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14-TF-0026

MAR 19 2014

The Honorable Peter S. Winokur, Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue, NW, Suite 700
Washington, DC 20004

Mr. Chairman:

TRANSMITTAL OF DEFENSE NUCLEAR FACILITIES SAFETY BOARD RECOMMENDATION 2012-2 IMPLEMENTATION PLAN DELIVERABLE FOR ACTION 4-2

This letter provides the deliverable responsive to Action 4-2 of the U.S. Department of Energy, Office of River Protection (ORP) Implementation Plan for Defense Nuclear Facilities Safety Board Recommendation 2012-2, Hanford Tank Farms Flammable Gas Safety Strategy. Action 4-2 is to demonstrate current capabilities to recover from a loss of ventilation.

The Attachment, RPP-RPT-56725, *DNFSB 2012-2 Action 4-2 Final Report*, documents the evaluation of Hanford Tank Farms' capability to recover from a loss of ventilation due to an extended loss of power. The time to restore ventilation ranged from two to eight days depending on the tank farm. All of the response times are compliant with limiting conditions for operations. To minimize the amount of time that ventilation is inoperable, the report includes three opportunities for improvement: (1) standardizing all the ventilation systems to have infrastructure for receiving alternate power similar to AW Farm, (2) modifying the existing infrastructure to allow generators to be permanently installed at each farm, and (3) developing shelf ready engineering change notices for providing alternate power to AY/AZ and AP Farms. ORP and its Contractor are evaluating these opportunities for improvements that include costs for implementation, schedule impact, and whether a commensurate level of risk reduction would occur.

K. W. Smith

Kevin W. Smith
Manager

Attachment

Distribution: see Page 2

MAR 1 9 2014

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ATTACHMENT

14-TF-0026

RPP-RPT-56725: DNFSB 2012-2 ACTION FINAL REPORT

DOCUMENT RELEASE FORM

(1) Document Number:	RPP-RPT-56725	(2) Revision Number: 0	(3) Effective Date: 2/18/14
(4) Document Type:	☐ Digital Image ☐ Hard copy ☒ PDF ☐ Video	(a) Number of pages (including the DRF) or number of digital images	27
(5) Release Type	☒ New ☐ Cancel	☐ Page Change	☐ Complete Revision
(6) Document Title:	DNFSB 2012-2 Action 4-2 Final Report	(7) USQ No.: R- ☒ N/A NA-2 TG Goetz TG Goetz 2/18/14 USQ Evaluator Sign/Date	
(8) Change/Release Description:	Initial Release		
(9) Change Justification:	N/A		

(10) Associated Structure, System, and Component (SSC) and Building Number:	(a) Structure Location: N/A		(c) Building Number: N/A	(e) Project Number: T1P55
	(b) System Designator: VTP		(d) Equipment ID Number (EIN): N/A	

(11) Impacted Documents:	(a) Document Type	(b) Document Number	(c) Document Revision
	N/A	N/A	N/A

(12) Approvals:

(a) Author (Print/Sign): D.R. May — Date: 2/18/14

(b) Reviewer (Optional, Print/Sign):

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Release Stamp: DATE: Feb 18, 2014 HANFORD RELEASE

(14) Clearance	(a) Cleared for Public Release	(b) Restricted Information?	(c) Restriction Type:
	☑ Yes ☐ No	☐ Yes ☑ No	

(15) Clearance Review (Print/Sign): APPROVED By Julia Raymer at 12:33 pm, Feb 18, 2014 — Date:

DNFSB 2012-2 Action 4-2 Final Report

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EDT/ECN: DRF JRR 2/18/14 UC:
Cost Center: Charge Code:
B&R Code: Total Pages: 27

Key Words: DNFSB 2012-2, Action 4-2, loss of ventilation, current capabilities, power loss event.

Abstract: This report discusses the historical response as well as the current capabilities of each DST farm to respond to a loss of ventilation scenario due to power loss. An Emergency Prepardness Evaluation Workshop was held to discuss each farm's response and to build a response schedule per farm. Opportunities for Improvement were identified in an effort to reduce the response times

APPROVED
By Julia Raymer at 12:34 pm, Feb 18, 2014
Release Approval Date

DATE:
Feb 18, 2014
HANFORD RELEASE
Release Stamp

Approved For Public Release

DNFSB 2012-2 Action 4-2 Final Report

D. R. May
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Date Published
February 2014

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EXECUTIVE SUMMARY

In September 2012, Defense Nuclear Facilities Safety Board (DNFSB) issued DNFSB Recommendation 2012-2, *Hanford Tank Farms Flammable Gas Safety Strategy*, which included within it five Sub-Recommendations. In general, DNFSB Recommendation 2012-2 identified the need to take action to reduce the potential risk posed by flammable gas events at the Hanford Tanks Farms.

In response to DNFSB Recommendation 2012-2, the U.S. Department of Energy (DOE) developed an Implementation Plan (IP) to address the Sub-Recommendations and improve the flammable gas controls in the near term. This report addresses Sub-Recommendation 4, Action 4-2 outlined within the IP. Action 4-2 provides direction to "Demonstrate current capabilities to recover from a loss of ventilation."

This report discusses the historical response as well as the current capabilities of each farm to respond to a loss of ventilation scenario due to power loss. An Emergency Preparedness Evaluation Workshop was held with the Double Shell Tank (DST) Farm Shift Managers, Cognizant System Engineers (CSE), and an Emergency Preparedness Representative to discuss each DST farm's respective response to a loss of ventilation scenario. The duration of each step was quantified to build a response schedule per farm (Appendix A).

Opportunities for Improvement (OFI) were identified in an effort to reduce the response times. These OFIs included standardizing all the DST ventilation systems to have infrastructure for receiving alternate power similar to AW Farm, modifying the existing infrastructure to allow portable generators to be permanently installed at each farm, and developing shelf ready Engineering Change Notices (ECN) for providing alternate power to AY/AZ and AP Farm.

There were no deficiencies or compensatory measures identified for the DST farms to respond to loss of ventilation due to power loss. The response times for each DST farm are compliant with the applicable Limiting Conditions for Operation (LCO).

