U.S. DEPARTMENT OF ENERGY CLIMATE ADAPTATION PLAN

2024-2027

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Cover photos (clockwise from top): Las Conchas Fire (2011) in New Mexico, which impacted Los Alamos National Laboratory Operations; Record-breaking precipitation event in February 2019 which impacted the Oak Ridge Reservation operations in Tennessee; Major ice storm in Western Area Power Administration's Sierra Nevada region in January 2017.

Executive Summary

The Department of Energy (DOE) is committed to lead by example in Federal efforts to manage the short- and long-term effects of climate change and extreme weather on its mission, policies, programs, and operations. In 2021, DOE issued the Climate Adaptation and Resilience Plan (CARP) to meet the goals of Executive Order (E.O.) 14008, *Tackling the Climate Crisis at Home and Abroad*, and to make climate adaptation and resilience an essential element of the work at DOE. The CARP established the requirement for DOE sites to develop Vulnerability Assessment and Resilience Plans (VARPs) to understand their risks and the resilience actions necessary to mitigate the impacts of climate change. During this process, sites identified critical assets, analyzed historic climate events and damages, projected future climate hazards and risks, and developed a set of resilience solutions.

The VARP process identified DOE's most vulnerable asset categories to be site buildings, mission critical equipment, and energy generation and distribution systems. DOE identified wildfire, heat waves, and precipitation as the most impactful climate risks. DOE is focused on increasing the resilience of our facilities and operations. DOE sites have identified, planned, and implemented building modifications to enhance resilience. Where appropriate, DOE plans to use performance contracting to accomplish resilience solutions involving larger equipment upgrades. DOE sites are also considering how to leverage communication, training, and process updates to keep workplaces safe for employees during extreme weather events.

To institutionalize climate adaptation and resilience at the Department, DOE revised two internal directives in 2023. First, DOE issued the revised Order 436.1A, *Departmental Sustainability*. The Order directs the Department to implement an approach that increases adaptation and resilience to the impacts of climate change; conserves and restores ecosystems and preserves native landscapes, watersheds, and biodiversity, and delivers environmental justice. The Order also directs DOE to engage with Tribal authorities where DOE operations may affect Tribal cultural resources or lands of ancestral, ceremonial, or other Tribal significance. DOE Order 413.3B, *Program and Project Management for the Acquisition of Capital Assets*, now includes requirements to adopt practical measures to incorporate clean energy sources, climate adaptation, resilience, and sustainability early in the design where total project cost is greater than $50 million (M). The revisions of Orders 436.1A and 413.3B were accomplished though integrated project teams representing diverse program and staff offices. Together, these Orders provide the drivers for climate adaptation and resilience.

To promote climate awareness across the Department, DOE created Introduction to Climate Change (Climate 101). The course is made up of three lessons: Climate Change Overview, Impacts of Climate Change, and Responses to Climate Change. Climate 101 includes case studies from DOE sites to help employees understand how climate change impacts the DOE mission and the work of all employees. The Department is also increasing climate change awareness by hosting webinars for management and staff. The cross-functional nature of climate action is a key message in DOE's climate policy. Through this Climate Adaptation Plan, DOE reinforces the importance of cross-functional support for climate adaptation and resilience.

Through its Climate Adaptation Plan, the Department is also able to advance environmental justice as part of its mission, consistent with E.O. 14008 and with E.O. 14096 on *Revitalizing Our Nation's Commitment to Environmental Justice for All*. As the Department implements its Climate Adaptation Plan to increase the resilience of its facilities and operations, the agency will use its best efforts to, as appropriate and consistent with applicable law: address disproportionate and adverse environmental and health effects (including risks) and hazards, including those related to climate change and cumulative impacts of environmental and other burdens on communities with environmental justice concerns; and, provide opportunities for the meaningful engagement of persons and communities with environmental justice concerns.

In addition, as a member of the White House Environmental Justice Interagency Council, the Department received recommendations on Climate Planning, Preparedness, Response, Recovery and Impacts from the White House Environmental Justice Advisory Council (WHEJAC). The report includes many recommendations that are relevant to the work of the Department. The Department is reviewing the recommendations and, as appropriate and to the maximum extent permitted by law, is taking steps to address the WHEJAC's recommendations.

