

PADUCAH GASEOUS DIFFUSION PLANT FY 2020 SITE SUSTAINABILITY PLAN

Unapproved Draft



U.S. Department of Energy
Sustainability Performance Office

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Acronyms

AFV	Alternative Fuel Vehicles
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
C&D	Construction and Demolition
CAAS	Criticality Accident Alarm System
CAB	Citizens Advisory Board
CAS	Condition Asset Survey
COOP	Continuity of Operations Program
D&D	Decontamination and Decommissioning
D&R	Deactivation and Remediation
DOE	U.S. Department of Energy
DUF ₆	Depleted Uranium Hexafluoride
EISA	Energy Independence and Security Act
EM	Environmental Management
EMS	Environmental Management System
EO	Environmental Order
EOC	Emergency Operations Center
EPA	Environmental Protection Agency
EPEAT	Electronic Product Environmental Assessment Tool
EPP	Environmentally Preferable Products
FRNP	Four Rivers Nuclear Partnership
FY	Fiscal Year
GHG	Greenhouse Gas
GSA	General Services Administration
HPSB	High Performance Sustainable Building
HVAC	Heating Ventilation and Air Conditioning
ILA	Industrial, landscaping, and Agriculture
INF	Infrastructure
ISMS	Integrated Safety Management System
ISO	International Standards Organization
ISSC	Infrastructure Support Services Contractor
KPDES	Kentucky Pollutant Discharge Elimination System
LED	Light-Emitting Diode
LPG	Liquid Propane Gas
PC	Personal computer
PGDP	Paducah Gaseous Diffusion Plant
PPPO	Portsmouth/Paducah Project Office
PUE	Power Utilization Efficiency
REC	Renewable Energy Certificates
ROI	Return on Investment
S&M	Surveillance and Maintenance
SSI	Swift & Staley Inc.
THIRA	Threat and Hazards Analysis and Risk Assessment
TVA	Tennessee Valley Authority
YOY	Year-Over-Year
ZEV	Zero Emission Vehicles

Executive Summary

The Paducah Gaseous Diffusion Plant (PGDP) was built in the early 1950s and has served the nation in producing enriched uranium, initially for the nuclear weapons program and later for nuclear fuel production. In 2013, production came to a close, and PGDP leased facilities were returned to the U.S. Department of Energy (DOE) in October 2014. The task of meeting sustainability goals is a challenge due to the dramatic increase in PGDP square footage managed by DOE since the baseline years for the individual sustainability goals were established. Consideration in meeting sustainability goals must be balanced against the dramatic increase in PGDP square footage, aging facilities, and eventual demolition of the facilities.

The PGDP Site prime contractors perform the following summary level activities:

- The Deactivation and Remediation (D&R) Contractor is responsible for ongoing deactivation, surveillance, maintenance, environmental remediation activities, and site-wide utilities.
- The Infrastructure Support Services Contractor (INF) is responsible for Site infrastructure, such as roads and grounds, janitorial services, and security/classification activities.
- The Depleted Uranium Hexafluoride (DUF₆) Contractor is responsible for the operation of the DUF₆ Conversion Plant and management of DOE UF₆ cylinders.

In fiscal year (FY) 2019, the DUF₆ Contractor updated its Environmental Management System (EMS) to conform to the ISO 14001:2015 standard. The next generation EMS Plan and six implementing procedures were produced in response to DOE Memorandum, a DUF₆ Independent Assessment of the EMS, the EMS component of Integrated Safety Management System (ISMS) Assessment in June 2018, and for general process improvement. For FY2019 there were 10 EMS objectives established. EMS objectives that were met include maintaining regulatory compliance (environmental performance improvement), waste diversion (increasing the amount of recyclables at the Portsmouth Site), and maintaining compliance with environmental regulations (through self-assessments and performance improvement). Significant improvements were realized in four areas, though more improvement is needed to bring the items to completion. These four areas were proactive compliance with Kentucky Pollutant Discharge Elimination System (KPDES) permitted effluent (developing early warning concentration levels to manage Outfall 017 at the Paducah Site), reducing radiological waste generation (eliminating respirator bags being returned from vendor), and monitoring greenhouse gases (monitoring methane consumption of PRISM units per ton of DUF₆ processed).

The Site Contractors are using a multifaceted approach to implement sustainable practices and projects and increase awareness of sustainability opportunities in the workplace. Unique challenges exist for PGDP, with some facilities being more efficient than others depending on the facility purpose and age. Given the age and complexity of the facilities, the PGDP Site continues to place priority on reducing energy use and cost, while exploring renewable or alternative energy solutions where life-cycle and cost-effective. With optimization of utilities, facility deactivation, and reductions in the PGDP footprint through demolition, building energy intensity reductions have been and will continue to be realized.

The PGDP FY2019 sustainability achievements include the following:

- Utilities in the C-533 Switchyard were isolated and the two C-360 power transformers were drained with over 300,000 gallons of mineral oil drained for recycle;
- Space utilization practices were implemented to consolidate employee office areas;
- Seventeen small structures and trailers were demolished representing a total footprint reduction of 13,876 ft².
- Steam was shut-off to C-335, C-337, C-535, C-536, C-537, and C-635, and other buildings where applicable when freeze protection was no longer required;
- C-600 boilers were shut-down beginning March 28, 2019, when steam was no longer required;
- A pollution prevention opportunity assessment was completed on C-412 Trailer Complex, C-302, C-709, and C-102 with 66% of office lights and fans being turned off properly at the end of shift and 90% of office waste being recycled properly;

- Waste minimizations were implemented by splitting a DUF₆ conversion building airlock into a radiologically clean and a controlled Radiological Material Area enabling packaging to be removed in the clean area and not have to be disposed as radiological waste;
- Contractors at PGDP promoted Earth Day by giving away wildflower seed, emphasizing natural resource conservation and as a lasting reminder to “think green”;
- Criticality Accident Alarm System (CAAS) pneumatic horns for the Site were transitioned to electronic horns which will save approximately 84,571 KW-Hr;
- A Paducah Site Housing Charter was established; and
- PGDP and Tennessee Valley Authority (TVA) entered into a utility energy savings performance contract agreement to reduce excess power usage by constructing a new DOE/TVA substation that is right-sized correctly for the Site.

Executive Summary Table

Prior DOE Goal	Current Performance Status	2 Year Performance & Plans	5 Year Performance & Plans	10 Year Performance & Plans
Energy Management				
30% energy intensity (Btu per gross square foot) reduction in goal-subject buildings by fiscal year (FY)2015 from a FY2003 baseline and 1.0% year-over-year (YOY) thereafter.	The Paducah Site had usage reductions in electrical, natural gas, and potable water during FY2019. The Site footprint was reduced by approximately 13,876 ft ² with the demolition of 17 small structures/trailers.	The Deactivation and Remediation (D&R) Contractor has identified 29 small structures for demolition in FY2020.		
Energy Independence and Security Act (EISA) Section 432 continuous (4-year cycle) energy and water evaluations.	The previous D&R Contractor completed an American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) Level I assessment in November 2016. The assessment reviewed the C-337 Process Building, C-752-A and C-753-A waste storage facilities, and the C series trailers representing approximately 2,337,137 ft ² or 28.9% of D&R Contractor facilities.	The Infrastructure Support Services Contractor (ISSC) and D&R Contractor will use the condition asset surveys with supplemental energy and water checks to meet the EISA 432 energy and water evaluations.	The ISSC and D&R Contractor will use the condition asset surveys with supplemental energy and water checks to meet the EISA 432 energy and water evaluations.	The ISSC and D&R Contractor will use the condition asset surveys with supplemental energy and water checks to meet the EISA 432 energy and water evaluations.
Meter all individual buildings for electricity, natural gas, steam and water, where cost-effective and appropriate.	Most Paducah Gaseous Diffusion Plant (PGDP) facilities were built in the early 1950s and many facilities are not	The D&R Contractor has submitted a list of facility meters at the Site and identified those	The Paducah Site will continue to evaluate use of metering such that the installation of meters is	The Paducah Site will continue to evaluate use of metering such that the installation of meters is

Prior DOE Goal	Current Performance Status	2 Year Performance & Plans	5 Year Performance & Plans	10 Year Performance & Plans
	individually metered for any utilities. The Site will install and track meters for use of power, natural gas, water, and other fuels, when repairs are made to the utility service for a building/group of buildings, such that installation of the meters are practicable to the U.S. Department of Energy (DOE). New meters will be installed on any new construction if utilities are used.	meters that have been added or deleted during the contract period. New office facilities will have electrical meters and new shower/restroom facilities will have electric and water meter.	practicable to DOE. Gas and electric meters will be installed as part of the Heating, Ventilation, and Air Conditioning (HVAC) service replacement projects.	practicable to DOE.
Water Management				
20% potable water intensity (Gal per gross square foot) reduction by FY2015 from a FY2007 baseline and 0.5% YOY thereafter.	Overall potable water usage has been decreased by 3% when comparing FY2019 to a baseline year of FY2015. The D&R Contractor has an approved plan.	Future plans include getting all air compressors and associated equipment off once through cooling water and reconfigure to recirculating cooling water or air-cooled compressors.	As equipment and systems cease to operate at the PGDP, potable water reductions will continue.	As equipment and systems cease to operate at the PGDP, potable water reductions will continue.
Non-potable freshwater consumption (Gal) reduction of industrial, landscaping, and agricultural (ILA). YOY reduction; no set target.	The Paducah Site does not have any ILA water.	The Paducah Site does not anticipate using any ILA water.	The Paducah Site does not anticipate using any ILA water.	The Paducah Site does not anticipate using any ILA water.
Waste Management				
Reduce at least 50% of non-hazardous solid waste, excluding construction and demolition debris, sent to treatment and disposal facilities.	The Paducah Site diverted 61.3% of non-hazardous solid waste from treatment and disposal.	The Paducah Site will continue with existing recycle activities and will initiate new recycling opportunities as they become available.	The Paducah Site will continue with existing recycle activities and will initiate new recycling opportunities as they become available.	The Paducah Site will continue with existing recycle activities and will initiate new recycling opportunities as they become available.
Reduce construction and demolition materials and debris sent to treatment and disposal facilities. YOY reduction; no set target.	The Paducah Site will continue to divert demolition materials and debris in FY2020 as opportunities are available.	The Paducah Site will continue actively diverting construction and demolition materials as opportunities are available.		

