Duane Arnold Energy Center

After Action Report/ Improvement Plan

Exercise Date – May 17-18, 2016

Radiological Emergency Preparedness (REP) Program

FEMA

Published August 22, 2016

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EXECUTIVE SUMMARY

On May 17 - 18, 2016, the Department of Homeland Security (DHS)/Federal Emergency Management Agency (FEMA) Region VII conducted a biennial Plume exercise including an Ingestion Pathway scenario as part of the overall exercise for the Duane Arnold Energy Center (DAEC).

In addition to the May 17-18th Exercise, an out-of-sequence drill was conducted on April 07, 2016. The purpose of both the exercise and drill was to assess the level of State and local preparedness in responding to a radiological emergency. The exercise and drill were held in accordance with FEMA's policies and guidance concerning the exercise of State and local radiological emergency response plans and procedures.

The previous biennial DAEC exercise was conducted on April 09, 2014. The qualifying emergency preparedness exercise was conducted on October 31 - November 1, 1990.

FEMA wishes to acknowledge the efforts of all who participated in and supported the exercise and drills. Along with the State of Iowa, Benton County and Linn County participated along with the various State and local organizations. The staff of NextEra Energy should also be commended for their work on the training, scenario development and exercise preparation. The cooperation and participation of the US Department of Energy, US Nuclear Regulatory Commission, US Department of Agriculture, US Food and Drug Administration, and other key components of the Federal Radiological Monitoring and Assessment Center are acknowledged.

Protecting the public health and safety is the full-time job of some exercise participants and an additionally assigned responsibility for others. Numerous individuals have willingly sought this responsibility by volunteering to provide vital emergency services to their community. The cooperation and teamwork of all the participants were evident during this exercise. Thanks to all who participated in this community service.

The State and local organizations demonstrated knowledge of their emergency response plans and procedures and adequately implemented them. There were no Level 1 or Level 2 findings as a result of this exercise or out-of-sequence drill.

Due to the unique nature of this (simulated) Plume / Ingestion scenario, the following precautionary actions were reported:

- placed dairy animals on stored feed and covered water
- restricted airspace
- closed area state park and recreation areas
- closed schools
- schools, and special populations from care facilities were moved to relocation centers
- area phonebooks, the Emergency Action Plans were stressed to be used
- and the 211 Call Center Rumor Control phone number was issued

The final protective action decision during the emergency plume phase was the simulated evacuation of portions of Benton and Linn counties in Iowa. Sub-areas 1, 4, 5, 6, 7, 16, 17, 18, 19 and 24 were evacuated. An estimated 82,597 persons were projected to have been affected by these decisions.

SECTION 1: EXERCISE OVERVIEW

1.1 Exercise Details

Exercise Name
Duane Arnold Energy Center

Type of Exercise
Plume / Ingestion

Exercise Date
May 17-18, 2016

Program
Department of Homeland Security/FEMA Radiological Emergency Preparedness Program

Scenario Type
Radiological Emergency/Ingestion Pathway

1.2 Exercise Planning Team Leadership

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1.3 Participating Organizations

Agencies and organizations of the following jurisdictions participated in the Duane Arnold Energy Center exercise:

Iowa Jurisdictions

Iowa Army National Guard
Iowa Department of Aging
Iowa Department of Agriculture and Land Stewardship
Iowa Department of Corrections
Iowa Department of Homeland Security and Emergency Management
Iowa Department of Human Services
Iowa Department of Inspections and Appeals
Iowa Department of Natural Resources
Iowa Department of Public Health
Iowa Department of Public Safety
Iowa Department of Transportation
Iowa Governor's Office
Iowa State University - Environmental Health and Safety
Iowa State University Extension Service
Iowa Utilities Board
University of Iowa - State Hygienic Lab

Risk Jurisdictions

Atkins Fire Department
Benton County Board of Supervisors
Benton County Dispatch
Benton County Emergency Management Agency
Benton County Public Health
Benton County Sheriff
Benton County Transportation
Cedar Rapids Fire Department
Cedar Rapids Mayor
Cedar Rapids Police Department
Center Point Fire/EMS Department
City of Cedar Rapids
Linn County Board of Supervisors
Linn County Community Services
Linn County Emergency Management Agency
Linn County Hazardous Materials Response Team
Linn County Public Health
Linn County Schools

Risk Jurisdictions (continued)

Linn County Secondary Roads
Linn County Sheriff's Department
Marion Police

Support/Volunteer Jurisdictions

Amateur Radio Emergency Services
American Red Cross
Buchanan County Emergency Management Agency
Civil Air Patrol
EAS Radio Station
Hiawatha Fire Department
Independence Fire Department
Iowa Mental Health Institute Fire Department
Jesup Fire Department
Kirkwood Community College
Mercy Medical Center (Private)
NextEra Energy
Radio Amateur Civil Emergency Services
2-1-1 Call Center – Public Inquiry

Federal Jurisdictions

Federal Emergency Management Agency
National Weather Service
US Department of Homeland Security
US Nuclear Regulatory Commission

SECTION 2: EXERCISE DESIGN SUMMARY

2.1 Exercise Purpose and Design

Duane Arnold Energy Center's (DAEC) Emergency Plan describes DAEC's capability to respond effectively to a radiological emergency at the site, and provides a detailed description of DAEC's interaction with Federal, State, and local government agencies as well as private organizations. The Emergency Plan provides for continuous emergency preparedness including the conduct of an annual exercise and preparatory drills.