ACRONYMS

ADM	Area Dayshift Manager
AOP	Abnormal Operating Procedure
CHAMPS	Computer History and Maintenance Planning Software
CSM	Central Shift Manager
DNFSB	Defense Nuclear Facilities Safety Board
DOE	U.S. Department of Energy
DST	Double-Shell Tank
ECN	Engineering Change Notice
FY	Fiscal Year
HMI	Human-Machine Interface
IP	Implementation Plan
LCO	Limiting Condition for Operation
LFL	Lower Flammability Limit
LOTO	Lockout/Tag out
OFI	Opportunity for Improvement
PM	Preventive Maintenance
SAC	Specific Adminstrative Control
SBA	Safety Basis Amendment
SS	Safety Significant
TOC	Tank Operations Contract
TSR	Technical Safety Requirements
WRPS	Washington River Protection Solutions

1.0 BACKGROUND

A function of the five primary ventilation systems servicing the 28 DSTs at Hanford Tank Farms is to remove flammable gases that may be generated by the tank waste due to radiolysis, thermolysis, and corrosion. The safety function of the DST primary ventilation system is to maintain the concentration of flammable gases below the lower flammability limit in the DST headspace (resulting from steady-state and induced gas releases due to water additions, chemical additions, and waste transfers into DSTs).

In 2012, DOE detailed to DNFSB near-term plans for DST ventilation system upgrades in Fiscal Years (FY) 2013 and 2014. This included compensatory measures in place and planned upgrades to safeguard the operability of the DST primary ventilation systems to ensure that flammable gases cannot accumulate to hazardous levels. However, DNFSB considered that the specific administrative control (SAC) for flammable gas control was inadequate. DNFSB Recommendation 2012-2, *Hanford Tank Farms Flammable Gas Safety Strategy*, was then approved by DNFSB.

DOE's response to DNFSB Recommendation 2012-2 identifies the need to take actions to reduce the risk posed by flammable gas events at the Hanford Tank Farms and included five Sub-Recommendations with Action items. Within the Sub-Recommendations, it included Sub-Recommendation 4, Action 4-2: Demonstrate current capabilities to recover from a loss of ventilation.

This report addresses Action 4-2. Included in this report is a discussion on the historical responses and current capabilities to respond to a loss of DST farm ventilation. The loss of ventilation will specifically focus on loss of power to a single farm. A site wide power loss event or a natural event such as a large earthquake will not be evaluated in this report.

The current capabilities were discussed in an Emergency Preparedness Evaluation Workshop with the DST farm Shift Managers, CSEs, and an Emergency Preparedness Representative. Each DST farm created a response schedule outlining the actions and timeframe associated with restoring ventilation to their farm. The response times for the five DST farms were compared in order to identify opportunities for improvement.

2.0 PURPOSE

The purpose of this report is for Washington River Protection Solutions, LLC. (WRPS) to assess the time required for each DST farm to restore primary ventilation following a loss of power, considering both historical responses and current capabilities. This assessment will also identify opportunities for improving the current response time for restoring the ventilation.

3.0 ASSUMPTIONS/REQUIREMENTS

The assumptions/requirements listed below were used to provide direction to the attendees during the workshop meeting held on January 21, 2014.

1. **Assumption:** Loss of ventilation will be a result of power loss only; no concurrent mechanical/electrical failures are assumed.

   Basis: Historically, power loss has been the leading cause of prolonged unplanned outages. Mechanical failures will not be addressed due to the preventive maintenance (PM) programs in place, spare parts program, and daily rounds performed. These programs are utilized to keep the ventilation systems operating on a daily basis.

   Preventive maintenance items are tracked in the Computer History and Maintenance Planning Software (CHAMPS) program and are performed to maintain the operability of the exhausters in each DST farm. Operations representatives from each farm review the PMs due within the coming 30 days every week to ensure all PMs are up to date.

   The *Shift Manager Standby DST Primary Ventilation Operability Verification* document is updated weekly and used to keep track of all the Technical Safety Requirements (TSR) for the ventilation systems. Daily and nightly visual inspections of the system are performed and captured in each farm's daily rounds logs. Spare parts are on hand for many of the major ventilation components.

   This exercise does not consider natural events such as a large earthquake which could cause a loss of power and concurrent mechanical/electrical failures of the ventilation system. An evaluation of system interaction effects ("two over one protection") from natural events (e.g., earthquakes [seismic events], high winds) is identified as a planned improvement. This evaluation will be addressed in DNFSB 2012-2 Action 1-2 which provides executable strategy, cost, and schedule for upgrading each DST primary tank ventilation system to meet SS requirements.

2. **Assumption:** Ventilation can be restored once the alternate power is connected.

   Basis: Consistent with Item 1 above, no concurrent mechanical/electrical failures of the ventilation system are assumed to occur during the loss of power. Therefore, when the alternate power is connected, the ventilation system is assumed to be capable of being restarted and performing its safety function. This assumption is based upon historical knowledge evaluation of short term power loss situations (e.g., lightning storm).

3. **Requirement:** Power loss is evaluated as farm specific, not site wide.

   Basis: The probability of a long-term site wide power loss occurring is less likely than a long-term power loss to an individual farm. Therefore this report focuses on a farm specific power loss event. Although a site wide power loss was not evaluated in depth, OFI 2 identified in section 7.0 describes the best case scenario for restoring power to each DST farm should this happen.

4. **Requirement:** Identify OFIs.

   Basis: One of the purposes of this exercise is to identify potential improvements that are practical, and if implemented, can improve response times to loss of ventilation caused by loss of power in the near term. One effective way to identify such improvements is to compare the response times for the five DST farms and identify the optimal configurations that produce the shortest response times and can be practically deployed in the other farms.

4.0 RECENT SY FARM CASE STUDY

The recent SY Farm power outage in August 2013 represents a power loss scenario similar to the one provided to the workshop attendees. This scenario was used as a case study during the workshop to demonstrate actual responses taken to restore the SY-Farm ventilation system.