05/31/2024

Jennifer Granholm
Secretary of Energy

Date

Department of Energy

2024-2027 Climate Adaptation Plan

Section 1: Agency Profile - Department of Energy

Agency Profile	
Mission	The mission of the Energy Department is to ensure America's security and prosperity by addressing its energy, environmental, and nuclear challenges through transformative science and technology solutions.
Adaptation Plan Scope	Office of the Under Secretary for Nuclear Security and National Nuclear Security Administration, Office of the Under Secretary for Science and Innovation, Office of the Under Secretary for Infrastructure, Office of Management, Office of Environment, Health, Safety, and Security, Office of Energy Justice and Equity, Office of Environmental Management, Office of Legacy Management, Office of Indian Energy Policy and Programs, Office of the Chief Human Capital Officer, Office of the Chief Financial Officer, Office of Project Management, Office of the General Counsel, Assistant Secretary for Congressional & Intergovernmental Affairs
Agency Climate Adaptation Official	Ingrid Kolb, Office of Management
Agency Risk Officer	James Owendoff, Office of the Chief Financial Officer
Point of Public Contact for Environmental Justice	Samuel Herbert, Office of Energy Justice and Equity
Owned Buildings	12,602 buildings with 112,649,202 square feet *(2022 snapshot from DOE Facility Information Management System)*

Leased Buildings	83 buildings with 3,743,536 rentable square feet[1] *(2022 snapshot from DOE Facility Information Management System)*
Employees	Federal FTE: 13,654 *(Office of Personnel Management Enterprise Human Resource Integration (2022 data))* Contractor support: 124,460 *(Contractor data from iBenefits (2022 data))* Total: 138,114
Budget	FY22 Enacted: $44.3 billion (*PL 117-103*) FY23 Enacted: $47.8 billion (*PL 117-328*) FY24 Enacted: $ 50.23 billion (*PL 118-42*) FY25 President's Budget: $51 billion (*Budget of the U.S. Government Fiscal Year 2025*)
Key Areas of Climate Adaptation Effort	Office of the Under Secretary for Nuclear Security and National Nuclear Security Administration, Office of the Under Secretary for Science and Innovation, Office of the Under Secretary for Infrastructure, Office of Management, Office of Environment, Health, Safety, and Security, Office of Environmental Management

The Department of Energy (DOE) is committed to leveraging skills and expertise across the agency to build adaptive capacity and resilience. DOE used a collaborative and cross-functional approach to develop our 2021 Climate Adaptation and Resilience Plan (CARP). The CARP development team included over 70 people from across various DOE program and staff offices, as well as DOE sites. The CARP has set the foundation for DOE's climate adaptation and resilience work over the last three years.

The CARP established a requirement for all DOE sites to develop a Vulnerability Assessment and Resilience Plan (VARP). The first step of the VARP process was to identify the VARP planning team. DOE's VARP guidance suggested the inclusion of energy programs, research and development, business continuity, emergency management, site planning, procurement, and the environmental management system team. The goal of using a cross-functional team was to achieve a holistic view of risks and hazards and their impacts on the mission at a site. The

[1] Number of facilities and square footage only includes leases made by the department directly and not leases made through the management and operating (M&O) contractors.

resulting VARP includes a portfolio of resilience solutions, which provides information for long term site planning and budget formulation to enhance resilience of the site.

DOE also used a cross-functional integrated project team to update DOE Order 436.1A, *Departmental Sustainability* (April 2023), to include climate adaptation and resilience. The responsibilities section of DOE O 436.1A establishes the roles of the Deputy Secretary, Chief Sustainability Officer, Chief Information Officer, Chief Financial Officer, and Senior Procurement Executive, among other leadership roles, in ensuring the implementation of the directive. Through DOE O 436.1A, the Department will integrate climate adaptation and resilience into all aspects of the organization.

In October 2023, DOE held its first Sustainability Summit to showcase progress and plans to achieve the Department's sustainability and climate goals. The Summit included a progress report on the 2021 CARP, a summary of the VARP findings, and demonstrations of climate tools and their applications at DOE sites. DOE Headquarters, Program Office, Site Office, and Site staff participated in knowledge sharing. DOE plans to hold a Sustainability Summit annually to continue sharing climate adaptation best practices, methods, and tools across DOE.

DOE is also using climate literacy as a tool to build adaptive capacity at the agency. In June 2023, DOE released an Introduction to Climate Change (Climate 101) course to build climate awareness across the Department. The course uses examples from DOE to show impacts of climate on DOE mission and operations, as well as DOE's responses to climate change. The course encourages DOE employees to assess how climate change will affect their ability to meet DOE's mission and provides examples of how to integrate climate action and resilience in their work.