The purpose of the May 17-18, 2016, exercise was to activate and evaluate portions of the Iowa State Emergency Plan, the Benton and Linn County emergency plans, and associated implementing procedures, in accordance with 44 CFR 350. Further, these exercises and drills tested the DAEC emergency response community's ability to assess and respond to emergency conditions and coordinate efforts with other agencies for protection of the health and safety of the public. The conduct and evaluation of this exercise provided additional training for emergency response organization personnel and a means to further enhance DAEC's emergency response capability.

The scenario was designed to provide the basis for a simulated radiological accident initiated by a Radiological Plume event at DAEC in Palo, Iowa, through which the capabilities and effectiveness of the emergency response plans can be evaluated. The scenario was used by the exercise controllers and evaluators as the control mechanism for the conduct of the exercise.
DAEC Emergency Planning personnel developed the scenario; it was reviewed by ICF, a FEMA contractor, prior to the final review and approval by FEMA Region VII.

The scenario, as driven by the DAEC Control Room Simulator and injects, depicted a simulated sequence of events of events which resulted in escalating conditions of sufficient magnitude to warrant mobilization of State and local agencies to respond to the simulated emergency.
Whenever practical, the exercise incorporated provisions for "free play" on the part of the participants.

2.2 Exercise Objectives, Capabilities and Activities

Duane Arnold Energy Center (DAEC) exercises and drills are conducted to test and provide the opportunity to evaluate emergency plans, associated implementing procedures, facilities, and equipment. This exercise tested the DAEC offsite response organizations' ability to assess and respond to emergency conditions as well as coordinate efforts with other agencies for protection of the health and safety of the public.

The DAEC Emergency Preparedness Exercise & Drill Program objectives are based on the Federal requirements delineated in 44 CFR 350, as well as on the priorities and procedures detailed in the emergency preparedness plans for the State of Iowa as well as Benton and Linn Counties. Additional guidance provided in NUREG-0654, NUREG-0696, and NUREG-0737, was used in developing these objectives.

The overall objective of the exercise was to evaluate the integrated capability of a major portion of the basic elements existing within the onsite emergency plans and emergency response organizations. The exercise tested the implementation of the plans and procedures of participating agencies, along with the capability of these agencies to conduct operations in accordance with these plans. This objective is further defined by the criteria evaluated for each participating location.

The exercise included full participation by the State of Iowa, Benton County, Linn County, and other associated offsite response organizations. A summary of the specific criteria evaluated for each of the participating organizations is listed in Table 3.1.

2.3 Scenario Summary

The following is the scenario summary provided by Duane Arnold Energy Center Emergency Preparedness personnel and approved by Department of Homeland Security/FEMA for use during the exercise on May 17-18, 2016.

Initial Conditions:
The DAEC 2016 Exercise being conducted on May 17-18, 2016, will be a test of the capabilities of the DAEC Emergency Response Organization.

Meteorological Conditions on May 17:
Today: Today will be a cloudy day in eastern Iowa. Temperatures should be seasonal in the 60's. There is a chance of scattered showers this afternoon. Winds this morning should be light 3 to 5 MPH from the North and Northeast. This afternoon those winds will pick up to 5-10 MPH.

Tonight: There is a 60% chance of thunderstorms this evening with winds from the north at 5-10 MPH. The lows are expected to be in the high 50's.

Tomorrow: Wednesday will be mostly sunny with highs in the mid-60's and northwest winds ranging from 5-10 MPH.

Three-day Forecast: Scattered thunderstorms are forecast; temperatures should be in the 60's through the weekend.

The conditions at the Duane Arnold Energy Center as of 0530, Tuesday, May 17, 2016:

Duane Arnold Energy Center is operating at 100% power; the unit is at middle of core life.

MWT 1908
MWE 639
CORE FLOW 49.5 Mlbm/hr

A CRD Pump is tagged out of service. Mechanics were working to repair a seal leak on the pump when a rub inside the pump was discovered. The pump has been disassembled. Machining of rotating elements is necessary. 'B' CRD pump is protected.

Painters are painting the walls in the 'B' Diesel Generator room. I&C will be working on the Refuel floor Kamans later today.

All other plant equipment is operable and conditions/parameters are as expected.

The day begins with the Duane Arnold Energy Center operating at 100% power. The plant is recovering from a load line adjustment the previous night and is holding for fuel conditioning. The core is at the middle-of-life. "A" CRD Pump was tagged out of service and dismantled when a rub was found. The pump shaft and wear rings are now being machined.

At ~0800, a contractor painting a wall in the "B" Emergency Diesel Generator (EDG) Room inadvertently drops a work light that breaks and ignites some diesel oil pooled on the floor. The diesel fire has visible flames and produces dense heavy smoke in the room. The in-plant operator verifies and reports the fire to the Control Room (Simulator). The (drill) fire brigade is assembled and dispatched to the scene (simulated) and reports to the Control Room that there is damage to the Diesel gage board and governor area wiring.

Conditions are now met for the Operations Shift Manager (OSM) to declare an **ALERT (HA2.1)** based on:

"FIRE or EXPLOSION resulting in visible damage to any Safe Shutdown/Vital Area or Control Room indication of degraded performance of a System of Concern."

The TSC and OSC will be activated; the EOF and JIC will mobilize. Accountability and assembly will be implemented. Two individuals will not respond to the accountability, and will need to be located.

At ~0920, alarms on 1C05A will indicate a high CRD temperature. OSC repair teams sent to investigate this problem at the HCU will not see any apparent problem or leakage.

At ~1000, an airline breaks on the "A" Feed water pump minimum flow valve; CV-1569 fails open and the 'A' Rx. Feed pump trips. The crew should immediately recognize the need to SCRAM the reactor.

When Operators attempt to manually scram the reactor using all available methods in the control room, there is no rod movement. A failure of the low suction pressure switch on "B" CRD trips the pump and will prevent Operations from driving rods. Venting the scram air header will result in some rod movement, but will not shutdown the reactor.