SY-Farm currently has two stand-alone exhausters, SY-A Train and SY-B Train, that are skid mounted and each has an independent power supply. The SY-B Train has an installed manual transfer switch to allow alternate power to be supplied. Historically, the temporary power to SY-B Train was routed from S-Farm via a temporary power cord and using the manual transfer switch.

On May 14, 2013, SY-Farm entered a planned maintenance electrical outage. During the planned electrical outage SY-B Train exhauster was operating via temporary power through S-Farm. A heavy windstorm on August 10, 2013, blew over power pole W1584 which supplied power to portions of S-Farm complex including the temporary power to SY-B Train. This resulted in a power loss to SY-B Train. At this time the flammable gas readings within SY-101, SY-102 and SY-103 were all 0% of the LFL. However with an exhauster not operating, it was expected that SY-103 would begin to accumulate flammable gas.

At this time, ST-Team maintenance was in the middle of electrical breaker testing for the facility and could not safely restore power to SY-Farm complex. Therefore no power was available to operate the SY-Farm exhausters. ST-Team spent several days pursuing multiple paths to restore power to the exhausters and updating their Recovery Plan. The most expeditious path turned out to be installing a portable generator outside of the farm and routing a temporary power cord through the farm to SY-B Train exhauster. In order to install the portable generator, some of the following activities were worked concurrently; 6 calendar days were spent determining what parts needed to be procured to hook up the generator, 14 calendar days were spent developing a temporary modification ECN, 17 calendar days were spent developing a work package, 4 calendar days were spent performing LOTOs, 3 calendar days were spent waiting for the procured parts to arrive onsite, and 2 calendar days were spent connecting the rented 70 KW portable diesel generator.

On August 30, 2013 temporary power was restored to SY-B Train. In all it took 20 days to get the SY Farm ventilation system back online after the windstorm knocked out power on August 10, 2013. During this outage, flammable gas readings were routinely taken. The highest

flammable gas reading was found in SY-103 with 11.9% of the LFL. SY-101 and SY-102 both had readings of 0% of the LFL.

ST-Team maintenance continued the planned portion of the electrical outage, eventually restoring the facility to normal configuration. Once this was complete, they exited the planned electrical outage and normal power was restored to both SY-A Train and SY-B Train on October 15, 2013.

In evaluating SY Farm's response there are several areas for improvement that are noted. Determining which electrical cord and plugs to procure and waiting on the procured parts to arrive added 9 calendar days to the overall response time. Now that these components have been procured and are onsite, the farm would only have to wait on the procurement of a rental generator. If each DST farm had the proper cords and plugs onsite to hook up alternate power, this would reduce their response time, as noted in section 7.0 OFI 1. Also, a pre-staged ECN for connecting a portable generator could have reduced the response time, as described in OFI 3.

Some difficulties encountered in the recent SY response involved obtaining the resources necessary to perform the work. There were few people trained to perform repairs on the unique equipment within the SY ventilation system. For example there was only one electrician from this farm team trained to work on the specific style of breakers. A lessons learned from this event would be to have multiple people trained on each component within the DST ventilation system. Standardizing the DST ventilation systems, as mentioned in section 7.0 OFI 1, would result in more people trained on each component. This would decrease the risk associated with performing the field work in a timely manner.

SY Farm's response time to a loss of ventilation scenario has been significantly reduced due to the lessons learned and previous work performed during the August 2013 power loss event. SY Farm now has a plan in place for providing alternate power to the ventilation system using a portable generator. The electrical cord and plugs have been procured and are available to hook up the generator. Also the work package and ECN used in the August 2013 event would be used as a template for developing the new ECN and work package. Taking these factors into consideration it is anticipated that the SY Farm response time can be reduced from 20 days in August 2013 to approximately 5 days currently, as described in section 6.5.

5.0 CURRENT CAPABILITIES

Historically in a loss of power scenario, select farms would wait for the electrical utilities group to respond before attempting to hook up an alternate source of power to restore the ventilation. A major reason for waiting is due to the frequency of short term power outages that are quickly resolved by the electrical utilities group. In many cases electrical utilities can have power back to the farm in less than a day. Another reason for waiting is due to the inability of specific farms to connect alternate power. Currently AY/AZ Farm, AP Farm, and SY-A Train ventilation systems are not capable of hooking up an alternate source of power without modifications; this issue is addressed in OFI 1 and OFI 2.

Since the 2013 SBA implementation there has been a raised awareness on the urgency associated with restoring ventilation to reduce the flammable gas build up in the tanks. By executing DNFSB 2012-2 Action 4-2, WRPS is taking steps to become better prepared for restoring ventilation in a loss of power event. Compiling each DST farm's current capabilities and current responses is the first step towards minimizing the flammable gas hazard associated with power loss.

Every DST farm has a unique configuration that influences the ability and timeliness for providing alternate power to the ventilation system. These configurations are listed below to help the reader better understand the response actions listed in section 6.0.

5.1 AN FARM

In a loss of power scenario specific to AN Farm, AN Farm is capable of running power from 241-AZ-156 Building. The power extension cord, with plugs, is stored in the AZ-801 Building and can be hooked up with a work package. There is a manual transfer switch in place which can switch over the power once the connections are in place.

Both ventilation trains in AN Farm are also capable of receiving power from a portable generator. However, the power extension cord and plugs are not procured to support this.

5.2 AY/AZ FARM

Currently there are no locations for hooking up alternate power to the ventilation in AY/AZ Farm should a loss of power scenario occur. This farm has a dedicated backup diesel generator located inside the 241-AZ-701 ventilation building with an automatic power transfer switch to run the ventilation should this happen. However, the generator is not operable at this time and the batteries have been removed. No maintenance has been performed on the generator in approximately 5 years. Since there is currently no place to plug in a portable generator, a plug would have to be hardwired in to supply power to the ventilation system or the existing generator would need to be restored, as described in section 7.0 OFI 2.

5.3 AP FARM

There are no locations for hooking up alternate power to AP Farm's ventilation should a loss of power event occur. The older style ventilation unit does not have the capability of plugging in a portable generator. A plug would need to be hardwired to allow a portable generator to hook up and supply power to the ventilation system, as noted in OFI 2.