Prior DOE Goal	Current Performance Status	2 Year Performance & Plans	5 Year Performance & Plans	10 Year Performance & Plans
Fleet Management				
20% reduction in annual petroleum consumption by FY2015 relative to a FY2005 baseline and 2.0 % YOY thereafter.		Opportunities to reduce petroleum consumption will continue to be tracked and reviewed for opportunities for improvements.	Opportunities to reduce petroleum consumption will continue to be tracked and reviewed for opportunities for improvements.	Opportunities to reduce petroleum consumption will continue to be tracked and reviewed for opportunities for improvements.
10% increase in annual alternative fuel consumption by FY2015 relative to a FY2005 baseline; maintain 10% increase thereafter.		Opportunities to increase E85 usage will continue to be tracked and reviewed on a monthly basis.	Opportunities to increase E85 usage will continue to be tracked and reviewed on a monthly basis.	Opportunities to increase E85 usage will continue to be tracked and reviewed on a monthly basis.
75% of light duty vehicle acquisitions must consist of alternative fuel vehicles (AFV).		Opportunities to increase AFV usage will continue to be tracked and reviewed.	Opportunities to increase AFV usage will continue to be tracked and reviewed.	Opportunities to increase AFV usage will continue to be tracked and reviewed.
Clean & Renewable Energy				
“Renewable Electric Energy” requires that renewable electric energy account for not less than 7.5% of a total agency electric consumption by FY2013 and each year thereafter.	Although minor in scope, the D&R Contractor continues to operate nine air monitoring stations powered by solar panels, which saves over 2,800 kWh per year. The DOE Portsmouth/Paducah Project Office (PPPO) purchased 20.5% Renewable Energy Certificates (REC’s) for the Paducah Site during FY2019.	DOE PPPO has purchased REC’s in the past and may continue in the future.	DOE PPPO has purchased REC’s in the past and may continue in the future.	DOE PPPO has purchased REC’s in the past and may continue in the future.
Continue to increase non-electric thermal usage. YOY increase; no set target but an indicator in the OMB scorecard.	DOE PPPO has purchased REC’s in the past and may continue in the future.	DOE PPPO has purchased REC’s in the past and may continue in the future.	DOE PPPO has purchased REC’s in the past and may continue in the future.	DOE PPPO has REC’s in the past and may continue in the future.
Green Buildings				
At least 15% (by count) of owned existing buildings to be compliant with the <i>revised</i> Guiding Principles for High Performance Sustainable Building (HPSB) by FY2020, with annual progress thereafter.	There are no existing Paducah facilities meeting this criterion.	Due to the age of the PGDP facilities and nature of the D&R Contractor scope, it will be difficult to implement the goal; however, the Paducah Site will implement as	Due to the age of the PGDP facilities and nature of the D&R Contractor scope, it will be difficult to implement the goal; however, the Paducah Site will implement as	Due to the age of the PGDP facilities and nature of the D&R Contractor scope, it will be difficult to implement the goal; however, the Paducah Site will implement as

Prior DOE Goal	Current Performance Status	2 Year Performance & Plans	5 Year Performance & Plans	10 Year Performance & Plans
		appropriate. There is no estimate to meet this goal at this time.	appropriate. There is no estimate to meet this goal at this time.	appropriate. There is no estimate to meet this goal at this time.
Net Zero Buildings: All new buildings (>5,000 GSF) entering the planning process designed to achieve energy net-zero beginning in FY 2020.	There are no existing Paducah Site facilities meeting this criterion.	Due to the age of the PGDP facilities and nature of the D&R Contractor scope, it will be difficult to implement the goal; however, the Paducah Site will implement as appropriate. There is no estimate to meet this goal at this time.	Due to the age of the PGDP facilities and nature of the D&R Contractor scope, it will be difficult to implement the goal; however, the Paducah Site will implement as appropriate. There is no estimate to meet this goal at this time.	Due to the age of the PGDP facilities and nature of the D&R Contractor scope, it will be difficult to implement the goal; however, the Paducah Site will implement as appropriate. There is no estimate to meet this goal at this time.
Increase regional and local planning coordination and involvement.	The PGDP Citizens Advisory Board (CAB) is chartered to provide advice to DOE-Environmental Management (EM) located at the Paducah Site. The CAB provides advice and recommendations concerning site-specific issues such as excess facilities and future land use and long term stewardship. The CAB is comprised of individuals from Western Kentucky and Southern Illinois. Members represent business, academia, labor, local government, environmentalist, special interest groups, and the general public. In addition to DOE, Environmental Protection Agency (EPA) and Kentucky and the West Kentucky Wildlife Management Area are represented on the board in an advisory capacity.	The PGDP will implement as opportunities present themselves. The CAB will continue as chartered.	The PGDP will implement as opportunities present themselves. The CAB will continue as chartered.	The PGDP will implement as opportunities present themselves. The CAB will continue as chartered.

Prior DOE Goal	Current Performance Status	2 Year Performance & Plans	5 Year Performance & Plans	10 Year Performance & Plans
Acquisition & Procurement				
<p>Promote sustainable acquisition and procurement to the maximum extent practicable, ensuring BioPreferred and biobased provisions and clauses are included in all applicable contracts.</p>	<p>The Paducah Site Contractor's assesses contract actions to maximize the supply or use of products and services that energy efficient; water efficient; bio-based; environmentally preferable; non-ozone depleting; contain recycled content; and nontoxic or less toxic alternatives, as appropriate.</p>	<p>The Paducah Site Contractor's assesses contract actions to maximize the supply or use of products and services that energy efficient; water efficient; bio-based; environmentally preferable; non-ozone depleting; contain recycled content; and nontoxic or less toxic alternatives, as appropriate.</p>	<p>The Paducah Site Contractor's assesses contract actions to maximize the supply or use of products and services that energy efficient; water efficient; bio-based; environmentally preferable; non-ozone depleting; contain recycled content; and nontoxic or less toxic alternatives, as appropriate.</p>	<p>The Paducah Site Contractor's assesses contract actions to maximize the supply or use of products and services that energy efficient; water efficient; bio-based; environmentally preferable; non-ozone depleting; contain recycled content; and nontoxic or less toxic alternatives, as appropriate.</p>
Measures, Funding, & Training				
<p>Annual targets for sustainability investment with appropriated funds and/or financed contracts to be implemented in FY2019 and annually thereafter.</p>	<p>Construction of the new Tennessee Valley Authority (TVA)/DOE substation to allow for proper sized transformers to be used and allow shutdown of PGDP's current transformers. Energy audit was completed in main office areas with 66% compliance with lights and fans off at the end of the day. PGDP employees were reminded to switch off the lights in their administrative areas at the end of each day.</p>	<p>PGDP and TVA entered into a utility energy savings performance contract agreement to reduce excess power usage by constructing a new DOE/TVA substation that is right-sized correctly for the Sites.</p> <p>Construction of the new TVA/DOE substation will continue with estimated completion in FY2020.</p>	<p>Performance contracting will be implemented as opportunities become available.</p>	<p>Performance contracting will be implemented as opportunities become available.</p>
Electronic Stewardship				
<p>Purchases: 95% of eligible acquisitions each year are Electronic Product Environmental Assessment Tool (EPEAT)-registered products.</p>	<p>Interim Target: 95% Current Performance: 98%</p>	<p>The Paducah Site will continue to acquire electronic products that meet or exceed purchasing specifications and standards required for federal agencies.</p>	<p>The Paducah Site will continue to acquire electronic products that meet or exceed purchasing specifications and standards required for federal agencies.</p>	<p>The Paducah Site will continue to acquire electronic products that meet or exceed purchasing specifications and standards required for federal agencies.</p>