With the ATWS and failure to manually SCRAM, conditions are now met for the Emergency Coordinator to declare a **SITE AREA EMERGENCY**, **(SS2.1)** based on:

*"An automatic scram failed to shut down the reactor A**ND** NONE of the following manual actions taken at 1C05 are successful in lowering reactor below 5% power:*

Manual Scram
Pushbuttons Mode

Switch to Shutdown
Alternate Rod
Insertion (ARI)

Non-essential personnel will leave the DAEC site; two of the evacuees sent from the site to the ORAA are contaminated.

The plant remains at power with the turbine on-line. RPV water level will be intentionally lowered to reduce power. RPV level can be stabilized below 87 inches. Responders should initiate a process to drive in one control rod at time by venting at each HCU.

When SBLC is initiated, one of the SBLC pumps fails and both SBLC squib valves fail to fire, resulting in no available Boron injection. When crews are sent to locally fire the squib valves, they will fire, but the only available SBLC pump will fail after ~2 minutes.

If RPV level is lowered to 64 inches, Drywell cooling will be lost. The crew is expected to begin venting the Drywell via AOP 573 (OI-573) to maintain DW pressure below 1.5 psig.

At ~1150, a steam line break occurs in the steam tunnel which results in high steam tunnel temperatures. All outboard MSIVs will close, resulting in fuel failure from the power excursion. One of the inboard MSIVs fails to close. The reactor vessel blows down into the steam tunnel. A release to the environment begins through the reactor main steam line "B", the steam tunnel, and the Standby Gas Treatment System stack. Steam also goes from the steam tunnel torus room to the SBGT stack. Moreover, an amount of steam goes from the steam tunnel to the turbine building exhaust fans to the environment. This will be identified by the Offgas, Turbine Building and Reactor Building KAMANs.

At ~1155, Reactor Building KAMANs will rise to the HI levels, and the crew should secure associated fans.

Main steam tunnel temperatures will reach and maintain above the maximum safe values, for ~ 20 minutes indicating a failure of the primary containment and Rx Coolant system. Drywell radiation will exceed 700 R/Hr after shutdown, indicating a loss of Fuel cladding.

With the Main steam tunnel temperatures above max safe, conditions are now met for the Emergency Response & Recovery Director to declare a **GENERAL EMERGENCY, FG1** based on:

Fuel Clad Barrier – Loss, *as indicated by*

RADIATION/CORE DAMAGE

Drywell Area Hi Range Rad Monitor RIM-9184A or B reading GREATER THAN 700 Rem/hr
OR
Torus Area Hi Range Rad Monitor RIM-9185A or B reading GREATER THAN 30 Rem/hr

RSC Barrier – Potential Loss, *as indicated by*

LEAKAGE

RCS Leakage GREATER THAN 50 GPM inside the drywell
OR
UNISOLABLE primary system leakage outside the drywell as indicated by area temps or ARMs exceeding the Max Normal Limits per EOP 3, Table 6.

Primary Cont Barrier – Loss, *as indicated by*

LEAKAGE

RCS Leakage GREATER THAN 50 GPM inside the drywell
OR

UNISOLABLE primary system leakage outside the drywell as indicated by area temps or ARMs exceeding the Max Normal Limits per EOP 3, Table 6."

The notification should indicate both filtered and unfiltered releases above Federal Limits.

If the crew allowed RPV level to lower to below +15 inches while in ATWS procedure, this would result in a potential of Fuel Cladding Barrier and a loss of RCS barrier. This would not require any notification due to already being in a Site Area Emergency. When the Steam Leak occurs, this will result in loss of Primary Containment barrier when Steam tunnel temperatures are reported above 300 F with the inboard MSIV failing to close, and cause FG 1 to be declared slightly sooner.

It is expected that the Reactor will be shut down, with some rods inserted and ~2 minutes of SBLC. A controlled plant cooldown is not allowed by the EOPs, thus RPV pressure will remain high. KAMAN values will not reach the values for RG 1.2 which would direct a plant Emergency Depressurization. MIDAS printouts will reach values for RG 1.1 about 20-50 minutes after the release, thus directing an ATWS ED per EOP 4.

The Reactor should remain shut down during the ED. Shutdown cooling will not be allowed per EOP ED procedure.

The release path will be towards the ORAA, thus the TSC/EOF should consider relocating the ORAA.

At ~1230, the release rates will cause a MIDAS report reflecting the need for a PAR upgrade from “D” to “E”.

If the crew performs Emergency Depressurization, it will be done via an ATWS-ED. If ED is performed, the control rods will no longer insert using high point vent due to low Reactor pressure.

By 1245 the ER&RD should have declared the change in PARs and Notifications should be made by 1300.

~ 1345 Day 1 Exercise activities may be terminated for DAEC with the completion of the PAR change notification and verification that ERF objectives have been met. (The FRMAC Advance Team will continue play).

SECTION 3: ANALYSIS OF CAPABILITIES

3.1 Exercise Evaluation and Results

Contained in this section are the results and findings of the evaluation of all jurisdictions and functional entities that participated in the May 17-18, 2016, exercise, as well as the out-of-sequence drill held on April 7, 2016. The drill and exercise tested the offsite emergency response capabilities of the state and local governments in the 10-mile plume and 50-mile emergency planning zones surrounding the Duane Arnold Energy Center.

Each jurisdiction and functional entity was evaluated on the basis of its demonstration of the criteria delineated in FEMA's Radiological Emergency Preparedness Program Manual, dated January 2016.