In FY 2014, it is anticipated that the TOC will receive funding to install new ventilation exhausters in AP and SY Farm as part of Project T1P83. Once the project is completed AP farm will be capable of connecting to alternate power.

5.4 AW FARM

In a loss of power scenario, AW Farm has an alternate power fusible disconnect plug available to hook up a portable generator and run the ventilation. The power extension cord, with plugs, is onsite and can be hooked up with a work package and a rented generator. This cord hooks up the fusible disconnect outside the farm boundary to one of the ventilation system plugs inside the farm. There is a manual transfer switch in place which can switch over the power once the portable generator is running.

The fusible disconnect located outside the farm allows for a portable generator to hook up and provide power without entering the farm and without developing an ECN. This results in the quickest response to provide alternate power when using a portable generator.

5.5 SY FARM

In a loss of power scenario, SY-B Train has a plug available to hook up a portable generator and run the ventilation. The power extension cord, with plugs, is onsite and can be hooked up with a work package and a rented generator. There is a manual transfer switch in place which can switch over the power once the portable generator is running. SY-A Train is not capable of hooking up to alternate power. OFI 1 and OFI 2 address opportunities for allowing both ventilation trains to be capable of connecting to alternate power.

As discussed in section 5.3, SY Farm's ventilation system is anticipated to be upgraded by Project T1P83. Once upgraded, SY Farm will be capable of connecting to alternate power.

6.0 DST FARM CURRENT RESPONSES TO LOSS OF VENTILATION

The Emergency Preparedness Evaluation Workshop performed on January 21, 2014 discussed capabilities for each DST farm to respond to loss of ventilation. The loss of ventilation scenario discussed was specifically due to long term power loss to a specific farm. Short term power loss "blips", sometimes associated with lighting strikes, were not the focus of this workshop. Historically in these situations, ventilation is restored automatically or manually. The power can automatically come back on in some situations or if a breaker has tripped an electrician will go to the farm to determine the cause and manually reset the breaker. Once the breaker is reset, existing procedures are followed to restore power to the ventilation in a short duration.

During the workshop, each farm's shift manager was asked to list out the steps they would take and walk through a loss of ventilation scenario. The corresponding durations were assigned to each relevant step. The durations assigned to each farm assume that the necessary resources will be available to perform the work and also assume that the farm is in workable conditions (e.g., no stop work)

A detailed response schedule for each DST farm can be found in Appendix A. The schedules show the amount of time it takes to get from identifying a loss of power event to restoring the primary ventilation in each farm. The schedules are built using a 7 day work week, 8 hours a day.

6.1 AN FARM RESPONSE

The total response time to restore the DST ventilation in AN Farm is approximately 2 days. See Appendix A for schedule details due to some response activities performed concurrently.

- Enter AOP-21 *Response to Tank Farm Ventilation Upset* and AOP-12 *Response to Unplanned Loss of Electrical Power.*
- The central shift manager (CSM) notifies personnel of the loss of ventilation.
- Send operator to the Human-Machine Interface (HMI) to determine the reason for loss of ventilation (0.5 hr).
- The Area Dayshift Manager (ADM) contacts the electrical utility dispatch regarding the current situation (1 day for response).
- Enter into time monitoring under LCO 3.1 A & B, see Appendix B for LCO 3.1 conditions and actions.
- Send operator to the farm to determine outage source (4 hrs.).
- The ADM contacts the electrical utility dispatch to receive an update on when they anticipate power to come back online.
- Assemble a level 2 work package to hook up alternate power from 241-AZ-156 (1 day).
    - The work package is similar to the one used in planned outages therefore reduces the amount of time necessary to create.
- Hook up power from 241-AZ-156 using an existing electrical cord (2 hrs.).
    - The electrical cord already has the proper plugs connected and is stored in 241-AZ-801.
- Restore ventilation (1 hr).
- Clear the farm (1 hr).
- Exit AOP-21 and continue time monitoring.
- Operator performs rounds (0.5 hr).
- Exit time monitoring for LCO 3.1A.
- Once the power is restored exit AOP-12.

AN Farm's ability to receive alternate power from 241-AZ-156 significantly reduces their response time in comparison to the other DST farms. By not requiring a portable generator rental or needing a LOTO on the generator, AN Farm saves approximately 3 days in their response schedule.

6.2 AY/AZ FARM RESPONSE

The total response time to restore the DST ventilation in AY/AZ Farm is approximately 7 days. See Appendix A for schedule details due to some response activities performed concurrently.

- Enter AOP-21 and AOP-12.
- CSM notifies the ADM of the loss of ventilation.
- CSM notifies personnel that the ventilation is down.
- Enter into time monitoring under LCO 3.1 A & B.
- The ADM contacts the electrical utility dispatch regarding the current situation (1 day for response).
- The ADM attempts to determine the source of the outage (4 hrs.).
- Develop recovery plan (3 days).
- Develop temporary modification ECN to hook up a portable generator (2 days).
- Develop level 1 work package to hardwire a hookup for the generator (3 days).
- Procure a 125KW rental generator (4 days).
- LOTO (2 days).
- Hang LOTO (1 day).
- Field execution to hookup generator (1 day).
- Restore the ventilation (1 hr).
- Perform rounds (1 hr).
- Clear Farm (1 hr).
- Exit AOP-21 and continue time monitoring as required in AOP.
- Exit time monitoring and exit AOP-12 once power is restored.

6.3 AP FARM RESPONSE

The total response time to restore the DST ventilation in AP Farm is approximately 8 days. See Appendix A for schedule details due to some response activities performed concurrently.

- Enter into AOP-21 and AOP-12.
- Send operator into farm to determine the failure (0.5 hr).
- The CSM notifies the ADM that there is a loss of power and ventilation.
- Enter into time monitoring under LCO 3.1 A & B.
- The ADM contacts the electrical utility dispatch regarding the situation (1 day for response).
- The ADM attempts to determine the source of the outage (4 hrs.).
- Develop recovery plan (1 day).
- Develop temporary modification ECN (1.5 days).
- Develop level 1 work package for hooking up the generator (3 days).
- Procure a 70 KW rental generator (2 days).
- LOTO for fan motor and generator (2 days).
- Perform field work to hook up the generator (1 day).
- Restore ventilation once generator is connected (2 hrs.).
- Clear farm (2 hrs.).
- Exit AOP-21 and continue time monitoring as required in AOP.
- Exit time monitoring and exit AOP-12 once power is restored.