Prior DOE Goal	Current Performance Status	2 Year Performance & Plans	5 Year Performance & Plans	10 Year Performance & Plans
Power management: 100% of eligible Personal computers (PCs), laptops, and monitors have power management enabled.	Interim Target : 100% Current Performance: 100%	Continue to meet goal.	Continue to meet goal.	Continue to meet goal.
Automatic duplexing: 100% of eligible computers and imaging equipment have automatic duplexing enabled.	Interim Target: 100% Current Performance: 100%	Continue to meet goal.	Continue to meet goal.	Continue to meet goal.
End of Life: 100% of used electronics are reused or recycled using environmentally sound disposition options each year.	Interim Target: 100% Current Performance 100%	Continue to meet goal.	Continue to meet goal.	Continue to meet goal.
Data Center Efficiency: Establish a power usage effectiveness target for new and existing data centers; discuss efforts to meet targets.	Interim Target: <1.5 Current Performance: 1.5	Will review server power and infrastructure and pursue options to improve efficiency by replacement of older equipment and continuing efforts to virtualize the server environment.	Will review server power and infrastructure and pursue options to improve efficiency by replacement of older equipment and continuing efforts to virtualize the server environment.	Will review server power and infrastructure and pursue options to improve efficiency by replacement of older equipment and continuing efforts to virtualize the server environment.
Organizational Resilience				
Discuss overall integration of climate resilience in emergency response, workforce, and operations procedures and protocols.	The Paducah Site Emergency Management Program addresses all-hazards events, to include natural phenomena (severe weather, earthquakes, etc.), man-made and technological emergencies, through emergency plan implementing procedures and facility Emergency Actions Plans.	Annual protective action drills will continue to be completed as scheduled.	Annual protective action drills will continue to be completed as scheduled.	Annual protective action drills will continue to be completed as scheduled.
Multiple Categories				
YOY Scope 1 & 2 Greenhouse Gas (GHG) emissions reduction from a FY2008 baseline.	During FY2019, electrical usage was reduced by 2.5% compared to FY2018. Natural gas was reduced by 10% compared to the prior FY. Through these reductions, GHG Scope 1 and 2 emissions will be	The Scope 1 and 2 GHG goal will be extremely difficult, if not impossible, to achieve given the FY2008 baseline and current status of the PGDP. Anticipate continued reductions with	The Scope 1 and 2 GHG goal will be extremely difficult, if not impossible, to achieve given the FY2008 baseline and current status of the PGDP. Anticipate continued reductions with	The Scope 1 and 2 GHG goal will be extremely difficult, if not impossible, to achieve given the FY2008 baseline and current status of the PGDP. Anticipate continued reductions with

Prior DOE Goal	Current Performance Status	2 Year Performance & Plans	5 Year Performance & Plans	10 Year Performance & Plans
	reduced.	utility optimization projects, space consolidation, and reductions to site footprint.	utility optimization projects, space consolidation, and reductions to Site footprint.	utility optimization projects, space consolidation, and reductions to Site footprint.
YOY Scope 3 GHG emissions reduction from a FY2008 baseline.	During FY2019, the Paducah Site continued implementing a consolidated 4 day/10 hour/day work week schedule with a slight increase of commuter mileage by approximately 5%.	The Scope 3 GHG goal will be extremely difficult, if not impossible, to achieve given the FY2008 baseline and current status of the PGDP. Anticipate continued 4 day/10 hour/day work week consolidated schedule.	The Scope 3 GHG goal will be extremely difficult, if not impossible, to achieve given the FY2008 baseline and current status of the PGDP. Anticipate continued 4 day/10 hour/day work week consolidated schedule.	The Scope 3 GHG goal will be extremely difficult, if not impossible, to achieve given the FY2008 baseline and current status of the PGDP. Anticipate continued 4 day/10 hour/day work week consolidated schedule.

Mission Change

The current mission of the PGDP is environmental cleanup and waste management, depleted uranium conversion, deactivation, remediation, and surveillance and maintenance. The Paducah Site continues efforts to reduce Site utilities through continued targeted efficiency measures and projects. There are 29 small structures and trailers identified for demolition in FY2020 which will decrease the Site footprint.

Future PGDP Utility Optimization Projects will reduce Site utility usage. These projects include the following:

- Complete Steam Heat Replacement
- C-300 Heating Ventilation and Air Conditioning (HVAC) Service Replacement
- Deactivate Heating/Chilled Water Lines
- Isolation of 161-kV Transmission lines into C-531 following construction of a new DOE/TVA Substation

Long term D&R projects include deposit removal in the process buildings. Once deposit removal is completed, the fire suppression systems will be deactivated which will reduce water usage. The currently scheduled dates for deposit removal and fire system deactivation are identified as follows:

Facility	Deposit Removal Completion	Fire System Deactivation
C-360	FY2019	FY2019
C-315	FY2022	FY2027
C-331	FY2024	FY2026
C-333	FY2022	FY2026
C-310	FY2024	FY2027
C-335	FY2025	FY2026
C-337	FY2026	FY2027

PGDP and TVA entered into a utility energy savings performance contract agreement to reduce excess power usage by constructing a new DOE/TVA substation that is right-sized correctly for the Sites D&R activities.

Construction has started on a new TVA/DOE substation which will result in energy savings due to the isolation of the 161-kV transmission lines and shutdown of associated operating equipment. The D&R Contractor is providing oversight and support for the new substation being installed by TVA (FY2020). The D&R Contractor will be responsible for coordination of final ties to the substation and testing.

The ISSC is working on the design of a new distribution system of 14kV feeder cables to connect the new TVA Substation into the plant's existing 14kV distribution system, thereby by passing the C-531 Switchyard.

DRAFT

Energy Management

Performance Status

The Energy Management category continues to be a challenge for PGDP with the October 2014 return of the leased facilities. Unique challenges exist in reducing building energy intensity for PGDP, with some facilities being more efficient than others depending on the facility purpose and age. Given the age and complexity of PGDP facilities, the Site has placed priority on reducing energy use and cost.

During FY2019, the Paducah Site has promoted energy savings through various projects and initiatives including:

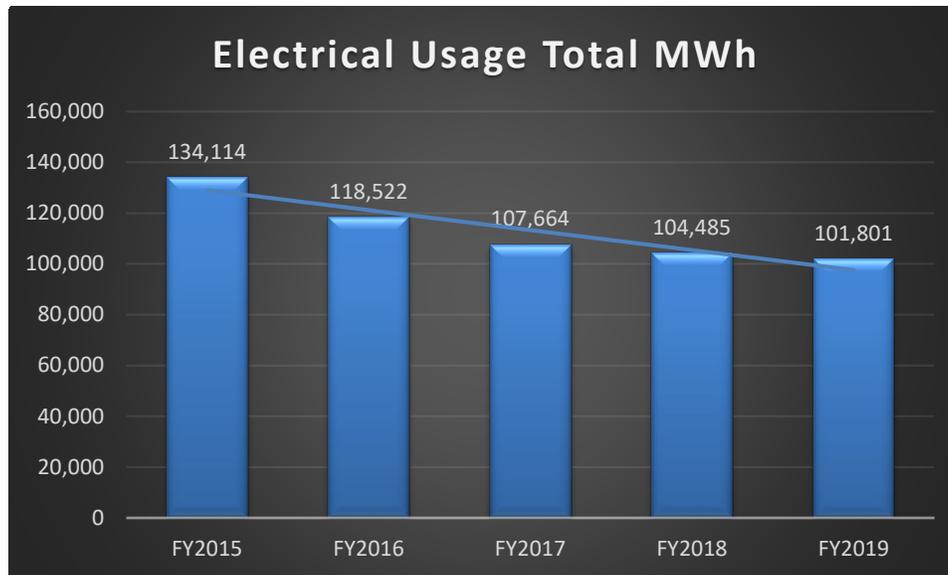
- Utilities in the C-533 Switchyards and the C-360 transformer were isolated with over 300,000 gallons of mineral oil drained for recycle;
- Air horns for the Site were transitioned from compressed air to electronic air horns which will save approximately 84,571 KW-Hr;
- An energy self-assessment was completed on C-412 Trailer Complex, C-302, C-709, and C-102 with 76% of office lights and fans being turned off properly at the end of shift;
- Shutting off steam to C-335, C-337, and C-635 when freeze protection was no longer required;
- Permanently isolated steam to C-535, C-536, and C-537;
- Permanently isolated electricity from C-400;
- Installing electric hot water heaters in C-100 and C-720 when steam was no longer required for comfort cooling;
- Shutting down boilers beginning March 28, 2019 during warm months when steam was no longer required;
- Demolishing 17 small structures and trailers representing a footprint reduction of approximately 13,876 ft²;
- Implementing space utilization practices by relocating and consolidating employee office areas;
- Installing/Repairing photo eyes/sensors on exterior lights; and
- Encouraging and reminding personnel to turn off lights when leaving administrative areas, including newsletter articles and plantwide postings on energy saving tips.

With the increase in Site footprint starting in October 2014, FY2015 serves as a representative baseline year to track all utilities including electrical usage. Electrical reductions continue to be realized each FY as indicated in Table 1. PGDP reduced electrical by ~24% from FY2015 to FY2019. Tables 1 and 2 list Site electrical use data and demonstrate the continued reduction in electrical usage.

Table 1. Electrical Usage

Electrical Usage	
Fiscal Year	Total MWh
2015	134,114
2016	118,522
2017	107,664
2018	104,485
2019	101,801

Table 2. Electrical Usage



The ISSC is contractually assigned operational responsibility for C-103 DOE Office Facility. In FY2018, four HVAC units at the C-103 building were replaced with newer more energy efficient roof top units; and the C-103 roof was replaced with a new cool roof HydroStop Premium Coat System. In FY2019, the ISSC evaluated building energy consumption to determine possible electricity reductions due to installation of the four HVAC units and the new cool roof. Evaluation results did indeed show electricity reeducation. In FY2018, annual electricity usage was 233,700 kilowatt-hour(s) kWh. In FY2019, annual usage was 213,700kWh. Results indicate electricity use dropped from FY2018 to FY2019 for the C-103 facility. Although reduction is small and considering the majority of facilities at the Paducah Site are non-operational no large scale reductions are foreseen in the near future. The reduction does show the Paducah Site does consider energy reduction a priority when replacing new HVAC units and evaluates new energy efficient alternatives when replacing existing roofs. Facilities previously utilized for gaseous diffusion activities have been de-leased and returned to DOE. The long-term vision for the Paducah Site includes decontamination and decommissioning (D&D) of most of these facilities. Furthermore, as the current mission at the Site progress DOE envisions an orderly transition of utility services for the remaining Site programs to providers within the local communities. The DOE PPPO - Paducah and the contractors are committed to maintaining the Site and facilities to meet the requirements of existing and future mission-related programs.

