



Department of Energy

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November 30, 2023

Mr. David Ruckstuhl, Prime Contracts Manager
Four Rivers Nuclear Partnership, LLC
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PPPO-02-10026041-24B

Dear Mr. Ruckstuhl:

DE-EM0004895: APPROVAL OF DELIVERABLE NO. 94, FINAL FOUR RIVERS NUCLEAR PARTNERSHIP, LLC, SUSTAINABILITY PLAN, CP2-ES-0101/FR1

Reference: Letter from M. Redfield to M. Fultz, "Four Rivers Nuclear Partnership, LLC—For Approval—Deliverable No.94—FINAL *Four Rivers Nuclear Partnership, LLC, Sustainability Plan at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, CP2-ES-0100/FR1," (FRNP-24-7865), dated November 16, 2023

The U.S. Department of Energy reviewed and approves the Four Rivers Nuclear Partnership, LLC, Deliverable No. 94, Final *Four Rivers Nuclear Partnership, LLC, Sustainability Plan at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, CP2-ES-0100/FR1.

If you have any questions or require additional information, please contact Cynthia Zvonar at (859) 219-4066.

Sincerely,

MARCIA FULTZ
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CP2-ES-0100/FR1

**Four Rivers Nuclear Partnership, LLC,
Sustainability Plan
at the Paducah Gaseous Diffusion Plant,
Paducah, Kentucky**

CLEARED FOR PUBLIC RELEASE

**Four Rivers Nuclear Partnership, LLC,
Sustainability Plan
at the Paducah Gaseous Diffusion Plant,
Paducah, Kentucky**

Date Issued—November 2023

U.S. DEPARTMENT OF ENERGY
Office of Environmental Management

Prepared by
FOUR RIVERS NUCLEAR PARTNERSHIP, LLC,
managing the
Deactivation and Remediation Project at the
Paducah Gaseous Diffusion Plant
under Contract DE-EM0004895

CLEARED FOR PUBLIC RELEASE

APPROVALS

**Four Rivers Nuclear Partnership, LLC,
Sustainability Plan
at the Paducah Gaseous Diffusion Plant,
Paducah, Kentucky**

CP2-ES-0100/FR1

November 2023

This Sustainability Plan implements the requirements of U.S. Department of Energy (DOE) Order 436.1A, *Departmental Sustainability*, for Four Rivers Nuclear Partnership, LLC, (FRNP) at the Paducah Gaseous Diffusion Plant. This plan identifies the Deactivation and Remediation Project's plan for meeting DOE sustainability goals.

FRNP management is committed fully to the proper implementation of this plan.

Approved by:

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Date: 2023.11.16 11:28:10 -06'00'

Myrna Redfield
Program Manager

Date

DOE Approval Letter: PPPO-02-10026041-24B

Date: 11/30/2023

Effective Date: 12/11/2023

Required Review Date: 11/30/2028

Nuclear Safety Documentation: N/A per CP3-NS-2001, Step 6.1.1

REVISION LOG

REVISION NUMBER	DATE	DESCRIPTION OF CHANGES	PAGES AFFECTED
FR0	08/29/2018	Initial Issue	All
FR0	7/06/2021	In accordance with the Corrective Action Plan for CAPA CA-003116, Action Item AI-0004735 and CAPA CA-003086, Action Item AI-0004709, the periodic review date for this procedure has been extended to August 30, 2023.	1
FR0A	7/25/2023	Periodic Review has been completed with no changes identified in procedure technical content. Nonintent changes have been incorporated per CP3-NS-2001. Date for review cycle has been reset.	All
FR1	11/16/2024	Revised to update to current executive order standards and current program in line with Sustainability Performance Office guidance.	All