3.2 Summary Results of Exercise Evaluation

The matrix presented in Table 3.1 presents the status of all exercise criteria, which were scheduled for demonstration during this exercise, at all participating jurisdictions and functional entities. Exercise criteria are listed by number and the demonstration status of those criteria is indicated by the use of the following letters:

1. **Met**
   An observed action, behavior, procedure, and/or practice that met the exercise criteria.
2. **Level 1 Finding**
   An observed or identified inadequacy of organizational performance in an exercise that could cause a determination that offsite emergency preparedness is not adequate to provide reasonable assurance that appropriate protective measures can be taken in the event of a radiological emergency to protect the health and safety of the public living in the vicinity of a Nuclear Power Plant (NPP).
3. **Level 2 Finding**
   An observed or identified inadequacy of organizational performance in an exercise that is not considered, by itself, to adversely impact public health and safety.
4. **Plan Issue**
   An observed or identified inadequacy in the offsite response organizations' (ORO's) emergency plan/implementing procedures, rather than that of the ORO's performance.
5. **N** - Not Demonstrated

Table 3.1 - Summary of Exercise Evaluation (1/2)

DATE: 2016-05-17/18 SITE: Duane Arnold Energy Center, IA M: Met, 1: Level 1, 2: Level 2, P: Plan Issue, N: Not Demonstrated		Iowa State EOC	IA Dose Assess,	Iowa FTC	IA Rad Tm # 1	IA Rad Tm # 2	211 Call Center	DAEC JIC	Iowa FCP	Linn County EOC
Emergency Operations Management										
Mobilization	1a1	M	M	M	M	M	M	M	M	M
Facilities	1b1									
Direction & Control	1c1	M							M	M
Communications Equipment	1d1	M	M	M	M	M	M	M	M	M
Equipment and Supplies	1e1	M	M	M	M	M	M	M	M	M
Protective Action Decision Making										
EW Exp. Control Decisions	2a1		M	M					M	M
PARs	2b1		M	M						
PADs	2b2	M	M							M
PADs for Disabled/Functional Needs	2c1									M
Ingestion PADs	2d1	M	M							
RRR Decisions	2e1	M	M							
Protective Action Implementation										
EW Exp. Control Implementation	3a1			M	M	M	M	M	M	M
KI Public/Institutionalized	3b1									M
PAD Imp. Disabled/Functional Needs	3c1									M
PAD Imp. Schools	3c2									M
TACP Establishment	3d1	M							M	M
Impediments to Evacuation	3d2	M							M	M
Implementation of Ingestion PADs	3e1	M								
Ingestion Strategies and Information	3e2	M								
Imp. of RRR Decisions	3f1	M								M
Field Measurement and Analysis										
RESERVED	4a1									
Field Team Management	4a2			M						
Field Team Operations	4a3				M	M				
Field Team Sampling	4b1									
Laboratory Operations	4c1									
Emergency Notification and Public Info										
Initial Alert & Notification	5a1									M
RESERVED	5a2									
Backup Alert & Notification	5a3									M
Exception Area Alerting	5a4									
Subsequent Public Information	5b1	M					M	M		M
Support Operations/Facilities										
Reception Center Operations	6a1									
EW Monitoring & Decon	6b1									
Congregate Care	6c1									
Contaminated Injured Transport & Care	6d1									

Table 3.1 - Summary of Exercise Evaluation (Continued. page 2/2)

DATE: 2016-05-17/18 SITE: Duane Arnold Energy Center, IA M: Met, 1: Level 1, 2: Level 2, P: Plan Issue, N: Not Demonstrated		NWS - Davenport	EAS Station	Iowa Ing Sampling Team #1 (Blue)	Iowa Ing Sampling Team #2 (Green)	Benton County EOC	Center Point – Urbana School Dist
Emergency Operations Management							
Mobilization	1a1			M	M	M	
Facilities	1b1						
Direction & Control	1c1					M	
Communications Equipment	1d1			M	M	M	
Equipment and Supplies	1e1		M	M	M	M	M
Protective Action Decision Making							
EW Exp. Control Decisions	2a1					M	
PARs	2b1						
PADs	2b2					M	
PADs for Disabled/Functional Needs	2c1					M	
Ingestion PADs	2d1						
RRR Decisions	2e1						
Protective Action Implementation							
EW Exp. Control Implementation	3a1		M	M	M	M	M
KI Public/Institutionalized	3b1					M	
PAD Imp. Disabled/Functional Needs	3c1					M	
PAD Imp. Schools	3c2					M	
TACP Establishment	3d1					M	
Impediments to Evacuation	3d2					M	
Implementation of Ingestion PADs	3e1						
Ingestion Strategies and Information	3e2						
Imp. of RRR Decisions	3f1					M	
Field Measurement and Analysis							
RESERVED	4a1						
Field Team Management	4a2						
Field Team Operations	4a3						
Field Team Sampling	4b1			M	M		
Laboratory Operations	4c1						
Emergency Notification and Public Info							
Initial Alert & Notification	5a1	M	M			M	
RESERVED	5a2						
Backup Alert & Notification	5a3					M	
Exception Area Alerting	5a4						
Subsequent Public Information	5b1	M	M			M	
Support Operations/Facilities							
Reception Center Operations	6a1						
EW Monitoring & Decon	6b1						
Congregate Care	6c1						
Contaminated Injured Transport & Care	6d1						M

3.3 Criteria Evaluation Summaries

3.3.1 Iowa Jurisdictions

3.3.1.1 Iowa State Emergency Operations Center

The Iowa State Emergency Operations Center (SEOC), located in Johnston, IA, had twenty one State agencies participate in the May 17 Duane Arnold Energy Center (DAEC) exercise. During this exercise, the SEOC Policy Group utilized very solid procedures and checklists. The Public Information Officers kept aware if the events that were occurring and tracked down the relevant information they needed to get out to the public. There was very good coordination among all State agencies. The State agencies dealing with Ingestion activities coordinated very well and relied on each other to help with resources as part of the ingestion pathway response.