On March 25, 2019, a Paducah Site Housing Charter was established with the objective to minimize the size/footprint of occupied facilities to the greatest extent practicable. This charter was established as a partnership between Four Rivers Nuclear Partnership, LLC, (FRNP), Swift and Staley Inc. (SSI), and the U.S. Department of Energy (DOE). The partnership strived to draw on the strengths of each organization in an effort to reduce the Paducah Site's utility and surveillance and maintenance (S&M) costs and maximize productivity of personnel.

Phase I of the Paducah Site Housing Charter has been completed. Phase I covers housing actions to be implemented from FY2019 through the end of FY2021, contingent on funding availability. Work to implement Phase I is underway.

Utility optimization is dependent on the Site occupancy approach and includes other drivers which are not solely based on reducing costs, including:

- Perform obvious cost-savings actions without delay to maximize return on investment (ROI);
- Consolidate personnel to:
 - Improve team interaction;
 - Move personnel closer to the work locations;
 - Reduce number of locations;

- Target eliminating the most expensive facilities first;
- Minimize capital investments in facilities to be demolished;
- Eliminate utility distribution systems where possible to support future work and minimize line losses/infiltration;
- Eliminate occupancy in buildings undergoing Stabilization and Deactivation;
- Purchase utilities from service providers rather than self-supplying; and
- Improve accommodations and safety of workforce.

Office moves to consolidate personnel will continue in FY2020. Paducah will continue phased moves in the contract base period (out to 2022). FY2019 moves (in support of the overall Site strategy) started in September, the current focus is on moving personnel out of C-720.

- Moved personnel from C-720 → C-100 (engineering, nuclear safety, operational programs, etc.)
 - These vacated spaces are not to be re-occupied
- Moved personnel from C-304 → C-100 (president’s office, project controls)

FY2020 will bring more moves to consolidate personnel with the end goal of vacating C-709, C-710, C-720 and the process buildings while concentrating people in C-412, C-302, C-300, C-304, C-764, C-755 and C-100 for the long term.

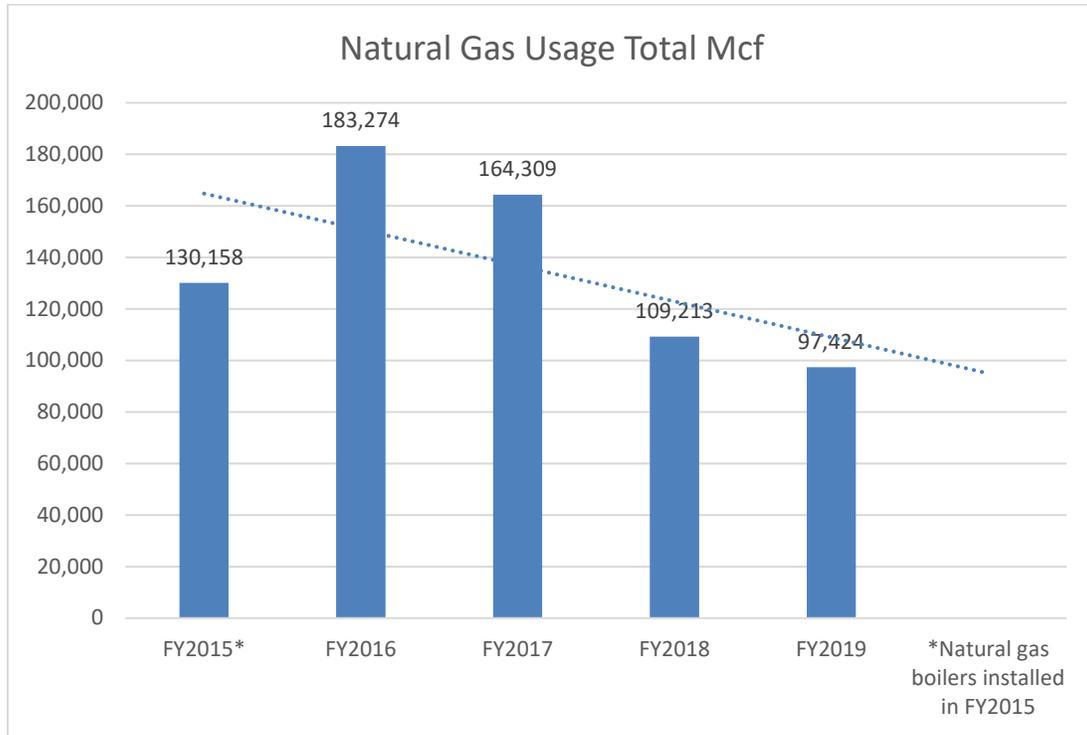
During FY2015, PGDP was tasked to shut-down the coal-burning steam plant and replace it with five more efficient low nitrous oxide burning package boiler units. The package boiler units operate using natural gas. There were significant reductions in natural gas usage with the largest single year reduction of ~46% occurring between FY2016 and FY2019. To reduce natural gas usage during FY2019, the boilers were shut down when freeze protection was no longer required. FY2019 indicates a reduction of approximately 11% from FY2018. Also, electric hot water heaters were installed for C-100, C-335, and C-720. Table 3 indicates PGDP reduced natural gas annually since FY2016.

Table 3. Natural Gas Usage

Natural Gas Usage	
Fiscal Year	Total Mcf
2015*	130,158
2016	183,274
2017	164,309
2018	109,213
2019	97,424

*Natural gas boilers installed in FY2015

Table 4. Natural Gas Usage

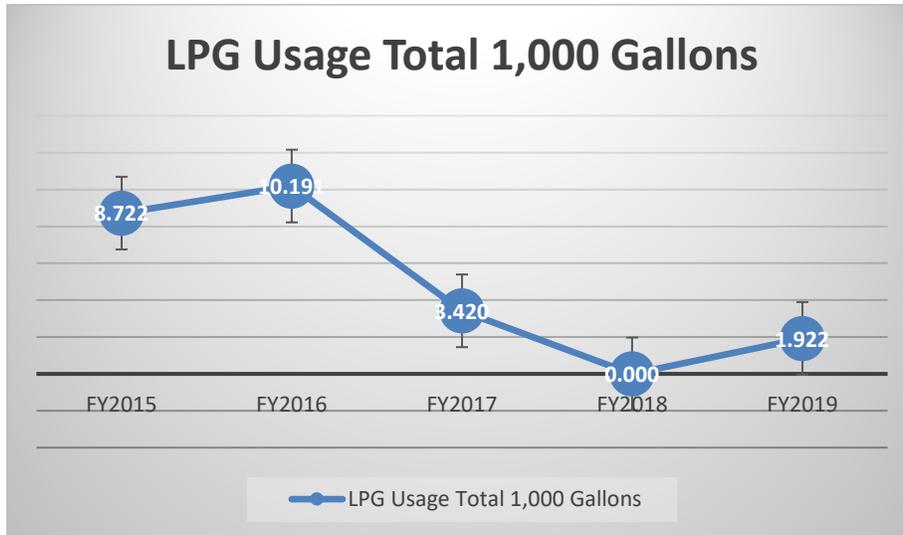


During FY2019, the D&R Contractor prepared, and DOE approved, the *Energy Efficiency Plan for the Deactivation and Remediation Project, Paducah Gaseous Diffusion Plant, Paducah, Kentucky*. The plan outlines how the PGDP is planning to meet the DOE goals and objectives contained in Executive Order 13693.

The previous D&R Contractor completed an ASHRAE Level I assessment in November 2016. The assessment reviewed the C-337 Process Building, C-752-A and C-753-A waste storage facilities, and the C series trailers representing approximately 2,337,137 ft² or 28.9% of D&R Contractor facilities.

Liquid propane gas (LPG) usage at Paducah is de minimus. The table below shows the Paducah Site use from FY2015 thru FY2019.

Table 5. LPG Usage



Plans and Projected Performance

The D&R Contractor is contractually required to “...increase energy efficiency by adding meters to buildings that meet the Department’s cost-benefit analysis guidelines.” Tracking and metering of utilities in federal buildings is required by Section 103 of the Energy Policy Act of 2005. Most of the PGDP facilities were built in the early 1950s and are not individually metered for any utilities. The Site will install and track meters for use of power, natural gas, water, and other fuels, when repairs are made to the utility service for a building/group of buildings, such that installation of the meters is practicable to DOE. This does not apply to facilities that are actively undergoing or have completed deactivation.

The PGDP plans for HVAC upgrades include adding meters for electricity or gas to each “new” installation. Plans include the installation of water and power meters on the new 500,000 gallon water storage tank. The new C-104 Access Control Facility, and new C-208 Firing Range are metered for power and water. If additions such as modular office and shower trailers are added at the Site the facility will be metered.

The Paducah Site is also evaluating replacing high pressure sodium fixtures with light-emitting diode (LED) fixtures in C-331. There will be half as many LED fixtures that produce the equivalent luminaire requirements. The energy savings will be 97.5 KW per year.

Future Energy Independence and Security Act (EISA) 432 evaluations will be completed in conjunction with the Condition Asset Surveys (CAS) along with supplemental energy and water checks. CAS are completed for all PGDP facilities on a five year rotating schedule.