6.4 AW FARM RESPONSE

The total response time to restore the DST ventilation in AW Farm is approximately 5 days. See Appendix A for schedule details due to some response activities performed concurrently.

- Enter into AOP-21 and AOP-12.
- Send Operator into the farm to determine the failure (0.5 hr).
- The CSM notifies the ADM that there is a loss of power and ventilation.
- Enter into time monitoring under LCO 3.1 A & B.
- The ADM contacts the electrical utility dispatch regarding the situation (1 day for response).
- The ADM evaluates the source of the outage (4 hrs.).
- Develop a level 2 work package to hook up a portable generator (1 day).
- Procure a 70KW rental generator (2 days).
- LOTO for generator (1 day).
- Perform field work to hook up the generator (4 hrs.).
- Restore ventilation once generator is connected (2 hrs.).
- Clear farm (2 hrs.).
- Exit AOP-21 and continue time monitoring as required in AOP.
- Exit time monitoring and exit AOP-12 once power is restored.

6.5 SY FARM RESPONSE

The total response time to restore the DST ventilation in SY Farm is approximately 5 days. See Appendix A for schedule details due to some response activities performed concurrently.

- Enter into AOP-21 and AOP-12.
- Send operator to perform a sweep of the farm (0.5 hr).
- ADM exits AOP-21.
- ADM contacts the electrical utility dispatch regarding the situation at hand (1 day for response).
- Enter into time monitoring under LCO 3.1 A & B.
- The ADM evaluates the source of the outage (4 hrs.).
- Develop a temporary modification ECN (1 day).
    - The ECN is similar to the one used during the August 2013 power outage, therefore reduces the amount of time necessary to create.
- Develop a level 2 work package to hook up a portable generator (1 day)
    - The work package is similar to the one used during the August 2013 power outage, therefore reduces the amount of time necessary to create.
- Procure a 70KW rental generator (2 days).
- LOTO for generator (1 day).
- Perform field work to hook up the generator (1 day).
- Restore the ventilation once generator is connected (2 hrs.).

- Clear farm.
- Continue time monitoring as required in AOP.
- Exit time monitoring and exit AOP-12 once power is restored.

7.0 OPPORTUNITIES FOR IMPROVEMENT

All response times estimated in section 6.0 above are compliant with the applicable Limiting Conditions for Operation 3.1 (Appendix B), so there are no deficiencies or need for compensatory measures. For the purposes of this exercise, the LCO 3.1, Action A.2.2 requirement to submit a Recovery Plan to ORP within 10 days was used as a benchmark. Although all the response times were less than 10 days, the response times for two farms AY/AZ Farm (7 days) and AP Farm (8 days) approach the 10 day benchmark. During the evaluation workshop, OFIs were discussed to reduce the DST farm's response times with the greatest emphasis being placed on the AY/AZ and AP Farms. For each OFI, the group identified which DST farm would be affected as well as how the response time could be improved. Of the list, the following were deemed to affect the most farms and reduce response time the most. The OFIs below have been listed in the order ranked (1 being the most important).

OFI 1: Standardize all of the DST ventilation systems (with the initial emphasis on the AY/AZ and AP Farms) to have infrastructure for receiving alternate power similar to AW Farm. That is, install a fusible disconnect located outside the farm boundary that can be readily connected to a portable generator. This approach would eliminate the need for an ECN, allow for the use of standardized operating procedures and universal connectors, and improve the availability of resources to work on the equipment. These factors will thereby reduce the response time as well as maintenance time on the equipment. Included in this OFI would be procuring the proper electrical cords and plugs necessary to connect the alternate power at each DST farm. The estimated time to implement this OFI is 6-12 months. This upgrade would therefore reduce the AY/AZ and AP farms response to approximately 5 days (AW Farm's current response time) and also provide some reduction in response times for the other farms which already have response times of 5 days or less.

OFI 2: Procure four 70 KW generators, with electrical cords and plugs, and permanently install them at each DST farm excluding AY/AZ Farm. This would allow the ventilation to be switched over to alternate power by starting up the generator and turning a manual switch. This would eliminate recovery plans, procurements, and ECNs from the response schedules. Having generators permanently hooked up as opposed to just having them on hand would ensure they would be available in loss of power situations.

As part of this OFI, for AY/AZ Farm, an evaluation would be performed to determine whether it is more practical to restore the existing backup generator or modify the existing electrical system to allow a portable generator to be procured

and permanently installed. The more practical alternative would then be implemented.

In a site wide power outage, this OFI would result in the quickest recovery time for each DST farm. This would take approximately 6-8 months to implement and would reduce each farm's expected response time down to approximately 1 day.

OFI 3: Develop an ECN for hooking up alternate power to AY/AZ and AP Farm. This ECN would be shelf ready should a loss of power event occur. Due to the work package and ECN being performed concurrently this would not gain any schedule in our response time. However, it would provide a reduction of risk within the schedule.

8.0 CONCLUSION AND RECOMMENDATION

In conclusion, each DST farm was evaluated on their response to a loss of ventilation scenario due to power loss. The responses were evaluated and captured during an Emergency Preparedness Evaluation Workshop. As noted previously, all response times are compliant with LCO 3.1 so there are no deficiencies or need for compensatory measures. However, for the purposes of this exercise, the 10 day requirement to submit a Recovery Plan to ORP per LCO 3.1 Action A.2.2 was used as a benchmark for developing the OFIs.

OFIs were identified to reduce the response time of each farm. Standardizing all DST ventilation systems (with the initial emphasis on the AY/AZ and AP Farms) to match AW Farm's current design (i.e., installing a fusible disconnect located outside the farm boundary that can be readily connected to a portable generator) was considered the most optimum OFI. Modifying the existing infrastructure to allow portable generators to be permanently installed at each farm was the second choice. This included restoring the existing AY/AZ generator or permanently installing a portable generator at AY/AZ Farm. The final OFI purposed was to develop a shelf ready ECN for AP and AY/AZ Farm to hook up alternate power.