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ACRONYMS

CFE	carbon-free energy
COOP	Continuity of Operations Programs
D&R	deactivation & remediation
DOE	U.S. Department of Energy
DUF ₆	depleted uranium hexafluoride
EAD	Energy Asset Disposal System
EISA	Energy Independence and Security Act
EMS	Environmental Management System
EO	Executive Order
EPA	U.S. Environmental Protection Agency
FEMP	Federal Energy Management Program
FRNP	Four Rivers Nuclear Partnership, LLC
FY	fiscal year
GHG	greenhouse gas
GSA	General Services Administration
ISO	International Organization for Standardization
ISSC	Infrastructure Support Services Contractor
LED	light-emitting diode
PACRO	Paducah Area Community Reuse Organization
PGDP	Paducah Gaseous Diffusion Plant
PPPO	Portsmouth/Paducah Project Office
PUE	power utilization efficiency
REC	renewable energy certificate
SPO	Sustainability Performance Office
SSP	Site Sustainability Plan
THIRA	Threat and Hazard Identification and Risk Assessment
TVA	Tennessee Valley Authority
ZEV	zero emission vehicles

1. INTRODUCTION

The purpose of this Four Rivers Nuclear Partnership, LLC, (FRNP) Sustainability Plan is to identify FRNP's plan to meet U.S. Department of Energy (DOE) site sustainability goals for the Paducah Gaseous Diffusion Plant (PGDP). This FRNP Sustainability Plan implements the requirements of DOE Order 436.1A, *Department Sustainability*. FRNP uses the FRNP Environmental Management System (EMS), CP2-ES-0101, as a platform for Sustainability Plan implementation (FRNP 2023). EMS objectives and targets, including those related to sustainability, are addressed in the EMS. Specific EMS objectives and targets are approved by the Executive Review Board on an annual basis, such as the objectives and targets for calendar year 2023 and include specific project goals pertaining to recycle, reduction, reuse of materials, and energy efficiency, among others.

Since 2011, DOE's Sustainability Performance Office (SPO) has issued guidance documents for completing sustainability reporting requirements. The *Sustainability Dashboard User Guide* and *Site Sustainability Plan Guidance* serve as resources for data reporting and developing narrative plans. As part of site sustainability reporting, the SPO launched the sustainability dashboard (Dashboard) in the fall of 2016. The purpose of the Dashboard is to maintain historical data sets for each DOE site and national laboratory; to collect current year data, consistent with processes established in the previous fiscal year (FY) reporting cycles; and to provide DOE sustainability personnel with analytical tools for managing sustainability at each site or within each program.

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 DOE in October 2014. The task of meeting sustainability goals is a challenge due to the dramatic increase in PGDP square footage managed by the DOE since the baseline years for the individual sustainability goals. Consideration in meeting sustainability goals must be balanced against the dramatic increase in PGDP square footage, aging facilities, and eventual demolition. The current PGDP mission is to accomplish environmental remediation, waste management, depleted uranium hexafluoride (DUF₆) conversion, and decontamination and decommissioning at the DOE Paducah Site. The goal is to accelerate cleanup in order to eliminate potential environmental threats, reduce the DOE footprint, and reduce life-cycle cost.

FRNP is one of three DOE prime contractors at the DOE Paducah Site. FRNP is responsible for ongoing deactivation, surveillance, maintenance, environmental remediation activities, and sitewide utilities at PGDP. FRNP is using a multifaceted approach to implement sustainable practices and projects and increase awareness of sustainability opportunities in the workplace.

The Infrastructure Support Services Contractor (ISSC) is responsible for managing the PGDP Site Sustainability Program and for preparing the annual sitewide PGDP Site Sustainability Plan (SSP), which includes an annual progress update on meeting DOE's sustainability goals for PGDP. ISSC's responsibilities include compiling and reporting the PGDP SSP narrative and data into the DOE Dashboard, with assistance from FRNP and the DUF₆ Conversion Facility Contractor. FRNP provides sustainability narratives and data annually (early in each FY) to the ISSC for Dashboard reporting in accordance with the annual schedule published by DOE's SPO. The sustainability narrative and data (e.g., annual updates), provided by FRNP to the ISSC, are and will continue to be reviewed and approved by DOE on an annual basis. FRNP will continue to share the SSP information, data, contractor experiences, and future successes internally and externally (e.g., with other DOE PGDP contractors) as part of the PGDP SSP.