The ISSC will perform six CAS inspections in FY2020. One building, three structures and two office trailers will be considered for EISA 432 evaluations. The building is a small communication facility that is 168 gross square feet, three other structures are non-energy consuming and two office trailers are operational with water and electricity. These doublewide office trailers will be evaluated for possible energy savings options. All six facilities are listed in the Facility Annual EISA S432 Evaluation Data spreadsheet as “Not Covered”.

Property ID	Property Name
C-802A	Communications Building
C-1900	DUF6 Railroad Spur
C-720-N1	Railroad Classification Yard
C-800	Motorcycle Parking Area
C-102-T02	Office Trailer
C-102-T03	Office Trailer

The D&R contractor has a minimum of 22 total CAS Inspections to perform during FY2020. These inspections will include six buildings, nine structures, and seven trailers, which are all listed in the table provided below. At this time the buildings & other structures will be evaluated for EISA Standards in conjunction with DOE O 430.1 C. Two out of the seven trailers are currently considered “covered,” however this is subject to change with the upcoming D&R work scopes.

Property ID	Property Name
C-375-19	Outfall (KPDES 019)
C-603-A	Slab
C-730-T05	Trailer, Office
C-746-B1	Staging Area
C-746-K	Landfill (Inactive)
C-746P-T03	Trailer, Office
C-752A-T10	Trailer, Office/Break
C-745-H	Cylinder Storage Yard
C-360-A	Toll Transfer and Sampling Building Anne
C-102-T05	Office Trailer
C-100-T08	FOCI Office and Change House Trailer
C-102	Hospital
C-337-A	Feed Vaporization Facility
C-315	Surge and Waste Building
C-300	Central Control Building
C-304	Office Building
C-102-T01	Office Trailer
C-102-T04	Office Trailer
C-745-X	Equipment Storage Pad
C-745-Y	Equipment Storage Pad
C-745-Z	Equipment Storage Pad
C-745-Z1	Equipment Storage Pad

Future projects identified to reduce energy usage include:

- Development of heating/cooling service replacement plans and schedules (D&R Contractor Deliverable 153);
- Installation of replacement heating/cooling service for the chiller and recirculating heat system with shutdown of current chiller and recirculating heat system;
- Installation of replacement heat service for steam; and
- Removal of 161-kV transmission lines from the C-531 and C-533 Switchyards and draining of mineral oil from equipment in the switchyards and associated ancillary/support facilities (due six months after completion of the tie-ins of the new 14kV cables to the existing 14kV distribution system and to new switchyard equipment).
- Install stand-alone air compressor in buildings requiring compressed air and dry compressed air to shut down C-620 air plant. Allowing the shutdown of the recirculating pump at C-631.

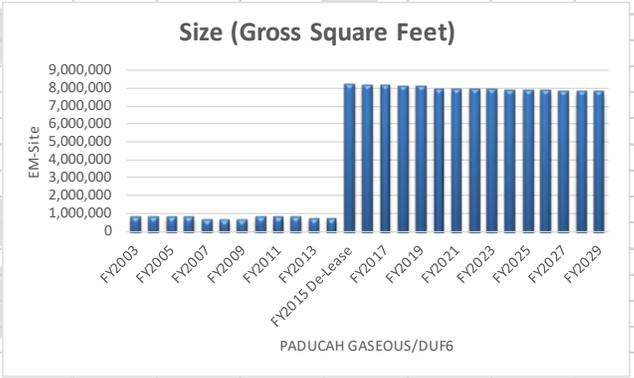
As part of the deactivation of facilities, energy reductions will continue. Reductions to the Site footprint through the demolition of 17 facilities in FY2019 and 29 facilities during FY2020 will also lower energy intensity for the PGDP. Future D&R Contractor Utility Optimization Projects will reduce Site utility usage. These projects include:

- Complete C-400 Complex Demolition;
- Complete Steam Heat Replacement;

- C-300 HVAC Service Replacement;
- Deactivate Heating/Chilled Water Lines;
- Installing stand-alone HVAC in buildings dependent on steam/chilled water; and
- Isolation of 161-kV Transmission lines into C-531 following construction of a new DOE/TVA switchyard.

Table 6: Historical Gross Square Footage for the Paducah EM Site and Projected Dispositions by the D&R Contractor

HQ Program Office	Site Name	Fiscal Year	Size (Gross Square Feet)
EM	Paducah Gaseous	FY2003	789,339
EM	Paducah Gaseous	FY2004	789,339
EM	Paducah Gaseous	FY2005	789,339
EM	Paducah Gaseous	FY2006	789,339
EM	Paducah Gaseous	FY2007	645,292
EM	Paducah Gaseous	FY2008	632,205
EM	Paducah Gaseous	FY2009	629,643
EM	Paducah Gaseous/DUF6	FY2010	782,297
EM	Paducah Gaseous/DUF6	FY2011	784,664
EM	Paducah Gaseous/DUF6	FY2012	788,688
EM	Paducah Gaseous/DUF6	FY2013	716,752
EM	Paducah Gaseous/DUF6	FY2014	724,627
EM	Paducah Gaseous/DUF6	FY2015 De-Lease	8,213,428
EM	Paducah Gaseous/DUF6	FY2016	8,132,651
EM	Paducah Gaseous/DUF6	FY2017	8,143,469
EM	Paducah Gaseous/DUF6	FY2018	8,099,688
EM	Paducah Gaseous/DUF6	FY2019	8,100,188
EM	Paducah Gaseous/DUF6	FY2020	7,928,540
EM	Paducah Gaseous/DUF6	FY2021	7,928,540
EM	Paducah Gaseous/DUF6	FY2022	7,928,540
EM	Paducah Gaseous/DUF6	FY2023	7,928,540
EM	Paducah Gaseous/DUF6	FY2024	7,812,400
EM	Paducah Gaseous/DUF6	FY2025	7,812,400
EM	Paducah Gaseous/DUF6	FY2026	7,812,400
EM	Paducah Gaseous/DUF6	FY2027	7,807,608
EM	Paducah Gaseous/DUF6	FY2028	7,807,608
EM	Paducah Gaseous/DUF6	FY2029	7,807,608



* Table also includes FIMS Anticipated Asset Information Module data.

Table 7. Energy, Natural Gas, and Water

Energy, Natural Gas, and Water										
NUMERICAL VALUES ONLY UNLESS OTHERWISE SPECIFIED										
	2019	2020	2021	2022	2023	2024	2025	10 Year Estimate (#'s or narrative)	Pg #s	NOTE
Energy Use										
Goal Energy Use										
Electricity (MWh)	101801	104366	104366	104366	104366	104366	104366	104366 annually 128224 + 5000 increase annually		5,000 annual increase supports DUF6 project.
Natural Gas (1000 CuFt)	98224	103224	108224	113224	118224	123224	128224	thru 2030.		
Other (MMBtu)										
Excluded Energy Use										
Electricity (MWh)										
Natural Gas (1000 CuFt)										
Other (MMBtu)										
								Projection for 2026 - 2030:		
								356239.79 MMBtu for electricity		
								annually. Natrual gas increases by		
Total (MMBtu if not split)	347457.7	356214.8	356219.8	356225	356229.8	356234.8	356239.79	5 MMBtu annually.		
Water Use										
Potable Water (MGal)	918	873.05	829.3975	787.928	748.5312	711.1047	675.549447	793 annually		
Non-Potable Freshwater (MGal)										
Total (MGal if not split)	918	873.05	829.3975	787.928	748.5312	711.1047	675.549447	793 annually		

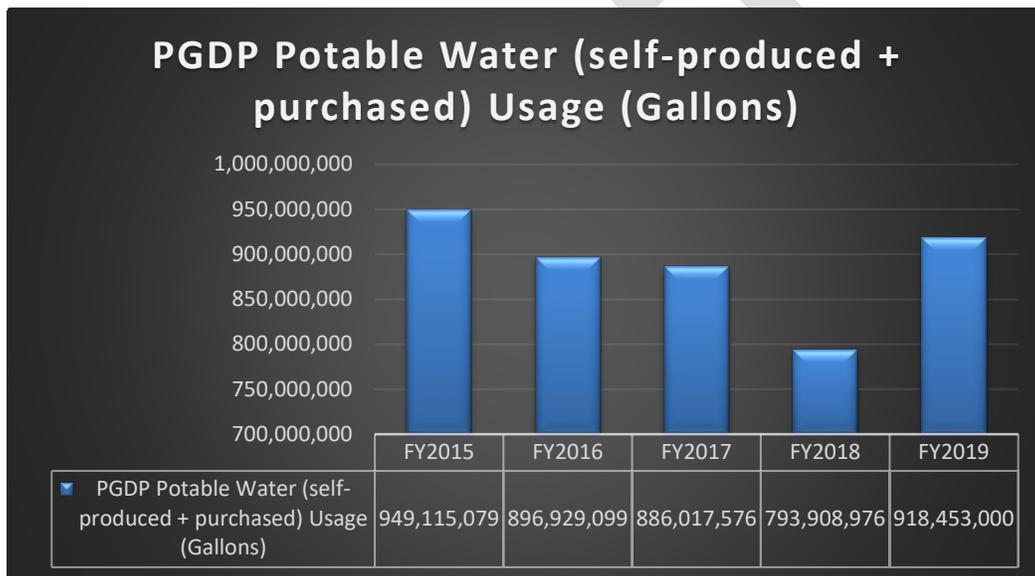
Note: Projections provided by Paducah D&R, INF, DUF6

Water Management

Performance Status

PGDP facilities are not individually metered for water usage. The C-611 Water Treatment Facility generates PGDP on-site water needs. Potable water is required for the operation of plant equipment and systems, such as the plant air system. The PGDP Site is required to reduce "...water consumption where practical, in all applicable buildings, trailer, and other structures and facilities." The sustainability goal requires a 36% potable water intensity reduction by 2025 from a FY2007 baseline. Overall potable water number metrics are significantly higher than the FY2007 baseline due to the return of the previously leased facilities. However, when using FY2015 as a baseline, overall potable water usage has been reduced by 3%. Refer to Table 8 for potable water usage (includes bottled drinking water).

