control (CPC) meetings, asked me to take over representation in these meetings as I picked up more leadership functions in my new assignment. However, the management of WTP PE&T indicated I was not welcome because I had a conflict of interest - I had previously worked at WTP and the meetings might cover some topics I previously worked on. I believed the conflict of interest claim was a "smoke screen". They feared that I might find flaws in the chemical control strategy and had an unfair advantage in that I knew their system well. Several times I asked to attend. Each time this was denied based on conflict of interest claims. After a year I asked again, basically appealing that a year had past; the manager that made the conflict of interest claim was gone; one of the others from WRPS that attended these CPC meetings had previously worked at the WTP; it was time to move on. Later, the reply back was - they had decided to make the CPC meetings closed. WRPS would no longer be invited. This highlights a common theme - WTP goes to much effort to not allow potential critical reviewers to gain access to key information. Meetings that might openly disclose process control issues are the last place a potential critical reviewer would be welcome.

In 2010 my first major WTP review effort at WRPS was to review the impact of precipitates in the pretreatment vessels and equipment. I focused on precipitates in the LAW receipt vessels (FRP-2) and the cross flow filter (CFF) shells. In order to complete my review, I needed to determine if the pulse jet mixers (PJMs) in the FRP-2 vessels could suspend the large size precipitates that would form. I started to request WTP mixing documents through the established procedures with WTP. However, essentially all the mixing related documents I requested were not approved (not provided). After months of being starved of the key information this review needed, my WRPS management met with WTP management to ask why most of the documents I requested were not being supplied in a timely manner as agreed. The answer, I am told, was - "Murray is no PJM expert" and basically had no business requesting this information. My WRPS management said there was nothing business sensitive or proprietary (agree criteria for denying access) in the requested documents that allowed WTP to deny access. Eventually WTP caved in and provided the documents. It was too late for my review. In my opinion, the key item was - I was singled out as a risk for a critical review and documents I requested that might lead to unwanted criticism were denied. Again because I had caused so many WTP design challenges and

changes (e.g., ion exchange column design changes, Equipment Option, challenges to the ion exchange hydrogen vent system design), when I needed WTP approval, chances were good it would be denied. In my opinion, this was a form of retaliation. It meant my reviews could not be as thorough.

Current WTP Issues

I would like to say let's forget the past mistakes and move on. Are there any current WTP real safety issues not being addressed? I believe the answer is a definite yes. Some issues tie to WTP operability which then ties to safety through the potential tremendous extension of the time required to treat and immobilize the Hanford tank waste. Many of the issues require detailed review to quantify (determine that a fix is needed) and multidiscipline teamwork to resolve. However at the present pace of issue resolution, many may not be resolved adequately before the scheduled start up.

As previously mentioned, the ion exchange hydrogen vent system is acknowledged as being inadequate.

The pretreatment cross flow filters (CFFs) are designed with no means of draining solids from the shell after installation. Solutions that mix in the shell during the WTP oxidative leaching process are expected to form MnO_2 precipitates that likely will not dissolve in subsequent flows. The quiescent lower portions of the CFF shells likely will accumulate MnO_2 precipitates. As precipitates accumulate, the CFF filtration rate will drop and the CFF will eventually need to be replaced. Also as the precipitates accumulate in the shells, dead zones with no flow will form. How will hydrogen and oxygen generated by radiolysis escape? These shells are not designed to be filled with solids. Potentially explosive gas mixtures could easily accumulate. Hopefully there will be no spark. A potential throughput disaster will occur when the CFFs must be removed and replaced. Removal and decontamination of the 5 CFFs and one heat exchange welded together as one unit will be a giant task possibly tying up the back end of pretreatment for a long time. Remotely installing the new five CFF units and heat exchanger assembly as one unit with many highly precise and near inflexible jumper connections will be very hard and possibly can't be done without unacceptable leakage at the jumper connections. This will be a grave throughput risk. In my opinion, a detailed analysis is needed on how to prevent solids from accumulating in the CFF shells and to prevent depth fouling of the CFF tubes, how to size reduce and adequately decontaminate the CFF and heat exchanger units, and how to remotely install a new assembly. (CFF tubes failed in testing / manufacture and represent another threat that the CFF units will need to be replaced with shells that have filled with waste solids.)