2. SUSTAINABILITY CATEGORIES

The most recent SPO guidance from DOE, *Fiscal Year 2023 Site Sustainability Plan Guidance*, dated September 2023, organized SSPs by overarching categories (rather than goals) to reduce redundancies and streamline reporting (DOE 2023). These categories are to help minimize or eliminate emissions of scope 1, scope 2, and scope 3 greenhouse gases at the Paducah Site. Scope 1 emissions include the greenhouse gas emissions from sources that are owned or controlled by DOE, such as vehicles and equipment, stationary sources, on-site landfills, wastewater treatment, and/or fugitive emissions. Scope 2 emissions include greenhouse gas emissions resulting from the generation of electricity, heat, or steam purchased by DOE. Scope 3 emissions include greenhouse gas emissions from sources not owned or directly controlled by DOE, such as business air travel, employee commuting, contracted solid waste, and/or wastewater treatment. This FRNP Sustainability Plan aligns with the FY 2023 guidance document and is consistent with the PGDP narrative reported in the Dashboard.

FRNP FY narrative and data contributions provided to ISSC are discussed in the preceding sections and correspond to the Dashboard's overarching categories. The following are the sustainability categories discussed in the sections below.

- Energy Management
- Water Management
- Waste Management
- Fleet Management
- Clean and Renewable Energy
- Sustainable Buildings
- Acquisition and Procurement
- Investments: Improvement Measures, Workforce, and Community
- Indirect Emissions
- Fugitives and Refrigerants
- Electronic Stewardship and Data Centers
- Adaptation and Resilience

3. ENERGY MANAGEMENT

The Energy Management category focuses on all energy-related topics such as greenhouse gas (GHG) emissions, energy intensity, metering, and nonfleet fuel use. The Dashboard narrative and data entry categories for this category include energy, facility metering status, Energy Independence and Security Act (EISA) Section 432 benchmarking and evaluations, non-fleet vehicles and equipment fuel, and efficiency and conservation measures. The Energy Management Category continues to be a challenge for PGDP with the October 2014 return of the facilities leased to United States Enrichment Corporation.

With the return of the previously leased facilities, the number of DOE managed facilities increased dramatically. These facilities were not part of the original FY 2008 baseline, but are now part of the DOE mission at PGDP. The addition of these facilities skews sustainability data. FRNP currently manages approximately 152 buildings, 53 trailers, and 242 other structured facilities, which include areas such as pads and yards. FRNP buildings and trailers cover almost 8 million ft². The majority of the FRNP gross square footage is attributable to the process buildings.

The Contract requires that FRNP “...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 maintained 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. In accordance with the Contract, FRNP will install and track meters for use of power, natural gas, water, and other fuels when modifications 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. Contract Deliverable No. 151 requires that FRNP provide a list annually of facility meters to be added or deleted.

CP2-ES-0104, *Energy Efficiency Plan for the Deactivation and Remediation Project, Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, has been developed and outlines how FRNP plans to meet DOE energy efficiency goals and objectives. FRNP activities and projects that have or will reduce energy usage are described in the plan (FRNP 2022a).

Specific FRNP sustainable activities that have or will reduce GHG emissions include the following:

- Implementing space utilization practices by relocating consolidating employee office areas, and maximizing teleworking opportunities;
- Using a 4-day, 10-hour work schedule, which reduces weekly commuter mileage by approximately 20%;
- Switching off lights in administrative and break areas when not in use;
- Implementing the use of new light-emitting diode (LED) bulbs for new construction and promoting the retrofitting of existing lighting to LED replacements, to the extent practicable;
- Replacing emergency lighting with LED bulbs in the C-631-1 Pump House and conducting testing to determine the reduction of electrical load on battery rooms with approximately 72% reduction demonstrated;
- Demolishing structures and trailers per contractual requirements; and
- Deactivating facilities.