Table 8. PGDP Site Water



Specific actions taken during FY2019 to reduce potable water usage include:

- Boilers were not in use from March 2019 through the start of FY2020;
- Firewater systems were isolated for C-360, C-400, C-535, and C-537;
- Water leaks were repaired as identified; and
- D&R Contractor will provide a detailed, optimized potable water system layout through the development of a PGDP hydraulic model. The model will address the current and proposed site-wide water needs and demands based on projected operational needs and population centers.

Plans and Projected Performance

The D&R Contractor has been tasked to prepare a plan for optimization of the on-site Sanitary Water distribution system as well as prepare water facility shutdown plan. Future plans include removing all air compressors and associated equipment from once through cooling water and reconfiguring the equipment to the recirculating cooling water or air-cooled compressors which will represent a savings of 300,000 gallons/day. As equipment and systems cease to operate at the PGDP, potable water reductions will continue.

Replacing one of the existing raw water pumps with a new pump right-sized for the mission instead of performing surveillance and maintenance on the current pumps will reduce the power required to operate the pump supplying water to the C-611 Water Treatment Plant.

Waste Management

Performance Status

The PGDP Site is committed to the practice of sustainable performance, preventing pollution and minimizing waste generation during all phases of operation, as described in respective Site contractor pollution prevention/waste minimization plans. New items and materials are reviewed for source reduction opportunities, and every effort is made to recycle to the greatest extent practicable. Site personnel (requisitions) are required to follow environmentally preferable product (EPP) purchasing guidance when procuring “green” products and non-toxic alternatives, including guidance on locating and procuring EPP, as well as justifying any deviations. Included in this process is an “environmental” review where concerns related to storage, facility hazards, emergency management and waste handling are addressed.

Demolition projects within the Limited Area at PGDP are often projects involving facilities that have radiological contamination, asbestos, or hazardous chemicals present. This can make diversion or recycling debris difficult to achieve, often resulting in disposal in regulated landfills. The waste from such demolitions is either shipped off-site for disposal or placed in the C-746-U Landfill, depending upon the level and type of contaminants. Historically, when the Site has demolished a clean facility recycling of the waste takes precedence; this is also the goal going forward. Diversion of construction and demolition (C&D) debris is factored into the planning phase of projects and performed whenever possible.

In FY2019, the PGDP Site diverted 61.33% of its waste from disposal in municipal solid waste landfills, including; paper, scrap metal, used oil and coolant, oily absorbent media, cardboard, plastic, excess chemicals, electronic items, light bulbs and batteries. Paper waste is minimized by duplex printing and is composed of at least 30% post-consumer material. The Infrastructure Record Department reduced the records footprint by ~2,085 cubic feet (ft³) through scanning to an electronic format, shredding and shipping off hardcopy records to a Federal Records Center. Tires are recycled through vendors for post-consumer materials, and liquids from maintenance of vehicles are recycled via refining.

The majority of C&D debris generated at the Site originates from within the Limited Area at facilities or locations contaminated with radiological or other hazardous chemical, preventing waste diversion. The waste from these C&D activities is either shipped offsite for disposal or placed in the C-746-U Landfill.

Site Contractors have been charged with the removal and disposition of excess property and equipment at the PGDP. In FY2019, several miscellaneous projects including switchyard de-energization and excess inventory reduction resulted in 177,220 lbs of scrap metal to be recycled. The goal is to recycle and reuse as much of the excess material and equipment as possible. Site property management secured the services of a certified electronics recycler, further supporting the proper management of excess electronics in FY2019.

Other recycle/reuse accomplishments for Site Contractors include:

- Recycled approximately 21,920 lbs of activated carbon;
- Recycled over 49,800lbs of batteries;
- Reused approximately 12,000 lbs of lead acid batteries;
- Reused approximately 18,320 lbs of pallets;
- Recycled over 106,00lbs of paper, cardboard, and toner cartridges
- Recycled approximately 177,220 lbs of miscellaneous scrap metal from C-631, C720, C-100, C-537;
- Recycled approximately 47,000 lbs of scrap metal associated with Infrastructure Support Services Contractor (ISSC) activities;
- Recycled over 85,000 lbs of paper;

- Recycled over 12,750 lbs of solids and liquids generated during vehicle maintenance;
- Recycled over 23,100 lbs of electronic scrap;
- Recycled approximately 900 lbs of light bulbs;
- Transferred approximately 94,000 lbs of concrete sully stones to local agencies for reuse;
- Recycled approximately 68 lbs of cigarette butts for incorporation into new plastic items; and
- Recycled approximately 1,200 lbs of plastic caps and lids for incorporation into new plastic items.

A primary part of Site Contractor's missions is to find ways to reduce waste and recycle those items that no longer are usable for the Site. For example, several items were transferred to other DOE contractors or federal agencies which accounted for 2,010 lbs of equipment and spare items being reused.

Site Contractors actively recycle non-radioactively contaminated materials. Collection points and processes have been established to accept and recycle paper, cardboard, rubber (including tires and belts) and metal non-radioactively contaminated materials generated from non-janitorial activities. Administrative and break-area wastes, including paper, aluminum cans, printer cartridges, electronic scrap, etc., are collected and recycled by the ISSC. A self-assessment was completed by the D&R Contractor on C-412 Trailer Complex, C-302, C-709, and C-102 to provide a snapshot of Site Contractor's effectiveness in conserving natural resources. It was found that a total there is a 91% effectiveness rate for recycling of paper and aluminum. Waste generated from vehicle maintenance is recycled by the ISSC, including used oil, coolant, oily absorbent, batteries and tires. The D&R Contractor promoted Earth Day by giving away wildflower seeds to emphasize natural resources. The ISSC issued eight pollution prevention reminders during FY2019, as well as published "Green Team" articles on various environmental topics monthly; including Earth Day, World Environmental Day, endangered species, ISMS policy, recycling and sustainability, and local cleanup opportunities.

During FY2019, the D&R Contractor drained and shipped offsite for recycle 300,000 gallons (190,000 lbs) of dielectric insulating oil as part of the C-533 Switchyard Project and C-360 transformer draining. This effort greatly improved the Site diversion rate.

Plans and Projected Performance

Site Contractors will continue to aggressively pursue recycling and reuse opportunities as part of infrastructure and deactivation and remediation strategies. These efforts are outlined in the contractor specific plans which include potential future excess items from various Site Contractor facilities. Equipment for potential transfer and reuse includes electrical equipment to TVA for reuse in the new PGDP Switchyard, as well as packaged excess electronics sent to certified recyclers. Also in FY2019, a new onsite firing range was constructed. This new facility will use non-lead/frangible ammunition, thereby reducing the amount of hazardous waste generated at the Site. The new firing range also allows the old firing range to be cleaned out before eventual demolition of the facility. The lead from the bullet trap will be recycled in FY2020. Site Contractors will continue the established typical recycling and reuse programs while pursuing new opportunities as identified.

Fleet Management

Performance Status

Alternative fuel vehicles (AFV) comprise 85% of the D&R Contractor fleet and 79% of the ISSC fleet. General Services Administration (GSA) fleet leased vehicles are replaced with AFV's based on GSA fleet minimum vehicle replacement standards using the GSA Drive-thru Customer Acquisition Module, taking into consideration availability and vehicle required end-use and/or purpose. During FY2019, 100% of GSA fleet leased replacement eligible vehicles were replaced with AFVs by the D&R Contractor, exceeding the statutory requirement that 75% of all covered acquisitions must be AFVs. One replacement vehicle was a Low Greenhouse Gas vehicle. Neither of the two ISSC replacement vehicles were AFV due to the intended end use/purpose of the vehicles.

During FY2019, alternative fuel was used 79% of the time by the D&R Contractor and 96% by the ISSC when E85 fuel was available for use. Section 701 of the Energy Policy Act of 2005 requires federal fleets to use alternative fuels in dual-fuel vehicles. Site personnel are encouraged to use alternative fuels such as E-85 in all dual-fuel vehicles to the fullest extent possible. Missed opportunities to utilize E-85 fuel is tracked and reviewed monthly for continued improvement, demonstrating a commitment to alternative fuel use.

Paducah Site contractors are still on course to reduce direct Greenhouse Gas (GHG) emissions by 50% by FY2025 relative to the FY2008 baseline for non-fleet vehicles and equipment.

Plans and Projected Performance

The Site will continue to replace GSA fleet leased vehicles with dual-fuel or AFV's when available. Continuing the effort to reduce the site-wide per-mile greenhouse gas emissions, the acquisition of zero emission vehicles (ZEV) and plug-in hybrid vehicles will be pursued when economically and operationally practical. However the PGDP does not have the appropriate charging or refueling infrastructure at this time to support ZEV's that will allow for vehicle level data reporting capabilities.