9.0 REFERENCES

DNFSB Recommendation 2012-2, *Hanford Tank Farms Flammable Gas Safety Strategy*, dated September 28, 2012.

DOE Response to Recommendation 2012-2, dated January 7, 2013.

DOE Implementation Plan for Defense Nuclear Facilities Safety Board Recommendation 2012-2, *Hanford Tank Farms Flammable Gas Safety Strategy*, dated June 6, 2013.

HNF-SD-WM-TSR-006, 2014, *Tank Farms Technical Safety Requirements*, Rev. 7-S, Washington River Protection Solutions LLC, Richland, Washington.

RPP-13033, 2014, *Tank Farms Documented Safety Analysis*, Rev. 5-C, Washington River Protection Solutions LLC, Richland, Washington.

TF-AOP-012, *Response to Unplanned Loss of Electrical Power*, Rev E-1, Washington River Protection Solutions LLC, Richland, Washington.

TF-AOP-021, *Response to Tank Farm Ventilation Upset,* Rev C-3, Washington River Protection Solutions LLC, Richland, Washington.

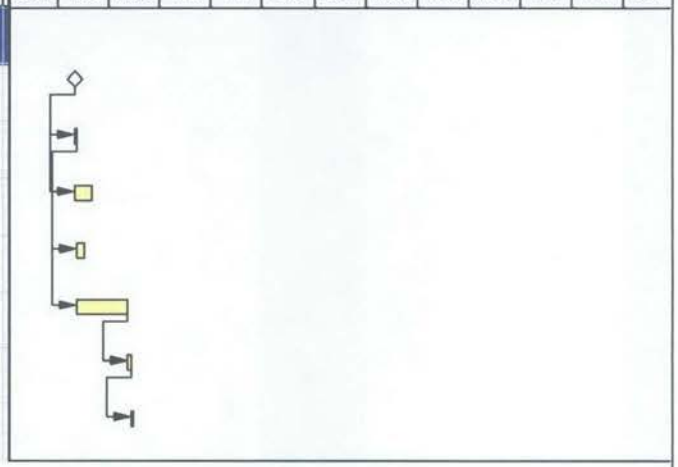
TF-SMR-001, *Shift Manager Standby DST Primary Ventilation Operability Verification,* Rev A-7, Washington River Protection Solutions LLC, Richland, Washington.

APPENDIX A

Response Schedules

DNFSB Recommendation 2012-2: Action 4-2 - Loss of Ventilation Power Response

Line Number	Activity ID	Activity Name	Duration (Work Hours)	Start	Finish
1.1 - AN Farm Response			11.5	21-Jan-14	22-Jan-14
	DSTVENTAN	DST Ventilation Power Loss Event - AN Farm	0.0	21-Jan-14*	
1	ANFARM1	Send Operator to HMI to Determine Failure	0.5	21-Jan-14	21-Jan-14
2	ANFARM2	Electrical Utility Response	8.0	21-Jan-14	21-Jan-14
3	ANFARM3	Send Operator to Determine Outage Source	4.0	21-Jan-14	21-Jan-14
4	ANFARM4	Develop Work Package	8.0	21-Jan-14	22-Jan-14
5	ANFARM5	Hook up Power from 241-AZ-156	2.0	22-Jan-14	22-Jan-14
6	ANFARM6	Restore Ventilation	1.0	22-Jan-14	22-Jan-14



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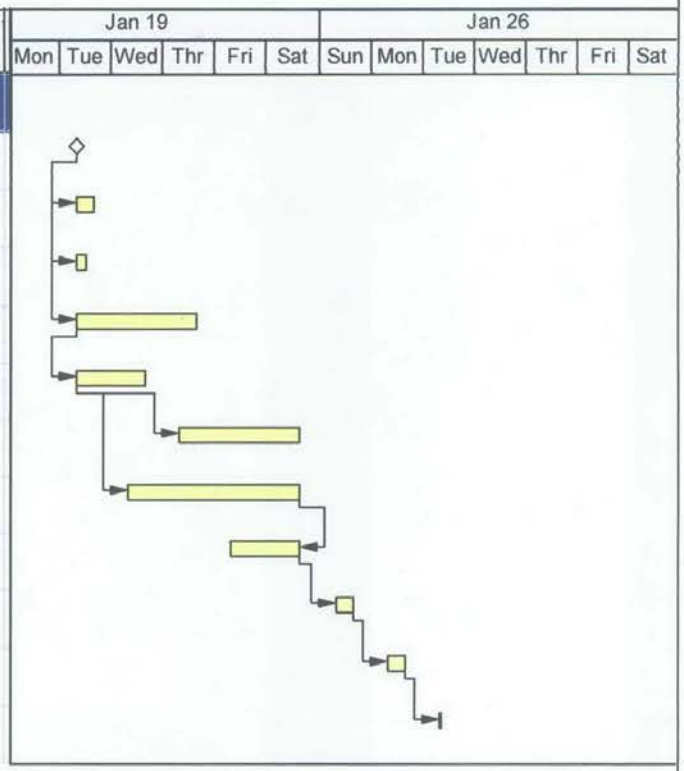
DNFSB Recommendation 2012-2: Action 4-2 - Loss of Ventilation Power Response