Specific FRNP sustainable projects that have or will reduce GHG emissions include the following:

- 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;
- Deactivation and removal of sewage lift stations that are no longer required to support the site mission; and
- Achievement of net-zero buildings through air-gapping of utilities with subsequent deactivation and future demolition per contractual requirements.

4. WATER MANAGEMENT

The Water Management category focuses on all water-related topics such as potable and industrial water intensity, landscaping, and agricultural water consumption. The Dashboard narrative and data entry categories for this category include potable water, industrial water, EISA S432 Evaluations, and efficiency and conservation measures.

PGDP facilities are not individually metered for water usage. FRNP operates the C-611 Water Treatment Facility. FRNP 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 FY 2007 baseline. Overall potable water number metrics are significantly higher than the FY 2007 baseline due to the return of the previously leased facilities, which were not included as part of the PGDP site sustainability baseline metrics; however, when using FY 2015 as a baseline, the overall potable water usage has been reduced.

Potable water is required for the operation of plant equipment and systems, such as the plant air system. Potable water reductions are realized as leaks to the system are identified and repaired. FRNP completed a plan for optimization of the on-site sanitary water distribution system (FRNP-RPT-0154, *Plan for Optimization of the On-Site Sanitary Water Distribution System for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*), and prepared a water facility shutdown plan for the C-611 Water Treatment Plant (CP2-EN-0315, *Water Plant Facility Shutdown Plan for the Paducah Gaseous Diffusion Plant, Paducah Kentucky*). As equipment and systems cease to operate at the Paducah Site, potable water reductions will continue.

5. WASTE MANAGEMENT

The Waste Management category focuses on all waste related topics such as municipal solid waste, waste diversion, wastewater treatment, and associated GHG emissions. Dashboard data entry categories include municipal solid waste, waste diversion, and wastewater treatment.

FRNP is committed to the practice of sustainable performance, preventing pollution, and minimizing waste generation during all phases of operation. Demolition projects at the 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 debris is factored into the planning phase of projects and performed whenever possible (FRNP 2022b).

Waste streams such as paper, aluminum, activated carbon, scrap metal, and cardboard are recycled. Universal waste eligible for recycling includes batteries, aerosol cans, and bulbs. FRNP opportunities for reuse include office furniture and wooden pallets; furniture and wooden pallets have and will continue to be provided to other PGDP contractors and to the Paducah Area Community Reuse Organization (PACRO) for reuse. Examples of items transferred to ISSC for final reuse/recycle/disposal include scrap metals, boilers, heavy mobile equipment, oils, electronics, radiation detection instruments, and office furniture.

In addition to the ISSC, another excess property disposition avenue is to use PACRO, a local reuse organization who has an agreement with DOE (DOE PACRO Asset Transition Agreement, dated September 2021). Following personal property screening through the Energy Asset Disposal System (EAD), PACRO acts as the primary avenue for reuse/recycle of excess PGDP personal property for economic development. Property not accepted through EAD or by PACRO may be dispositioned to other entities in accordance with the Contract, DOE regulation, and site procedures.

Additional information regarding recycling efforts is addressed in CP2-WM-0002, *Four Rivers Nuclear Partnership, LLC, Paducah Deactivation and Remediation Project Asset Recovery and Recycling Program Personal Property Disposition Plan*.

6. FLEET MANAGEMENT

The Fleet Management category focuses on all fleet related topics such as GHG emission and fleet inventory, mileage, and fuels, including petroleum reduction and alternative fuel use. Dashboard data entry categories for Fleet Management include fleet vehicle fuel, inventory, and mileage. Fleet data is managed in the General Services Administration (GSA) Fleet Drive-Thru, the Federal Fleet Management System, and the Paducah Site Fleet Management Information Systems. Fleet management includes analysis of vehicle allocation methodology in order to control fleet size and cost, project future cost, support fleet optimization on-site, and identify zero emission vehicles (ZEV) and electric vehicle supply equipment strategies and plans specific to the Paducah Site.