The four FRP-2 vessels (LAW receipt vessels) have no source of heating and are in cool black cells, have very long solution residence time (lots of time to cool), have relatively weak mixing capability, and have feeds frequently saturated with sodium salts at reasonably warm temperatures. Large size, quick settling sodium phosphate and oxalates precipitates are likely to form and settle to the bottom of these vessels, representing a threat of hydrogen gas accumulation and an entrapment point for other solids. The lone suction lines off each vessel passing through the cold black cells represent risk of plugging that may be very difficult to reopen. This appears to be a serious problem with no apparent action to address.

The annual WRPS WTP operational readiness evaluations provide detailed listings of other issues needing resolution. Many of the issues can only be efficiently resolved in design. Are they being addressed in time to have an operable facility? (A teamwork approach where WTP, WRPS, and ORP cooperate to determine vulnerabilities and find solutions would help immensely.)

Roots of Problems

In my opinion the root causes of these problems lie in the construction contract, the contract incentives, and the teamwork (or lack of) assigned to design and review the design of the processes and facilities.

The WTP contract provides incentives for construction milestones and commissioning production sprint goals, but little incentive to assure the WTP is designed so it can complete its mission in the time required. The duration from contract award to commissioning is so long that few on the design team will be held responsible for design results. Present goals, fees and incentives are realized by producing a design that doesn't require change. Those that point out design problems in the review process can easily become the source of design schedule slippage or cost over runs and can be perceived as the enemy of achieving incentivized goals. The reality of how the design will work in WTP operation is so far in the future that passing the review process can easily become the objective instead of creating a design that accomplishes the goals for the long-term. I believe the construction of the CFF and heat exchanger assemblies as one welded unit with all shell drains welded shut is an example of designing a unit that may meet the sprint goals but likely will not meet the long-term mission goals.

The WTP processes are interconnected and complex. Most workers are focused on narrow areas and rarely see the "big picture". While I worked on the project I saw very little cross functional design review efforts other than presentations for external reviewers with the one exception of the CPC review meetings started in late 2009, shortly before I left WTP. (I believe these meetings started with excellent objectives but lacked the needed repetitive effort with follow-up in individual process areas to assure good functionality.) Openness to review of design with the objective of finding and fixing problems in general seems missing, especially once the design is declared complete. This is especially true with reviewers outside the WTP, such as the WRPS operational readiness evaluations of the WTP where WTP indicates it is not in their contract scope to significantly support reviews. Even within WTP at times tension between Bechtel design engineering, PE&T, and R&T caused access to information/help to be difficult or denied.

The EFRT results in 2006 are a good illustration that the review process at WTP allows major risks to not be addressed. This review identified many serious risks that if not addressed could lead to WTP failure to achieve its mission. Most risks that the EFRT identified were already known, but not being efficiently addressed. An obvious question is - why in 2006 were so many serious problems not being addressed? I believe this was indicative of an internal review and correction process that may have looked good on paper but was not getting the job done. After the EFRT report was issued, the main and potential EFRT issues seemed to be treated like a punch list - work on and chose all the specific items they identified but don't look for other similar problems. The lack of response to the precipitates in the ion exchange

feed (which was not found by the EFRT but clearly presented later by me) is an example of not appropriately responding to known risks unless DOE dictates a response.

Suggested Solutions to Problem

In my opinion, the key to fixing the problems requires open, cross functional review of significant WTP unit operations with review including:

- open access to WTP information,
- participation within and beyond WTP,
- focus on long-term operability and safety, and
- interconnection with the whole WTP process.

The review process must not be treated like another "defend the design to external reviewers" effort or it will be doomed to failure. Instead the focus needs to be what is required to make the process work reliably, safely for the full WTP mission. Participants must be motivated for long-term safe operation. It may be essential for DOE to impact WTP managers pay and position based on how they internalize long-term safe operation goals and openness to the review process. Likely the WTP contract will require modification. Hopefully the WTP contractors will internalize these goals. If not, success may require changing the contract team.

One of the major issues that will certainly surface is cost. Will the finished WTP construction and commissioning cost exceed the budgeted $12.3B? It may, but the overall Hanford waste treatment mission costs will be much more if the problems are not addressed, compared to if they are addressed as soon as practical. If the WTP facility is allowed to process hot waste prior to addressing the more serious issues, the WTP may never accomplish its intended mission or the time required for completion of the mission may be tremendously more than presently forecast.