As vehicle telematics become available thru GSA during the 2020 vehicle acquisition cycle, the Site will plan to utilize vehicle telematics deployed on new GSA vehicle acquisitions to assess fleet performance by collecting vehicle level data to monitor and track vehicle health, scheduled maintenance, identify poor driving habits, fuel usage, excessive idle time, high and low vehicle utilization, and to assist with identifying opportunities for continued improvement in emission reduction, fleet right sizing and future fleet optimization to support D&R Contractor mission.

Renewable Energy

Performance Status

The Paducah Site meets its renewable energy goal through Renewable Energy Certificates (REC). DOE Portsmouth/Paducah Project Office (PPPO) purchases REC's for the Portsmouth and Paducah Sites. Per the attestation from the REC provider "Orion Renewable Energy Trading Group LLC" the REC(s) transferred to DOE Paducah include emissions, and other environmental characteristics associated with renewable resources.

Purchased Clean and Renewable Energy

The DOE PPPO purchased 20,898 MWh RECs from the DLA in FY2019 for Paducah. The RECs were produced using biomass as fuel. This equates to a 20.5% use of purchased renewables for Paducah (total electric use in FY2019 was 101,801 MWh).

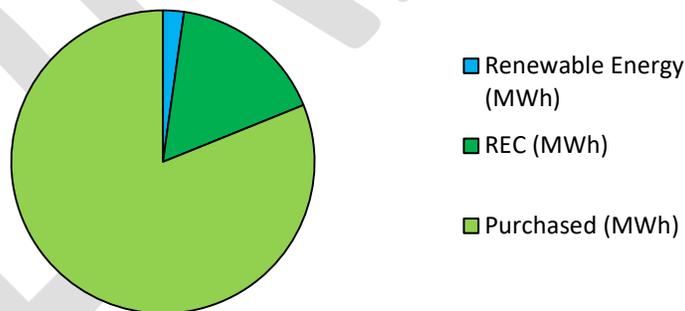
Although minor in scope, there are some On-site Renewable Generation Systems:

- Nine solar-powered variable speed air monitoring stations in support of continuous air monitoring in various locations. A total of over 2,800 kWh is saved per year with the use of solar panels at these locations.
- One solar-powered LED light is being used on site providing lighting to a storage Connex.
- One solar-powered bird deterrent device is employed at the Site.
- Two small, portable, solar-powered vehicle speed indicator units are being used around Site in high-traffic areas.
- One solar powered sign.
- Two solar-powered portable cameras are utilized for project activities.
- Three solar-powered portable ambient air samplers in support of continuous air monitoring in various locations.

Table 8 below shows Grid Power Usage, Purchased REC's, and Estimated Renewable Generation Systems.

Table 8. Energy Use

Energy Use



Plans and Projected Performance

DOE PPPO has purchased REC's in the past and may continue in the future. The Site will consider the use of clean energy technology during work planning activities, as appropriate.

On-Site Renewable Generation Systems

No large-scale on-site renewable energy system exists at Paducah. However, in light of the fact that power will continue to be needed for remaining missions at the Site and whatever future missions may utilize the former Gaseous Diffusion Plant land once D&D is completed, Paducah will continue to evaluate potential projects as they arise.

Purchased Clean and Renewable Energy

Paducah will continue to take renewable energy use into consideration during future land transfers and the decisions being made relative to the Site's future land use after remediation has been completed.

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Sustainable Buildings

Performance Status

There are no existing facilities meeting the Sustainable Buildings criterion. The Site demolished 17 small structures and trailers representing a footprint reduction of approximately 13,876 ft².

The PGDP Site ISSC completed construction of the C-208 Firing Range. The building is a 5,749 square foot firing range for the Site Protection Force. The firing range does not meet all Site sustainability requirements. Several green building specifications are being met, such as automatic lighting controls operating light emitting diodes lowering overall energy consumption. Some of the green building features include guiding principles from the Federal Energy Management Program including building level utility metering from guiding principal 5, high efficiency water fixtures from guiding principal 7, non-irrigated landscape complying with guiding principal 8, and storm water management techniques that satisfy guiding principal 10.

There are many sustainable features utilized in the design of the C-208 Firing Range. These features, as mentioned above, include automatic lighting controls utilizing infrared sensors that determine when a room is occupied eliminating the need to remember to turn off the lights when leaving the area. High efficiency water fixtures used in this building utilize water flow rates as specified by the ASHRAE standard 189.1-2014 section 6.3.2.1. This standard requires that water fixtures comply with Environmental Protection Agency (EPA) WaterSense criteria reducing the quantity of water used by occupants. Storm water management techniques for this building site utilize erosion controls and a storm water detention area. The drainage pattern of the Site after construction will be consistent with storm water drainage before the Site was developed.

The main obstacle for meeting guidelines pertaining to the building efficiency is the ventilation system. The ventilation system, because of the hazardous nature of the fumes produced by discharging firearms indoors, must comply with safety regulations. Because of this requirement, the efficiency of the HVAC system does not exceed ASHRAE 90.1 standards by 30%. The design of the ventilation system utilized for the firing range does however, aid in energy efficiency because it utilizes a closed loop High-Efficiency Particulate Air filter system. This closed loop system keeps the climate controlled air from the building inside the ventilation system minimizing the amount of outdoor hot or cold air introduced into the system and saving energy.

The D&R Contractor initiated planning of acquiring seven new office and shower trailers. The new trailers will allow for the reduction of personnel footprint that will allow for the further deactivation of buildings at the Paducah Site. Many of the new trailers will not have restroom facilities with a central location to reduce the amount of utilities needed for the individual trailers. The restroom and shower facilities will utilize water fixtures that use auto-shutoff sink and shower hardware to minimize water usage. LED light fixtures will be utilized that abide by ASHRAE 90.1 standards in the office and shower trailers.

Plans and Projected Performance

Due to the age of the PGDP facilities and nature of the mission scope, it will be difficult to implement the Sustainable Building goals for existing facilities. There are plans to demolish 29 small buildings and trailers during FY2020.

The PGDP Site will begin construction in FY2020 on one building over 5,000 ft². The building is a 6,317 ft² Security Management Building (C-210). The Security Management building does not meet all Site sustainability requirements. However, several green building specifications are being met, such as automatic lighting controls operating light emitting diodes and high efficiency HVAC systems lowering overall energy consumption. Some of the green building features include guiding principles from the Federal Energy Management Program including building level utility metering from guiding principal 5, high efficiency water fixtures from guiding principal 7, non-irrigated landscape complying with guiding principal 8, and storm water management techniques that satisfy guiding principal 10.

There are many sustainable features utilized in the design of the C-210 Security Management Building. These features, as mentioned above, include automatic lighting controls utilizing infrared sensors that determine when a room is occupied eliminating the need to remember to turn off the lights when leaving the area. High efficiency water fixtures used in this building utilize water flow rates as specified by ASHRAE standard 189.1-2014 section 6.3.2.1. This standard requires that water fixtures comply with EPA WaterSense criteria reducing the quantity of water used by occupants. Storm water management techniques for this building site utilize erosion controls. The drainage pattern of the site after construction will be consistent with storm water drainage before the site was developed.

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Acquisition & Procurement

Performance Status

The PGDP Site Contractors have request for purchasing procedures in place describing how sustainability categories are evaluated for the item being purchased unless there is a legitimate reason why a sustainability item is not appropriate for the application. The sustainability categories reviewed include preference for energy-efficient products. All new subcontracts contain requirements for products and services to be energy-efficient when applicable.

Site Contractors use procurement processes and procedures to assess subcontract actions to maximize the supply or use of products and services that are energy efficient (ENERGY STAR or Federal Energy Management Program-registered products); water efficient; bio-based; environmentally preferable (including Electronic Product Environmental Assessment Tool-registered products); non-ozone depleting; and contain recycled content, non-toxic, or less toxic alternatives, as appropriate.

The PGDP Site had a total of 208 (SSI & FRNP - pending MCS) new contract actions during FY2019. All contracts had applicable sustainability clauses.

Table 9. FY 2019 Sustainable Acquisition (SA) Progress

FY 2019 Sustainable Acquisition (SA) Progress	
Metric	Total
Number of Eligible Contract Actions	208
Number of Contract Actions w/ SA Clauses	208
Percent of Contract Actions w/ SA Clauses	100%
Total Eligible Contract Dollars (\$)	39,667,683
Total Contract Dollars (\$) w/ Clauses	39,667,683
Percent of Contract Dollars w/ SA Clauses	100%

Plans and Projected Performance

The PGDP Site will continue to assess subcontract actions to maximize the supply or use of products and services that are energy efficient.

Measures, Funding, & Training

Performance Status

Construction has started on a new DOE/TVA substation with an anticipated completion date in FY2020. DOE is using the DOE energy conservation program to fund the new DOE/TVA substation. Payback is based on shutdown of PGDP transformers and using right sized transformers at the new location.

The ISSC is working on the design of a new distribution system of 14kV feeder cables to connect the new TVA Substation into the plant's existing 14kV distribution system, thereby bypassing the C-531 Switchyard.

The ISSC proactively suggested a design change for the C-531 Switchyard By-Pass project to route new power feeder cables via underground direct drilled borings instead of utilizing overhead cable trays. The original scope from DOE specified use of overhead cable trays. The design team realized there was an opportunity and investigated the savings potential. Utilizing directional boring provides a much quicker installation time for the feeder cables and avoids expensive elevated cable trays and T-post supports. The construction savings to DOE for the power feeder design is estimated to be approximately \$2 million.