All thirteen criteria at this location were adequately demonstrated in accordance with the plans, procedures, and extent of play agreement.

In summary, the status of DHS/FEMA criteria for this location is as follows:

a. MET: 1.a.1, 1.c.1, 1.d.1, 1.e.1, 2.b.2, 2.d.1, 2.e.1, 3.d.1, 3.d.2, 3.e.1, 3.e.2, 3.f.1, 5.b.1.
b. LEVEL ONE: None
c. LEVEL TWO: None
d. PLAN ISSUES: None
e. NOT DEMONSTRATED: None
f. PRIOR ISSUES - RESOLVED: None
g. PRIOR ISSUES - UNRESOLVED: None

3.3.1.2 Iowa Dose Assessment

The Iowa Dose assessment was conducted by the Iowa Department of Public Health (IDPH), located in Johnston, Iowa. IDPH performed accurate dose projections, validation of the assessments using independent analysis and field team results, and protective action recommendations including evacuations, despite differing results and additional evacuation recommendations from the licensee. The Iowa Dose Assessment team worked very well together as well as with other organizations in the SEOC including the Nuclear Regulatory Commission (NRC).

All eight criteria in this area were adequately demonstrated in accordance with the plans, procedures, and extent of play agreement.

In summary, the status of DHS/FEMA criteria for this location is as follows:

a. MET: 1.a.1, 1.d.1, 1.e.1, 2.a.1, 2.b.1, 2.b.2, 2.d.1, 2.e.1.
b. LEVEL ONE: None
c. LEVEL TWO: None
d. PLAN ISSUES: None
e. NOT DEMONSTRATED: None
f. PRIOR ISSUES - RESOLVED: None
g. PRIOR ISSUES - UNRESOLVED: None

3.3.1.3 Iowa Field Team Coordination

Field team coordination is conducted out of the Alliant Tower in Cedar Rapids, IA. Both Iowa State University Environmental Health and Safety and the University of Iowa State Hygienic Laboratory worked to monitor and coordinate the activities of state radiological teams in the field. They demonstrated excellent communication and direction control of the state monitoring teams, and fast and accurate communication of readings with the Rad-Responder.

All seven criteria at this location were successfully demonstrated in accordance with the plans, procedures, and extent of play agreement.

In summary, the status of DHS/FEMA criteria for this location is as follows:

a. MET: 1.a.1, 1.d.1, 1.e.1, 2.a.1, 2.b.1, 3.a.1, 4.a.2.
b. LEVEL ONE: None
c. LEVEL TWO: None
d. PLAN ISSUES: None
e. NOT DEMONSTRATED: None
f. PRIOR ISSUES - RESOLVED: None
g. PRIOR ISSUES - UNRESOLVED: None

3.3.1.4 Iowa Radiological Monitoring Team # 1 (Blue) – EPZ

The Blue Team displayed excellent teamwork and use of procedures, extensively utilizing Rad Responder for transmitting survey readings and locations, and they found the program to be an extremely useful tool.

For exercises and emergencies at DAEC, the radiological monitoring teams deploy out of the EOF in Cedar Rapids, Iowa. The Blue Team's professionalism and determination to complete tasks/procedures correctly contributed to a successful demonstration.

All five criteria at this location were adequately demonstrated in accordance with the plans, procedures, and extent of play agreement.

In summary, the status of DHS/FEMA criteria for this location is as follows:

a. MET: 1.a.1, 1.d.1, 1.e.1, 3.a.1, 4.a.3.
b. LEVEL ONE: None
c. LEVEL TWO: None
d. PLAN ISSUES: None
e. NOT DEMONSTRATED: None
f. PRIOR ISSUES - RESOLVED: None
g. PRIOR ISSUES - UNRESOLVED: None

3.3.1.5 Iowa Radiological Monitoring Team # 2 (Green) - EPZ

For exercises and emergencies at DAEC, the radiological monitoring teams deploy out of the Emergency Operations Facility (EOF) in Cedar Rapids, IA. Radiological Monitoring Team #2 (Green) consisted of very professional staff members from the Iowa State University

Environmental Health and Safety Office and the Department of Agriculture worked well together, each group complimenting each other. The teams were knowledgeable of their equipment and procedures, which led to the successful demonstration of all five criteria.

All five criteria at this location were adequately demonstrated in accordance with the plans, procedures, and extent of play agreement.

In summary, the status of DHS/FEMA criteria for this location is as follows:

a. MET: 1.a.1, 1.d.1, 1.e.1, 3.a.1, 4.a.3.
b. LEVEL ONE: None
c. LEVEL TWO: None
d. PLAN ISSUES: None
e. NOT DEMONSTRATED: None
f. PRIOR ISSUES - RESOLVED: None
g. PRIOR ISSUES - UNRESOLVED: None

3.3.1.6 Iowa Ingestion Sampling Team # 1 (Blue) – EPZ

The team worked extremely well together with all members having specific duties. They followed their procedures extensively to make sure of no mistakes and that samples were taken correctly. The team was very careful to not cross-contaminate, displaying excellent technique.

All five criteria at this location were adequately demonstrated in accordance with the plans, procedures, and extent of play agreement.