Line Number	Activity ID	Activity Name	Duration (Work Hours)	Start	Finish
1.2 - AY/AZ Farm Response			57.0	21-Jan-14	28-Jan-14
	DSTVENTAYAZ	DST Ventilation Power Loss Event - AY/AZ Farm	0.0	21-Jan-14*	
1	AYAZFARM1	Electrical Utility Response	8.0	21-Jan-14	21-Jan-14
2	AYAZFARM2	ADM to Determine Outage Source	4.0	21-Jan-14	21-Jan-14
3	AYAZFARM3	Develop Recovery Plan	24.0	21-Jan-14	23-Jan-14
4	AYAZFARM4	Develop Temporary ECN	16.0	21-Jan-14	22-Jan-14
5	AYAZFARM5	Develop Work Package	24.0	23-Jan-14	25-Jan-14
6	AYAZFARM6	Procure 125KW Rental Generator	32.0	22-Jan-14	25-Jan-14
7	AYAZFARM7	LOTO	16.0	24-Jan-14	25-Jan-14
8	AYAZFARM8	Hang LOTO	8.0	26-Jan-14	26-Jan-14
9	AYAZFARM9	Field Execution	8.0	27-Jan-14	27-Jan-14
10	AYAZFARM10	Restore Ventilation	1.0	28-Jan-14	28-Jan-14



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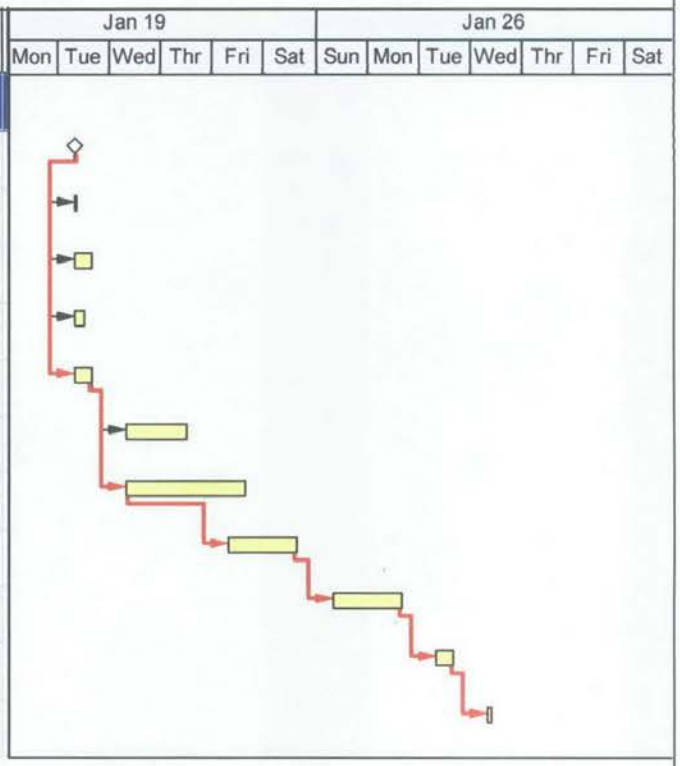
DNFSB Recommendation 2012-2: Action 4-2 - Loss of Ventilation Power Response

Line Number	Activity ID	Activity Name	Duration (Work Hours)	Start	Finish
1.3 - AP Farm Response			66.0	21-Jan-14	29-Jan-14
	DSTVENTAP	DST Ventilation Power Loss Event - AP Farm	0.0	21-Jan-14*	
1	APFARM1	Send Operator to Determine Failure	0.5	21-Jan-14	21-Jan-14
2	APFARM2	Electrical Utility Response	8.0	21-Jan-14	21-Jan-14
3	APFARM3	ADM to Determine Outage Source	4.0	21-Jan-14	21-Jan-14
4	APFARM4	Develop Recovery Plan	8.0	21-Jan-14	21-Jan-14
5	APFARM5	Develop Temporary ECN	12.0	22-Jan-14	23-Jan-14
6	APFARM6	Develop Work Package	24.0	22-Jan-14	24-Jan-14
7	APFARM7	Procure 70KW Rental Generator	16.0	24-Jan-14	25-Jan-14
8	APFARM8	LOTO	16.0	26-Jan-14	27-Jan-14
9	APFARM9	Field Execution	8.0	28-Jan-14	28-Jan-14
10	APFARM10	Restore Ventilation	2.0	29-Jan-14	29-Jan-14



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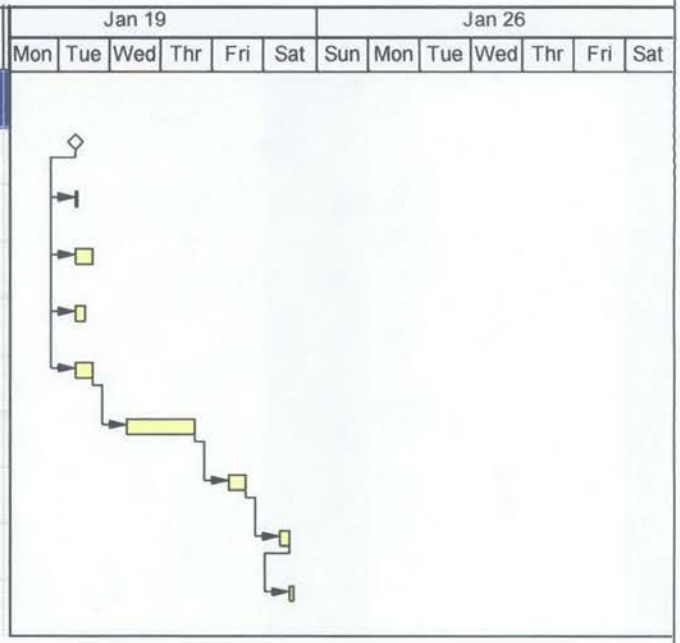
DNFSB Recommendation 2012-2: Action 4-2 - Loss of Ventilation Power Response

Line Number	Activity ID	Activity Name	Duration (Work Hours)	Start	Finish
1.4 - AW Farm Response			38.0	21-Jan-14	25-Jan-14
	DSTVENTAW	DST Ventilation Power Loss Event - AW Farm	0.0	21-Jan-14*	
1	AWFARM1	Send Operator to Determine Failure	0.5	21-Jan-14	21-Jan-14
2	AWFARM2	Electrical Utility Response	8.0	21-Jan-14	21-Jan-14
3	AWFARM3	ADM Evaluates Outage Source	4.0	21-Jan-14	21-Jan-14
4	AWFARM4	Develop Work Package	8.0	21-Jan-14	21-Jan-14
5	AWFARM5	Procure 70KW Rental Generator	16.0	22-Jan-14	23-Jan-14
6	AWFARM6	LOTO	8.0	24-Jan-14	24-Jan-14
7	AWFARM7	Field Execution	4.0	25-Jan-14	25-Jan-14
8	AWFARM8	Restore Ventilation	2.0	25-Jan-14	25-Jan-14