Interactions with R&T and Dr. Tamosaitis

The DNFSB's Recommendation 2011-1 *Safety Culture at the Waste Treatment and Immobilization Plant* indicated, "tension at the WTP project between organizations charged with technical issue resolution and development of safety basis scope, and those organizations charged with completing design and advancing construction, is unusually high." I personally experienced this many times and concur that this is an accurate summation. I believe that the one WTP group that directly experienced this conflict more than any other was the R&T group managed by Dr. Tamosaitis. This was a natural outcome of trying to resolve and compare test results to WTP designs. I met many times with Dr. Tamosaitis and frequently also with my immediate manager (reporting to Dr. Tamosaitis) in Dr. Tamosaitis' office, strategizing how to reconcile design to test results. If a design would not work well, we would try to brainstorm how to fix the design, though first we would try to determine if there was any way the proposed design could work. We also discussed how to present the results in an understandable and convincing manner. Dr. Tamosaitis first objective always was long-term WTP functionality. The second objective was how to best present the results/suggestions so needed changes would be implemented. There obviously was much tension between Bechtel design, which did not want any changes, and the R&T group, which after testing would report back that specific designs would not work and recommend

changes. The design of the ion exchange column internals, support screen, and gas venting systems are examples that repetitively came up from 2005 through 2009. (To the best of my knowledge, the gas venting issue for the resin bed support screen and the inlet screen was not properly resolved. The 2009 recommendations that I issued and with endorsement by the offsite Bechtel Chief Process Engineer provided potential solutions that were not implemented.)

It was obvious to me, my immediate manager, and Dr. Tamosaitis that tension between design and R&T grew each time we challenged a design. But consistently, when warranted, we did that. To my perception, the Bechtel design group felt that since design was not an R&T function, R&T should not challenge their designs. We felt that since I was in R&T, in the process engineering group of PE&T, and had design review responsibilities, it was my role. Dr. Tamosaitis helped support me both through his management meetings and review of strategies. But his role in this clearly did not endear him to design.

In late 2009 when Dr. Tamosaitis knew I wanted to transfer to WRPS, he appropriately asked why I was leaving. He knew well the tensions with design were a factor. I thought I could do more good for WTP reviewing from outside where WTP design management could not impact me (including appraisals and future career opportunities). He said that he would protect me (at WTP). I agreed - Dr. Tamosaitis always had protected / supported me. My response was, "when I need it, will you be there?" Dr. Tamosaitis was no friend of the design folks and I doubted if he would survive that long. That, apparently, was close to a prophetic statement. We both knew his supporting the supposition that design must be fixed if testing indicates it will not work had a price.

Results of Good Work

I believe I contributed the two most significant process improvements to the WTP process, certainly to the pretreatment portion of the WTP process. The conversion to spherical resorcinol formaldehyde would not have happened without my leadership and work. The prior resin had grave risk of plugging the process and was extremely expensive with the conversion to the new resin saving $3B in 2008 dollars for long-term operation and $30M for commissioning. The conversion of the process to the Equipment Option will shorten the time to complete the WTP mission at 70% availability by about 5 years compared to the next best option (assuming the WTP runs). The savings in full mission costs from this are at least $5B. It would not have happened without my efforts. The outcome to me is - I am now demoted in grade and title. I chose this to avoid WTP retaliation and career stagnation.

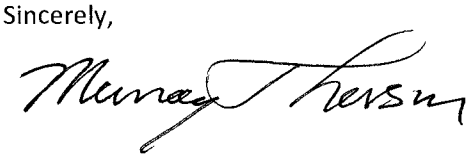
Dr. Tamosaitis by far was the one manager in all of WTP that championed fixing the design when needed. He guided and protected me and others in his group from the strong desire to silence any results that might imply changes were needed. He was escorted off the project for no apparent real offense - a career ending disgrace. He is now reportedly left with trivial tasks as he works to restore his reputation, if he can.

It appears to me there is no reward for doing the right thing when it comes to challenging WTP design.

Do the Right Thing

As I stated earlier, I am a second generation Hanford worker. My father worked 34 years at Hanford as an electrical engineer and assured the power supplies to the production reactors were reliable so key core coolant and other critical functions worked. Even today at age 94 if started he will go on about how proud he was to keep the power reliable, etc. His generation was like that. They got the job done. It is our turn. Let get the job done - safely.

Sincerely,



Murray Thorson, P. E.

cc: Andrew Thibadeau, Defense Nuclear Facilities Safety Board
Rick Schapira, Defense Nuclear Facilities Safety Board