Section 2: Risk Assessment

DOE used the Federal Climate Mapping for Resilience and Adaptation Application (Federal Mapping App)— which was developed for federal agencies by the White House Council on Environmental Quality (CEQ) and the National Oceanic and Atmospheric Administration (NOAA) to conduct a high-level screening of climate hazard exposure for federal facilities and personnel. In addition to this high-level screening, DOE used information from DOE site's Vulnerability Assessment and Resilience Plans (VARPs). VARPs assess sites climate risks and explain the resilience actions necessary to mitigate the impacts of climate change. In this process, sites identified critical assets, analyzed historic climate events and damages, projected future climate hazards and risks using Representative Concentration Pathways (RCP) 4.5 and 8.5, and developed a set of resilience solutions.

DOE assessed the exposure of its buildings; employees; and lands, waters, and cultural and natural resources to five climate hazards: extreme heat, extreme precipitation, sea level rise, flooding, and wildfire risk.

Hazard	Description	Scenario	Geographic Coverage
Extreme Heat	Measured as whether an asset is projected to be exposed to an increased number of days with temperatures exceeding the 99th percentile of daily maximum temperatures (calculated annually), calculated with reference to 1976-2005. Data are from high-resolution, downscaled climate model projections based on the Localized Constructed Analogs (LOCA) dataset prepared for the 4th National Climate Assessment.	RCP 4.5	CONUS
		RCP 8.5	CONUS
Extreme Precipitation	Measured as whether an asset is projected to be exposed to an increased number of days with precipitation amounts exceeding the 99th percentile of daily maximum precipitation amounts (calculated annually), with reference to 1976-2005. Data are from high-resolution, downscaled climate model projections based on the LOCA dataset prepared for the 4th National Climate Assessment.	RCP 4.5	CONUS
		RCP 8.5	CONUS and AK
Sea Level Rise	Measured as whether an asset is within the inundation extents from NOAA Coastal Digital Elevation Models and the 2022 Interagency Sea Level Rise Technical Report. Intermediate and Intermediate-High sea level rise scenarios used as proxies for RCP 4.5 and 8.5, respectively.	RCP 4.5	CONUS and PR
		RCP 8.5	CONUS and PR
Wildfire Risk	Measured as whether an asset is in a location is rated as high, very high, or extreme risk based on the U.S. Forest Service Wildfire Risk to Potential Structures (a data product of Wildfire Risk to Communities), which estimates the likelihood of structures being lost to wildfire based on the probability of a fire occurring in a location and likely fire intensity. Data reflects wildfires and other major disturbances as of 2014.	Historical	All 50 States
Flooding	Measured as whether an asset is located within a 100-year floodplain (1% annual chance of flooding) or 500-year floodplain (0.2% annual chance of flooding), as mapped by the Federal Emergency Management Agency National Flood Hazard Layer.	Historical	All 50 States and PR

Climate Data Used in Agency Risk Assessment

Exposure to extreme heat, extreme precipitation, and sea level rise were evaluated at mid- (2050) and late-century (2080) under two emissions scenarios, RCP 4.5 and RCP 8.5. Exposure to flooding and wildfire risk were only evaluated for the present day due to data constraints.

Climate Scenarios Considered in Agency Risk Assessment

Scenario Descriptor		Summary Description from 5th National Climate Assessment
RCP 8.5	Very High Scenario	Among the scenarios described in NCA5, RCP 8.5 reflects the highest range of carbon dioxide (CO_2) emissions and no mitigation. Total annual global CO_2 emissions in 2100 are quadruple emissions in 2000. Population growth in 2100 doubles from 2000. This scenario includes fossil fuel development.
RCP 4.5	Intermediate Scenario	This scenario reflects reductions in CO_2 emissions from current levels. Total annual CO_2 emissions in 2100 are 46% less than the year 2000. Mitigation efforts include expanded renewable energy compared to 2000.

Additional details about the data used in this assessment are provided in Appendix A.

2A. Climate Hazard Exposures and Impacts Affecting Federal Buildings

Indicators of Exposure of Buildings to Climate Hazards	RCP 4.5 2050	RCP 4.5 2080	RCP 8.5 2050	RCP 8.5 2080
Extreme Heat: Percent of buildings projected to be exposed to more days with temperatures exceeding the 99th percentile of daily maximum temperatures (calculated annually) from 1976-2005	100%	100%	100%	100%
Extreme Precipitation: Percent of buildings projected to be exposed to more days with precipitation amounts exceeding the 99th percentile of daily maximum precipitation amount (calculated annually) from 1976-2005	100%	100%	100%	100%
Sea Level Rise: Percent of buildings projected to be inundated by sea level rise	<1%	<1%	<1%	<1%
	High Risk	**Very High Risk**		**Extreme Risk**
Wildfire: Percent of buildings at highest risk to wildfire	9%	6%		<1%
	100- or 500- year floodplain			
Flooding: Percent of buildings located within floodplains	2%			

Department of Energy (DOE) sites developed VARPs to understand their risks and the resilience actions necessary to mitigate the impacts of climate change. In this process, sites identified critical assets, analyzed historic climate events and damages, projected future climate hazards

and risks, and developed a set of resilience solutions. More information is available in the Appendix A.