In summary, the status of DHS/FEMA criteria for this location is as follows:

a. MET: 1.a.1, 1.d.1, 1.e.1, 3.a.1, 4.b.1.
b. LEVEL ONE: None
c. LEVEL TWO: None
d. PLAN ISSUES: None
e. NOT DEMONSTRATED: None
f. PRIOR ISSUES - RESOLVED: None
g. PRIOR ISSUES - UNRESOLVED: None

3.3.1.7 Iowa Ingestion Sampling Team # 2 (Green) – EPZ

The University and Department of Agriculture Technicians worked well together complimenting the strengths and experience of each group. They followed their procedures extensively to make sure of no mistakes and that samples were taken correctly. The team was very careful to not cross-contaminate. They displayed best practice when it came to the “Silver Zeolite Cartridge

Counting Technique".

All five criteria at this location were adequately demonstrated in accordance with the plans, procedures, and extent of play agreement.

In summary, the status of DHS/FEMA criteria for this location is as follows:

a. MET: 1.a.1, 1.d.1, 1.e.1, 3.a.1, 4.b.1.
b. LEVEL ONE: None
c. LEVEL TWO: None
d. PLAN ISSUES: None
e. NOT DEMONSTRATED: None
f. PRIOR ISSUES - RESOLVED: None
g. PRIOR ISSUES - UNRESOLVED: None

3.3.1.8 Duane Arnold Joint Information Center

The Iowa Joint Information Center (JIC) for DAEC events was co-located with the DAEC JIC at the Alliant Towers in Cedar Rapids, IA. In addition to the State Public Information Officers (PIOs), both Linn and Benton Counties had PIOs report to the JIC. The public inquiry hotline(s) were staffed with operators located at the 2-1-1 Call Center in Cedar Rapids as well as in the Iowa SEOC in Johnston, IA. There was good communication between the Utility JIC Manager, the Iowa State JIC, and Benton and Linn Counties.

All of the off-site response organizations (ORO) PIOs were experienced and the coordination between the OROs was seamless.

All five criteria at this location were adequately demonstrated in accordance with the plans, procedures, and extent of play agreement.

In summary, the status of DHS/FEMA criteria for this location is as follows:

a. MET: 1.a.1, 1.d.1, 1.e.1, 3.a.1, 5.b.1.
b. LEVEL ONE: None
c. LEVEL TWO: None
d. PLAN ISSUES: None
e. NOT DEMONSTRATED: None
f. PRIOR ISSUES - RESOLVED: None
g. PRIOR ISSUES - UNRESOLVED: None

3.3.1.9 Iowa Forward Command Post

The Iowa Forward Command Post (FCP) was established in the conference room of the Iowa State Patrol District 11 Headquarters. Several state agencies report to the FCP to coordinate state activities in response to an event at DAEC. The representatives from each of the agencies participating at the FCP demonstrated a thorough knowledge of their respective functions. Excellent Briefings were demonstrated, and there was proactive discussions for a possible

relocation of the FCP, if needed.

All eight criteria at this location were adequately demonstrated in accordance with the plans, procedures, and extent of play agreement.

In summary, the status of DHS/FEMA criteria for this location is as follows:

a. MET: 1.a.1, 1.c.1, 1.d.1, 1.e.1, 2.a.1, 3.a.1, 3.d.1, 3.d.2.
b. LEVEL ONE: None
c. LEVEL TWO: None
d. PLAN ISSUES: None
e. NOT DEMONSTRATED: None
f. PRIOR ISSUES - RESOLVED: None
g. PRIOR ISSUES - UNRESOLVED: None

3.3.1.10 National Weather Service - Davenport, Iowa

The National Weather Service (NWS) Event Coordinator's performance was outstanding during the Duane Arnold Energy Center Plume Exercise on May 17, 2016. The NWS is well prepared to coordinate and send EAS and instructional messages to the public. They were very familiar with their procedures and at the end self-identified areas for improvement.

All criteria at this location were adequately demonstrated in accordance with the plans, procedures, and extent of play agreement.

In summary, the status of DHS/FEMA criteria for this location is as follows:

a. MET: 5.a.1, 5.b.1.
b. LEVEL ONE: None
c. LEVEL TWO: None
d. PLAN ISSUES: None
e. NOT DEMONSTRATED: None
f. PRIOR ISSUES - RESOLVED: None
g. PRIOR ISSUES - UNRESOLVED: None

3.3.1.11 211 Call Center - Public Inquiry

The 2-1-1 Call Center is operated by the United Way in Cedar Rapids, Iowa in order to assist in the public inquiry portion of the DAEC response. The 2-1-1 Call Center’s information management system was very robust and had the capability to expand to meet the needs of even large scale events. The staff showed excellent attention to detail and coordination with the Joint Information Center (JIC) in providing the public correct information.

Five criteria were adequately demonstrated in accordance with plans, procedures, and the extent of play agreement.

In summary, the status of DHS/FEMA criteria for this location is as follows:

a. MET: 1.a.1, 1.d.1, 1.e.1, 3.a.1, 5.b.1.
b. LEVEL ONE: None
c. LEVEL TWO: None
d. PLAN ISSUES: None
e. NOT DEMONSTRATED: None
f. PRIOR ISSUES - RESOLVED: None
g. PRIOR ISSUES - UNRESOLVED: None

3.3.2 Risk Jurisdictions

3.3.2.1 Linn County Emergency Operations Center

The Linn County Emergency Operations Center (EOC) is located in Cedar Rapids, IA. Numerous County Agencies worked in the EOC during the exercise.

The Linn County EOC staff demonstrated outstanding communication and information sharing both within the EOC, and to other off site response organizational (ORO) partners. The GIS capabilities were very robust and interactive (not only showed subareas, but showed changing conditions/impediments throughout exercise play). Linn County was highly connected with microphones at each table and this helped greatly during the briefings.

Seventeen criteria were adequately demonstrated in accordance with plans, procedures, and the extent of play agreement.