Each of the PGDP contractors has its own respective fleet management program; all are responsible for requisitioning, managing, maintaining, and dispositioning DOE-owned and -leased vehicles, which includes all preventive maintenance aspects of the Site fleet. The majority of the Site fleet is made up of GSA vehicles from the regional office. While preventive maintenance is administered for all fleet vehicles, GSA vehicles are managed through vetted GSA-approved vendors.

Vehicles are replaced based on criteria that include age and/or the mileage standards that GSA has established. The Contract requires that the Deactivation and Remediation (D&R) Contractor "...transition all fleet vehicles to alternative fuel as vehicles are replaced." The pursuit of plug-in hybrid vehicles is required "where economically and operationally practical." PGDP currently has six level-two charging stations to support plug-in hybrid vehicles. Additional infrastructure will be needed to support continued replacement of vehicles with ZEV and/or plug-in hybrid. FRNP fleet vehicles are considered for replacement with alternative fuel vehicles, taking into consideration availability and their required end-use or purpose.

Because vehicle telematics became increasingly available through GSA during the FY 2023 vehicle acquisition cycle, the Site may 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 and scheduled maintenance; to identify poor driving habits, fuel usage, excessive idle time, and 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 site mission.

7. CLEAN AND RENEWABLE ENERGY

The Clean and Renewable Energy category focuses on clean and renewable energy use as a percentage of overall energy use. Dashboard data entry categories for Clean and Renewable Energy include clean and renewable energy and efficiency and conservation measures.

PGDP has had limited success in meeting clean energy targets. Power supply is readily available from the Tennessee Valley Authority (TVA) and has come at a low cost compared to the high cost of clean energy alternatives. FRNP is not responsible for purchasing power; DOE negotiates the TVA power contract and purchases power. In the past, DOE Portsmouth/Paducah Project Office (PPPO) has purchased renewable energy certificates (RECs) for PGDP and may choose to purchase RECs in the future. Due to the nature and scope of FRNP activities, clean energy opportunities are limited. Although minor in scope, FRNP is responsible for nine air monitoring stations powered by solar panels, which saves over 2,800 kWh per year. FRNP added five solar-powered golf carts to its utility vehicle fleet. The power from these solar panels can increase driving distance up to 50% while simultaneously cutting electricity use from standard battery chargers, which results in an approximate savings of 20% on electricity cost.

The Federal Energy Management Program (FEMP) carbon pollution-free electricity or carbon-free energy (CFE) resources for federal agencies provides possible opportunities for on-site CFE and storage investments. FRNP will consider the use of clean energy technology during work planning activities, as appropriate. Given the age and complexity of PGDP, FRNP will place priority on reducing energy use and cost while exploring renewable or alternative energy solutions where life-cycle cost-effective.

8. SUSTAINABLE BUILDINGS

The Sustainable Buildings category focuses on sustainable building-related topics such as high performance sustainable buildings, Net-Zero, and building inventory changes and design. The Dashboard data entry categories for sustainable buildings consist of sustainable buildings, facility goal category, and building inventory change and design. A net-zero emissions building portfolio by 2045, including a 50% emissions reduction by 2032, was set by Executive Order (EO) 14057, *Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability*. Beginning in FY 2022 and thereafter, all new construction of buildings greater than 25,000 gross ft² that enter the planning process shall be designed to achieve energy net-zero and, where feasible, water or waste net-zero by FY 2030. Net-zero emission buildings are energy-efficient, all-electric buildings that, when connected to on-site renewable energy or a regional grid, provide 100% CFE on a net annual basis. These buildings sufficiently provide an annual balance of zero Scope 1 and Scope 2 emissions.