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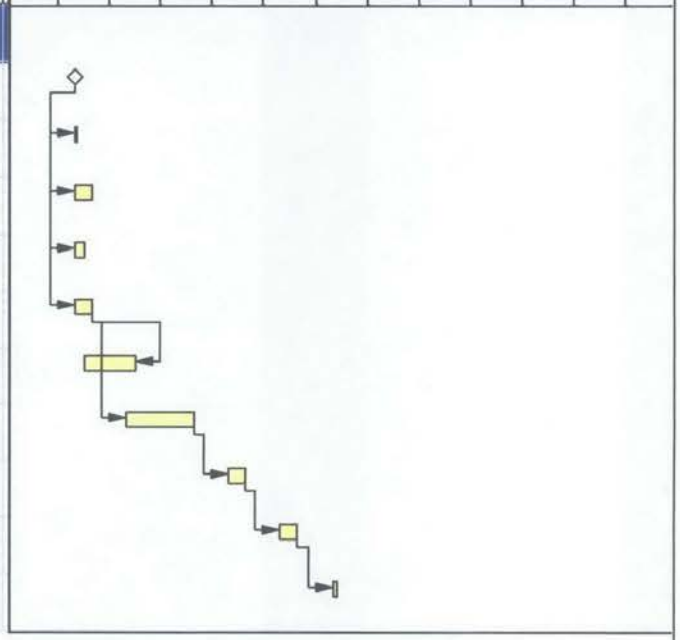
DNFSB Recommendation 2012-2: Action 4-2 - Loss of Ventilation Power Response

Line Number	Activity ID	Activity Name	Duration (Work Hours)	Start	Finish
1.5 - SY Farm Response			42.0	21-Jan-14	26-Jan-14
	DSTVENTSY	DST Ventilation Power Loss Event - SY Farm	0.0	21-Jan-14*	
1	SYFARM1	Operator Perform Sweep of Farm	0.5	21-Jan-14	21-Jan-14
2	SYFARM2	Electrical Utility Response	8.0	21-Jan-14	21-Jan-14
3	SYFARM3	ADM to Determine Outage Source	4.0	21-Jan-14	21-Jan-14
4	SYFARM4	Develop Temporary ECN	8.0	21-Jan-14	21-Jan-14
5	SYFARM5	Develop Work Package	8.0	21-Jan-14	22-Jan-14
6	SYFARM6	Procure 70KW Rental Generator	16.0	22-Jan-14	23-Jan-14
7	SYFARM7	LOTO	8.0	24-Jan-14	24-Jan-14
8	SYFARM8	Field Execution	8.0	25-Jan-14	25-Jan-14
9	SYFARM9	Restore Ventilation	2.0	26-Jan-14	26-Jan-14



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APPENDIX B

Limiting Condition for Operation 3.1

LCO 3.1, *DST Primary Tank Ventilation Systems,* states that A. One DST primary tank ventilation system train (the in-service train) shall be OPERABLE AND operating, except for outages not to exceed 24 hours AND B. The other DST primary tank ventilation system train (the standby train) shall be OPERABLE, except for outages not to exceed 10 days. This LCO is applicable to all DST farms.[1]

Table A-1: LCO 3.1 Conditions and Required Actions

	CONDITION	REQUIRED ACTION	COMPLETION TIME
A.	In-service DST primary tank ventilation system train is not OPERABLE OR not operating for ≥ 24 hours.	A.1 Start up an OPERABLE DST primary tank ventilation system train. OR A.2.1 Monitor the flammable gas concentration in the headspace of each tank in the affected tank farm. AND A.2.2 Submit a RECOVERY PLAN to the ORP. AND A.2.3 Start up an OPERABLE DST primary tank ventilation system train in accordance with the RECOVERY PLAN.	8 hours 60 hours AND Once per 72 hours thereafter 10 days In accordance with the RECOVERY PLAN
B	Standby DST primary tank ventilation system train is not OPERABLE for ≥ 10 days.	B.1 Restore the standby DST primary tank ventilation system train to OPERABLE status. OR B.2.1 Submit a RECOVERY PLAN to the ORP. AND B.2.2 Restore the standby DST primary tank ventilation system train to OPERABLE status in accordance with the RECOVERY PLAN.	21 days 31 days In accordance with the RECOVERY PLAN
C	Concentration of flammable gas is > 25% of the LFL in	Stop all activities in and directly above the affected tank, except for the following: • flammable gas	8 hours

[1] *HNF-SD-WM-TSR-006, 2013, DST Primary Tank Ventilation Systems, Rev. 7-S, Washington River Protection Solutions LLC, Richland, Washington.*

	the tank headspace.	sampling/monitoring; • deenergizing or removing equipment that does not meet ignition controls; and • actions to reduce the flammable gas concentration. AND C.2 VERIFY the flammable gas concentration is < 60% of the LFL in the tank headspace. AND C.3 Stop all activities in enclosed spaces connected to the affected tank headspace, except for flammable gas sampling/monitoring and actions to reduce the flammable gas concentration. AND C.4 Deenergize or remove equipment that does not meet ignition controls in the affected tank headspace and connected enclosed spaces.	24 hours AND Once per 24 hours thereafter Prior to the concentration of flammable gas exceeding 60% of the LFL Prior to the concentration of flammable gas exceeding 60% of the LFL
D	Concentration of flammable gas is > 60% of LFL in the tank headspace.	D.1 Submit a RECOVERY PLAN to the ORP. AND D.2 Reduce the tank headspace flammable gas concentration to ≤ 25% of the LFL in accordance with the RECOVERY PLAN.	10 days In accordance with the RECOVERY PLAN

[1] *HNF-SD-WM-TSR-006, 2013, DST Primary Tank Ventilation Systems, Rev. 7-S, Washington River Protection Solutions LLC, Richland, Washington.*