In summary, the status of DHS/FEMA criteria for this location is as follows:

a. MET: 1.a.1, 1.c.1, 1.d.1, 1.e.1, 2.a.1, 2.b.2, 2.c.1, 3.a.1, 3.b.1, 3.c.1, 3.c.2, 3.d.1, 3.d.2, 3.f.1, 5.a.1, 5.a.3, 5.b.1.
b. LEVEL ONE: None
c. LEVEL TWO: None
d. PLAN ISSUES: None
e. NOT DEMONSTRATED: None
f. PRIOR ISSUES - RESOLVED: None
g. PRIOR ISSUES - UNRESOLVED: None

3.3.2.2 EAS Station

The EAS Station was very knowledgeable of the stations responsibilities in response to a Duane Arnold Energy Center emergency, and executed their responsibilities in a highly professional and timely manner throughout the exercise. The EAS Station has the capability to receive and broadcast EAS messages 24 hours a day.

Four criteria for this location were adequately demonstrated in accordance with the plans, procedures, and extent of play agreement.

In summary, the status of DHS/FEMA criteria for this location is as follows:

a. MET: 1.e.1, 3.a.1, 5.a.1, 5.b.1.
b. LEVEL ONE: None
c. LEVEL TWO: None
d. PLAN ISSUES: None
e. NOT DEMONSTRATED: None
f. PRIOR ISSUES - RESOLVED: None
g. PRIOR ISSUES - UNRESOLVED: None

3.3.2.3 Benton County Emergency Operations Center

The Benton County Emergency Operations Center (BCEOC) is located in Vinton, Iowa. The Benton County Board of Supervisors, in close consultation with the Emergency Management Coordinator (EMC), served as the Direction and Control officials responsible for making protective action decisions (PADs) for the public within Benton County. The Health Representative gave an excellent Radiological Briefing and the Traffic and Access Control staff were very knowledgeable of the county geography and roads.

The Benton County group functioned well as a team and were proactive in discussing situations and possible scenarios for each phase of the Response, Recovery and Relocation (RRR) portion of the exercise.

Seventeen criteria were successfully demonstrated in accordance with the plans, procedures, and extent of play agreement.

All messaging and subsequent messaging was developed and distributed in a timely manner.

a. MET: 1.a.1, 1.c.1, 1.d.1, 1.e.1, 2.a.1, 2.b.2, 2.c.1, 3.a.1, 3.b.1, 3.c.1, 3.c.2, 3.d.1, 3.d.2, 3.f.1, 5.a.1, 5.a.3, 5.b.1.
b. LEVEL ONE: None
c. LEVEL TWO: None
d. PLAN ISSUES: None
e. NOT DEMONSTRATED: None
f. PRIOR ISSUES - RESOLVED: None
g. PRIOR ISSUES - UNRESOLVED: None

3.3.3 Support Jurisdictions

3.3.3.1 Center Point – Urbana School District

Center Point-Urbana School District (District) demonstrated their knowledge of the procedures, equipment, and supplies required for evacuation of the schools at Site Area Emergency (SAE), with adequate bus drivers, buses and dosimetry equipment. Present for the interview were the Transportation Director; the Elementary School Principal, and a Bus Driver, and all were very knowledgeable of the procedures and their duties during an emergency evacuation.

Three criteria were successfully demonstrated in accordance with the plans, procedures, and extent of play agreement.

In summary, the status of DHS/FEMA criteria for this location is as follows:

a. MET: 1.e.1, 3.a.1, 3.c.2.
b. LEVEL ONE: None
c. LEVEL TWO: None
d. PLAN ISSUES: None
e. NOT DEMONSTRATED: None
f. RIOR ISSUES - RESOLVED: None
g. PRIOR ISSUES - UNRESOLVED: None

SECTION 4: CONCLUSION

Based on the results of this exercise and the out-of-sequence drill, the offsite radiological emergency response plans and preparedness for the State of Iowa and the affected local jurisdictions are deemed adequate to provide reasonable assurance that appropriate measures can be taken to protect the health and safety of the public in the event of a radiological emergency. Therefore, 44 CFR Part 350 approval of the offsite radiological emergency response plans and preparedness for the State of Iowa site-specific to the Duane Arnold Energy Center will remain in effect.

APPENDIX A: EXERCISE TIMELINE

Table 1 presents the times recorded for various activities and decisions at each of the evaluated locations during the Duane Arnold Energy Center exercise held on May 17, 2016. A disparity in times is normal given the need for message transmissions and decision-making at the various locales. The times are recorded as dictated by the scenario, which for this exercise reflects the nature of the off-hours (simulated) exercise.

Table 1 - Exercise Timeline
DATE: 2016-05-17 SITE: Duane Arnold Energy Center, IA

Emergency Classification Level or Event	Time Utility Declared	Iowa State EOC	Iowa Dose Assessment	211 Call Center	DAEC JIC	Iowa FCP	Linn County EOC
Unusual Event (NOUE)	N/A						
Alert (ALERT)	805	820	839	844	809	825	817
Site Area Emergency (SAE)	1008	1020	1024	1016	1014	1028	1018
General Emergency (GE)	1210	1227	1227	1213	1216	1236	1222
Radiation Release Started	1210	1227	1220		1216	1236	1222
Radiation Release Terminated	N/A						
Facility Declared Operational		947	918	800	919	853	855
Governor Declared State of Emergency		922	934		922		915
Closed Pleasant Creek			920				
SAE /Precautionary Actions		1030	1025	1048	1028		1022
Siren Activation					1037		1037
EAS Message					1038		1038
Protective Action Decision -Evacuate 1, 4, 5, 6		1238	1235	1253	1225		1225
Siren Activation					1240		1240
EAS Message (GE)					1241		1241
Special News Broadcast - Evacuate 1, 4, 5, 6					1247		1247
Protective Action Decision - Wind Change, Evacuate Additional Sub Area(s) 7		1317	1305				1317
Siren Activation		1332					1332
Special News Broadcast - Evacuate Sub Areas 1, 4, 5, 6, 7, 16, 17, 18, 19, 24			1320	1351			1334
KI - Decision for EWs		1306	1306		1307	1306	1317
KI - Extended to All Evacuated Sub Areas						1319	
Exercise Terminated		1356	1359	1400	1400	1355	1349