PGDP currently is undergoing deactivation, demolition, and remediation. Due to the life-cycle of existing FRNP facilities along with the cost to make existing facilities net-zero buildings, D&R Contractor facilities will become net-zero buildings through air-gapping of utilities with subsequent deactivation and demolition.

9. ACQUISITIONS AND PROCUREMENT

The Acquisitions and Procurement category focuses on nonelectronic acquisitions, procurement, and GHG supply chain topics. The Dashboard data entry category for acquisitions and procurement consists of

sustainable contract review. The corresponding sustainability goal promotes sustainable acquisition and procurement to the maximum extent practicable, ensuring BioPreferred and biobased provisions and clauses are included in 95% of applicable contracts.

EO 14057, *Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability*, requires that sites promote sustainable acquisition and procurement by ensuring that environmental performance and sustainability factors are included to the maximum extent practicable for all applicable procurements in the planning, award, and execution phases of an acquisition by meeting statutory mandates that require purchase preference for recovered content products. The products are identified by one or more of the following:

- The U.S. Environmental Protection Agency (EPA) Comprehensive Procurement Guideline program;
- The U.S. Department of Agriculture BioPreferred Program;
- The ENERGY STAR energy-efficient products list;
- DOE FEMP-designated energy- and water-efficient products list; and
- The EPA Significant New Alternatives Policy program list of products that are made with or contain acceptable alternatives to ozone-depleting substances.

FRNP will use the procurement process and procedures to assess subcontract actions to maximize the supply or use of products and services that are energy efficient (ENERGY STAR or FEMP-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.

10. INVESTMENTS: IMPROVEMENT MEASURES, WORKFORCE AND COMMUNITY

The Investments: Improvement Measures, Workforce, and Community category focuses on topics relating to efficiency and conservation measure, performance contracts, other funding mechanisms, and training and education. The Dashboard narrative and data entry categories include life cycle cost-effective efficiency and conservation measures, appropriations/direct obligations, and training and education on sustainability and climate literacy. CP2-ES-0104, *Energy Efficiency Plan for the Deactivation and Remediation Project, Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, discusses the opportunities for energy savings. The annual site facility occupation status report (Contract Deliverable No. 146) has identified the goal to reduce the number of occupied facilities by 20% over the Contract baseline period of performance. Through facility deactivation and utility optimization efforts, including reduction in site footprint through the removal of small structures and trailers, utility usage reductions will continue.

11. INDIRECT EMISSIONS

The Indirect Emissions category focuses on all travel related topics such as Scope 3 GHG emissions, air travel, ground travel, and commuting. The Dashboard narrative and data entry categories include air travel,

ground travel, and commute. The Sustainability Goal for this category is a 25% Scope 3 GHG reduction by FY 2025 from a FY 2008 baseline.

The PGDP 25% Scope 3 GHG reduction by FY 2025 from a FY 2008 baseline will be challenging, if not impossible, to attain. Travel and commuting sustainability goals are a challenge for PGDP 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 must be balanced against the dramatic increase in the PGDP workforce, which is managed as part of DOE Sustainability efforts.

The FRNP workforce uses a 4-day, 10-hour work schedule, which reduces commuter mileage by approximately 20%. FRNP minimizes GHG emissions from business travel through authorization procedures, such as specifying that intermediate-size, or smaller rental vehicles are to be used unless there are groups of four or more traveling.

FRNP has determined that, for the Paducah Site, there is the potential applicability of 12 of the 15 Scope 3 categories. These categories are the following:

- Purchased goods and services;
- Capital goods, fuel- and energy-related activities (not included in Scope 1 or Scope 2);
- Upstream transportation and distribution;
- Waste generated in operations;
- Business travel;
- Employee commuting;
- Upstream leased assets;
- Downstream transportation and distribution;
- Processing of sold products;
- End-of-life treatment of sold products; and,
- Investments.