Future Energy Independence and Security Act (EISA) 432 evaluations will be completed in conjunction with the Condition Asset Surveys which will include supplemental energy and water checks. Site personnel responsible for completing condition asset surveys have completed a DOE training course which provides a thorough understanding of the condition assessment process and includes participation in actual asset inspections.

PGDP employees were reminded in the Daily Safety Sheet, emails, and video messaging boards to get involved in energy efficiency by switching off the lights in their administrative areas at the end of the work day. The D&R Contractor completed a pollution prevention opportunity assessment of office areas after hours for the C-412 Trailer Complex, C-302, C-709, and C-102 and a total of 137 areas/rooms were observed; of the 137 rooms, there were 47 rooms (or 34%) with the lights observed "on" and 4 (or 3%) with fans observed "on." After the self-assessment a reminder was sent out to the Site to remind employees to power off equipment before they leave.

Plans and Projected Performance

Construction of the new DOE/TVA Substation will continue with an anticipated completion date in FY2020.



Travel & Commute

Performance Status

Travel and commuting sustainability goals have been a challenge for the Site due to the return of leased facilities in October 2014. When the leased facilities were returned to DOE in October 2014, the facilities and their associated workforce increased dramatically. Consideration in meeting this goal using the FY2008 baseline must be balanced against the dramatic increase in the Site workforce.

The ISSC and D&R Contractor implemented a consolidated 4 day/10 hour/day work week schedule in FY 2018 which reduced the number of work days per week from five to four. The Site saw a slight increase of 5% in commuter mileage in FY2019 compared to FY2018, due to an increase in D&R employees.

Air travel for the Site personnel was higher for FY2019 compared to FY2018 with an increase of 32% in airline GHG emissions.

Air and ground travel was increased for the Site due to an increase in off-site training for more personnel that was needed to support Site activities more efficiently.

Plans and Projected Performance

PGDP anticipates maintaining the current work schedule and does not envision any future significant changes in commuter mileage or travel. Travel between Paducah and Portsmouth, Ohio and/or Lexington, Kentucky is inherent to managing the DUF₆ project and not likely to be reduced significantly on a year to year basis.

Fugitives & Refrigerants

Performance Status

The PGDP Refrigerant 114 (R-114), Freon is contained in the C-310/315, C-331, C-333, C-335, and C-337 process building coolant systems and equipment; rail cars; and International Standards Organization (ISO) containers. The R-114 inventory calculations for the end of FY2019 indicate an ending estimated inventory of 8,540,785 lbs. From FY2018 to FY2019, there has been an estimated increase of 20,142lbs. In reality, no R-114 was added to the system. The erroneous 0.2% increase in refrigerant inventory numbers can be attributed to several different factors for example manual readings being taken by different operators, and temperature during reading.

Other fugitives and refrigerants were procured and used for recharging as part of general maintenance actions.

Plans and Projected Performance

The D&R Contractor is tasked with ensuring all of the R-114 Freon systems at the PGDP are drained and completely dispositioned within the D&R contract period of performance. As part of the deactivation of facilities, R-114 will be unloaded into compliant containers to be recycled, reused, or dispositioned as needed. Plans include identifying a pathway of recycle, reuse, or disposition from the Site that reduces the risk of significant environmental liability that the ozone depleting substance creates. While the R-114 is onsite, PGDP contractors ensure the systems and equipment, railcars, and ISO containers are tracked and leaks monitored using procedures CP4-OP-1147, *R-114 Container Inspection*, and CP4-OP-0438, *Periodic Regulatory Checks*. Servicing of the equipment is completed under CP4-OP-1146, *Operation of the R-114 Systems*, which is completed by a certified technician. All evacuations, monitoring, disposal, and recordkeeping will be performed in compliance with 40 CFR 82, Subpart F – Recycling and Emission Reduction.

As part of D&R, the R-114 Freon in C-333 is being transferred into C-337 to start minimizing energy costs in C-333. This system will eventually be air gapped and the total capacity of the Freon system will decrease.

Other fugitives and refrigerants will continue to be reported as part of general maintenance actions.

Electronic Stewardship

Performance Status

The Site electronics-related assets are acquired following Electronic Product Environmental Assessment Tool (EPEAT) guidelines, as appropriate and when available. As seen in Table 10 below, during FY2019, the Site acquired, 150 computer monitors, four desktop computers, three laptops, and 479 mobile phones that are all EPEAT Gold-certified. One scanner, 270 desktop computers, and 62 laptops were purchased that meet the EPEAT Silver requirements, and three televisions were acquired that are Energy Star-certified. The goal of 95% of eligible acquisitions each year being EPEAT-registered products was surpassed at 98% for the Site.

100% of eligible computers and imaging equipment have automatic duplexing enabled.

The Site has a datacenter at the C-100 facility and at the DUF₆ facility. The server room at C-100 is utilizing approximately 29 kilovolt-amperes of total power which represents approximately 58% of the total maximum load. The primary server infrastructure consists of approximately 24 blade servers attached to a fiber channel data storage area network.

All used electronics are reused or recycled using environmentally sound disposition options each year. During FY2019, there was an e-scrap of shipment of 22,959 lbs. to a R2 recycler.

Table 10, FY2018 Electronics Acquisition

Electronics	Total Number Acquired	EPEAT-Registered			EPEAT Compliance
		Bronze	Silver	Gold	
Computers and Displays	576	87	332	157	98%
Imaging Equipment	1		1		100%
Televisions	3				0%
Mobile Phones	479			479	100%

Plans and Projected Performance

Future electronics-related assets will be procured in accordance with DOE requirements. The electronics stewardship goals are to continue reductions of electrical consumption and increase reuse and recycling of obsolete machines and equipment. Environmentally approved vendors will be used for recycling electronics as the need arises. Electronics deemed appropriate for reuse will be made available on the GSA website, or other pre-approved avenues.

The Site will continue to evaluate efficient and environmentally sustainable printing capabilities in accordance with Environmental Order (EO) 13693 and implement best practices from DOE Guide 436.1-1, *Federal Sustainable Print Management*. The Site will continue to enable automatic duplexing capabilities on eligible equipment to ensure maintenance of the goal.

Although the current power utilization efficiency (PUE) value for the data center meets the current goal (< 1.5), evaluations will continue to be conducted to determine if improvements to the data center PUE are appropriate.

DRAFT

Resilience

Performance Status

The D&R Contractor is responsible for the overall Emergency Management and Fire Services direction and control at PGDP. The Emergency Management Program is designed to comply with federal, state, and local regulations, which include maintaining Letters or Memoranda of Agreement and relationships with off-site agencies and service providers for responding to emergencies at PGDP. The PGDP Site Emergency Management Program addresses all-hazards events, to include natural phenomena (severe weather, earthquakes, etc.), man-made and technological emergencies, through emergency plan implementing procedures and facility Emergency Actions Plans.

The implementation of Continuity of Operations (COOP) Programs, per DOE Order 150.1A, *Continuity Programs*, provides a site-specific approach to responding to all-hazards (to include climatic) emergency events. PGDP has no mechanism of anticipating climate change directly. The COOP Plan describes how PGDP mission essential functions can be performed and maintained during a continuity event, such as an earthquake or other severe natural phenomena events. The Site COOP program ensures sustained operations and performance of mission essential functions through a rigorous program of testing, training and exercising, to ensure a resilient program is maintained. Organizational elements involved in conduct and support of Site mission essential functions include emergency management, operations, emergency response organization, Continuity Emergency Response Group and continuity support subject-matter-expert personnel. The COOP plan integrates elements of standard business continuity practices and information technology disaster recovery plans within its overarching program.

The most recent National Climate Assessment from the United States Global Change Research Program states that the Southeast region of the United States may be exceptionally vulnerable to sea level rise, extreme heat events, hurricanes and decreased water availability. As Kentucky is not a coastal state, sea levels and hurricanes are not considered impacts to our region; however, our area of the region has experienced sizeable numbers of tornadoes and winter storms causing billions of dollars in damages over the past 30 year period. Increasing heat trends, while greatly impacting commercial livestock and agriculture productivity, do not adversely impact the DOE mission at the PGDP yet may result in increased wildfire activity due to lack of excess moisture in surrounding foliage.

Severe natural phenomena events are analyzed within the Site Threat and Hazards Analysis and Risk Assessment (THIRA) document. The THIRA analyzed flooding, severe weather (thunderstorms, tornadoes, high winds, etc.), and earthquakes as potential severe natural phenomena events that may impact the DOE Site. Of those events, a large-scale earthquake originating from the New Madrid Seismic Zone was determined to have the largest impact, along with subsequent cascading events, resulting in potential releases of hazardous materials and mass casualties. The THIRA included suggested additional resource allocations that may be utilized if such an event may occur.

The DOE Site is currently evaluating locations for its primary emergency operations center (EOC), as the Site mission changes to upgrade the EOC to an electronic based platform by which to track communications, notifications and command and control activities. Current discussion is centered on options available from upgrading the existing EOC and alternate EOC, to potentially building a new facility. It is important to note that this evaluation is in its initial stages and no commitments have been made as to final path forward. When implemented, the electronic EOC management system will greatly streamline and enhance overall emergency response efforts.

The Site Emergency Management Plan forms the basis of the overall Site emergency preparedness program and subsequently, forms a core element of the Site COOP program as well. As such, the resiliency of both programs, while distinct and yet integrated; both benefit greatly from the integration of the overall program plans and related implementing procedures.

Plans and Projected Performance

The PGDP Site will continue the location evaluation for its primary EOC. Annual protective action drills will continue to be completed as scheduled.