Table 1 - Exercise Timeline
DATE: 2016-05-17 SITE: Duane Arnold Energy Center, IA

Emergency Classification Level or Event	Time Utility Declared	EAS Station	IA RAD Monitoring Blue	IA RAD Monitoring Green	Iowa FTC	NWS Davenport	Benton County EOC
Unusual Event (NOUE)	N/A						
Alert (ALERT)	805		849	846	840		814
Site Area Emergency (SAE)	1008		1032	1032	1010	1025	1013
General Emergency (GE)	1210	1228	1212	1212	1210	1227	1217
Radiation Release Started	1210		1217	1216	1215		1217
Radiation Release Terminated	N/A			1216			
Facility Declared Operational					1018		858
Governor Declared State of Emergency						938	934
Closed Pleasant Creek							
SAE /Precautionary Actions		1028			1036	1036	1021
Siren Activation		1037				1043	1037
EAS Message		1038				1043	1038
Protective Action Decision -Evacuate 1, 4, 5, 6						1229	1225
Siren Activation						1240	1240
EAS Message (GE)						1241	1241
Special News Broadcast - Evacuate 1, 4, 5, 6							1247
Protective Action Decision - Wind Change, Evacuate Additional Sub Area(s) 7							1317
Siren Activation							1332
Special News Broadcast - Evacuate Sub Areas 1, 4, 5, 6, 7, 16, 17, 18, 19, 24							1334
KI - Decision for EWs			1310	1310	1307		1307
KI - Extended to All Evacuated Sub Areas							1317
Exercise Terminated			1346	1346	1326		1352

APPENDIX B: EXERCISE EVALUATORS AND TEAM LEADERS

The evaluation team for this exercise and out-of-sequence drill consisted of DHS/FEMA Radiological Emergency Preparedness Program (REPP) personnel, Region Assistance Committee (RAC) members from various Federal agencies, and ICF, a federal contractor.

DATE: 05-17/18-2016 SITE: Duane Arnold Energy Center, IA

LOCATION	EVALUATOR	AGENCY
Iowa State Emergency Operations Center	*Cara Christenson-Riley Jesse King Tim Harris	FEMA RVII FEMA HQ FEMA HQ
Iowa Dose Assessment	*Jill Leatherman	ICF
Iowa Field Team Coordination	*Charles Hooper	EPA
Iowa Radiological Monitoring Team # 1 (Blue) – EPZ	*Jeff Clark	FEMA RVII
Iowa Radiological Monitoring Team # 2 (Green) – EPZ	*Michael Howe	FEMA HQ
Iowa Radiological Sampling Team # 1 (Blue) – EPZ	*Jeff Clark	FEMA RVII
Iowa Radiological Sampling Team # 2 (Green) – EPZ	*Michael Howe	FEMA HQ
Duane Arnold Joint Information Center	*Daniel Kanakares Pat Tenorio	FEMA RVII FEMA HQ
Iowa Forward Command Post	*Nan Calhoun-Williams K. Darren Bates	FEMA RVI FEMA HQ
National Weather Service - Davenport, Iowa	*Taneeka Hollins	FEMA RI
211 Call Center - Public Inquiry	*Audie Canida	FEMA RVII
Linn County Emergency Operations Center	*Dennis Branson Janet Hlavaty-LaPosa Robert Swartz Kenneth Wierman	FEMA RVII FEMA RX FEMA RI FEMA HQ
EAS Station – WMT	*Dan Feighert	FEMA RVIII
Benton County Emergency Operations Center	*Norman Valentine Judy Dodgen Barbara Thomas Bonnie Sheffield	FEMA RVII FEMA RVII FEMA RI FEMA RVIII
Center Point – Urbana School District	*Andrew Chancellor Sharron McDuffie	FEMA RVII FEMA RVII
* Team Leader		

APPENDIX C: ACRONYMS AND ABBREVIATIONS

DAEC	Duane Arnold Energy Center
DHS	Department of Homeland Security
EAL	Emergency Action Level
EAS	Emergency Alert System
ECL	Emergency Classification Level
EMA	Emergency Management Agency
EOC	Emergency Operations Center
EOF	Emergency Operations Facility
EPA	Environmental Protection Agency
EPZ	Emergency Planning Zone
EW	Emergency Worker
FCP	Forward Command Post
FEMA	Federal Emergency Management Agency
FTC	Field Team Coordination
GE	General Emergency
FRMAC	Federal Radiological Monitoring and Assessment Center
ING	Ingestion
JIC	Joint Information Center
KI	Potassium Iodide
NPP	Nuclear Power Plant
NRC	Nuclear Regulatory Commission
NWS	National Weather Service
OOS	Out Of Sequence
ORAA	Offsite Relocation and Assembly Area
ORO	Offsite Response Organization
OSC	Operations Support Center
PAD	Protective Action Decisions
PAR	Protective Action Recommendation
PIO	Public Information Officer
PPE	Personal Protective Equipment
RAC	Regional Assistance Committee
REP	Radiological Emergency Preparedness
RRR	Relocation, Reentry and Return
SAE	Site Area Emergency
SEOC	State Emergency Operations Center
TACP	Traffic & Access Control Point
TSC	Technical Support Center

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