Currently, the Paducah Site tracks business travel, employee commuting, upstream leased assets, and waste generated in operations. Due to the nature of the Paducah Site mission with environmental remediation and deactivation, it would be challenging to calculate several of the applicable Scope 3 categories.

Due to the nature and mission of the Paducah Site, reducing emissions from waste management sites will be challenging due to the methods of transport and treatment needed on specific types of waste. The consolidation of waste to reduce the number of shipments needed will help with the reduction of emissions. Site emissions may be reduced due to waste management if an on-site waste disposal facility is constructed. Most waste shipments would no longer need to be transported long distances and a significant reduction in shipments would help reduce emissions.

Most wastewater on-site is handled by the on-site C-615 Wastewater Treatment Plant. If a wastewater contractor is utilized, minimization of vehicle idling and time on-site would help to reduce emissions. There are opportunities to flow down increased emission reduction activities through contractual actions such as reporting on sustainable acquisition.

12. FUGITIVES AND REFRIGERANTS

The Fugitives and Refrigerants category focuses on the emissions of fugitive gases and refrigerants. The Dashboard narrative and data entry category is fugitives and refrigerants.

Inventories of 1,2-dichlorotetrafluoroethane (R-114) at the Paducah Site originally were estimated to be 8.5 million lb. The R-114 in the C-331, C-310, and C-333 facilities was transferred to the C-335 and C-337 facilities to eliminate surveillance and maintenance requirements and fugitive emissions in C-331, C-310, and C-333. In addition, the C-333 R-114 system has been isolated (air-gapped) from other R-114 systems. R-114 is contained in the C-335 and C-337 process building coolant systems and equipment, railcars, and International Organization for Standardization (ISO) containers.

FRNP is tasked with ensuring all R-114 systems at PGDP are drained and completely dispositioned within the FRNP Contract period of performance. As part of the deactivation of facilities, R-114 will be unloaded into compliant containers to be dispositioned as needed. Currently, R-114 is being processed at an off-site treatment and disposal facility. PGDP has shipped approximately 4.25 million lb of R-114 for destruction through the end of FY 2023. The remaining inventory of R-114 will be sent for destruction through the end of FY 2025, based on available funding.

While R-114 is on-site, PGDP contractors ensure that the systems and equipment, railcars, and ISO containers are tracked and leaks are monitored using compliant procedures and are 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.

Other fugitives and refrigerants are reported as part of general maintenance actions.

13. ELECTRONICS STEWARDSHIP AND DATA CENTERS

The Electronics Stewardship category focuses on all electronics-related topics such as acquisitions, operations, end-of-life disposal strategies, and data centers. The Dashboard narrative and data entry categories include electronics acquisition, electronics operations, electronics end-of-life, and data centers.

FRNP does not operate any data centers. The ISSC is responsible for providing, maintaining, and operating the Local Area Networks and Wireless Local Area Networks. Services include maintenance and repair of the PGDP IT infrastructure. The Paducah Site has one datacenter located at the C-100 Administration Building. The server room at C-100 utilizes approximately 36 kilovolt-amperes of total power, which represents approximately 45% of the total maximum load. The primary server infrastructure is a virtual environment that consists of 45 physical hosts that use hyper-converged storage for production, virtual desktop, and backup infrastructure.

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. In an effort to expand the power capacity within the server room, a new uninterruptible power supply has been installed in the server room, which provides improved power efficiency.

FRNP's electronics stewardship goals are to help reduce electrical consumption and increase reuse and recycling of obsolete machines and equipment. Specific FRNP actions to help meet the goals for electronics stewardship include the following:

- Monitors and computers, after a set time, drop into a hibernate state;
- Used electronics are reused or recycled using environmentally sound disposition options;
- Eligible printers are set to default to duplex printing capabilities;
- Electronics-related assets will be acquired following Electronic Product Environmental Assessment Tool guidelines when available;
- Environmentally approved vendors will be used for electronics recycling as the need arises; and
- Electronics deemed appropriate for reuse will be placed on the GSA website, or other pre-approved avenues.

14. ADAPTATION AND RESILIENCE

The Adaptation and Resilience Category focuses on resilience strategies and procedures that identify and respond to events with the potential to disrupt, strain, compromise, or eliminate DOE activities or facilities. The Dashboard narrative and data entry categories for this include the climate resilience status questionnaire.

The implementation of Continuity of Operations Programs (COOP), per DOE Order 150.1B, *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 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 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, and continuity 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 indicates 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 as impacts to the Western Kentucky region; however, the region has experienced a sizeable number of tornadoes and winter storms, which caused 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 PGDP, but 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 Hazard Identification and Risk Assessment (THIRA) document. The THIRA analyzed flooding, severe weather (e.g., thunderstorms, tornadoes, high winds), and earthquakes as potential severe natural phenomena events that may impact the DOE Paducah Site. Of those events, a large-scale earthquake originating from the New Madrid Seismic

Zone, along with the subsequent cascading events, was determined to have the largest impact, which may result in potential releases of hazardous materials and mass casualties. The THIRA included suggested additional resource allocations that may be utilized if such an event occurs.

FRNP is responsible for the overall Emergency Management and Fire Services direction and control at PGDP. The FRNP 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 FRNP Paducah Site Emergency Management Program addresses extreme and changing weather conditions and events through procedures and Emergency Actions Plans.

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. As such, the resiliency of both programs, while distinct and yet integrated, benefit greatly from the integration of the overall program plans and related implementing procedures.

An assessment of climate vulnerability was developed using observed and projected climate data at the Paducah Site. The data was used to define various threats (i.e., heat waves, cold waves, lightning, tornadoes) and used to gauge the current and future threats to site assets. Most assets are threatened to a degree by current weather events such as heavy rain and tornadoes. More damaging are heat waves, ice storms, lightning, and wildfires. Assets affected by these types of events received the highest vulnerability ratings.

The risk matrix identified outside workers, on-site waste disposal, site buildings, and site transportation as having high risk to climate change. Heat waves (as currently defined) are expected to become more common by the end of the century, with consequent disruptions to site operations as site managers struggle to keep buildings cool and outdoor workers safe. Lightning can endanger outdoor workers and damage buildings. Both tend to be mitigated by existing procedures that require workers to avoid excess time outdoors during hot or stormy periods, reliable air conditioning, and grounding buildings to DOE standards.

15. REFERENCES

- DOE (U.S. Department of Energy) 2023. *Fiscal Year 2023 Site Sustainability Plan Guidance*, U.S. Department of Energy, September.
- FRNP (Four Rivers Nuclear Partnership, LLC) 2020a. *Plan for Optimization of the On-Site Sanitary Water Distribution System for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, FRNP-RPT-0154, Four Rivers Nuclear Partnership, LLC, Paducah, KY, September.
- FRNP 2020b. *Heating and Cooling Service Replacement Plan for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, FRNP-RPT-0144, Four Rivers Nuclear Partnership, LLC, Paducah, KY, September.
- FRNP 2020c. *Water Systems Hydraulic Model and Report for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, FRNP-RPT-0119, Four Rivers Nuclear Partnership, LLC, Paducah, KY, July.
- FRNP 2022a. *Energy Efficiency Plan for the Deactivation and Remediation Project, Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, CP2-ES-0104/FR1A, Four Rivers Nuclear Partnership, LLC, Paducah, KY, December.

FRNP 2022b. *Four Rivers Nuclear Partnership, LLC, Paducah Deactivation and Remediation Project Asset Recovery and Recycling Plan*, CP2-WM-0002/FR6, Four Rivers Nuclear Partnership, LLC, Paducah, KY, September.

FRNP 2023. *Environmental Management System for the Deactivation and Remediation Project*, CP2-ES-0101/FR4A, Four Rivers Nuclear Partnership, LLC, Paducah, KY, January.