DOE used the VARP process to identify DOE's most vulnerable asset categories to be site buildings, mission critical equipment, and energy generation and distribution systems. DOE also identified wildfire, heat waves, and precipitation as the most impactful climate risks. The findings from the VARP process are consistent with the findings of CEQ's Federal Mapper App.

DOE has facilities in nearly every region in the United States. DOE identified regional variation in the impact of climate on DOE assets. For example, sites in the Midwest are projected to experience increased drought and extreme weather, while the Northeast, Southeast, and Southern Great Plains sites are projected to experience increased heat waves and storm activity. The Northwest and Southwest sites are projected to experience increased heat, extreme precipitation, and wildfire. Coastal facilities, particularly along the Gulf and East Coast are projected to experience a combination of more extreme storm events such as hurricanes, along with sea level rise and storm surge. Based on historical events and climate projections, the most at-risk regions for DOE are the Northwest, Southwest, and Southeast.

The results of the VARP process and Federal Mapper App confirm that DOE site buildings are vulnerable to the effects of climate change, particularly wildfire, and increasing temperature and precipitation. These impacts have a direct impact on DOE's ability to accomplish our mission. High temperatures can pose risks to outdoor workers' health and hinder productivity. Wildfires have the potential not only to damage or destroy buildings but also to disrupt critical services such as power, gas, communications, transportation, and water supply. Climate change information projects these impacts to worsen through many locations through the year 2080 impacting future operational capability of DOE missions and operations. Adaptation and resilience solutions for buildings will be explored in part three of this plan.

2B. Climate Hazard Exposures and Impacts Affecting Federal Employees

Indicators of Exposure of Employees to Climate Hazards	RCP 4.5 2050	RCP 4.5 2080	RCP 8.5 2050	RCP 8.5 2080
Extreme Heat: Percent of employees duty-stationed in counties projected to be exposed to more days with temperatures exceeding the 99th percentile of daily maximum temperatures (calculated annually), from 1976-2005	100%	100%	100%	100%
Extreme Precipitation: Percent of employees duty-stationed in counties projected to be exposed to more days with precipitation amounts exceeding the 99th percentile of daily maximum precipitation amount (calculated annually), from 1976-2005	100%	100%	100%	100%
Sea Level Rise: Percent of employees duty-stationed in counties projected to be inundated by sea level rise	2%	2%	2%	2%

	High Risk	Very High Risk	Extreme Risk
Wildfire: Percent of employees duty-stationed in counties at highest risk to wildfire	17%	<1%	<1%

The DOE workforce is primarily made up of management and operating (M&O) contractors, who are not included in the Office of Personnel Management data used in the Federal Mapper App. As is shown in the Agency Profile in Section 1, DOE's workforce is composed of about 10 percent Federal FTEs and about 90 percent contractors. Although M&O contractors were not included in the personnel data analyzed in the above table, these staff work onsite with DOE Federal personnel, so their locations are generally represented in this analysis. Additionally, site VARPs included site workforce (Federal FTEs and M&O contractors) as an asset to be assessed for vulnerability, providing supplemental information for a more accurate picture of the vulnerability of DOE's site workforce to climate change.

As part of the VARP process, the Southwest and Hawaii regions identified their site workforces as one of their most vulnerable assets. In the Southwest region, the site workforce was found to be vulnerable to wildfire, as well as cold waves, a climate hazard not included in the Federal Mapper App analysis.

The results of VARP process and Federal Mapper App show that the DOE workforce is vulnerable to the effects of climate change, particularly flooding, wildfire, and increasing temperature and precipitation. Any impacts on DOE's workforce have a direct impact on the ability to accomplish the mission. Power outages caused by extreme storms or extreme heat can impact employee safety. Poor air quality from wildfire smoke can lead to respiratory issues in the workforce. Adaptation and resilience solutions to build resilience in DOE's workforce will be explored in section three of this Plan.

2C. Climate Hazard Exposures and Impacts Affecting Federal Lands, Waters and Cultural Resources

The impacts to DOE sites mentioned in 2A. and 2B. address the climate hazard impacts to DOE's lands and waters. Cultural resources were included as an asset in the VARP process. Below are examples of DOE cultural resources which were identified as being exposed to climate change in VARPs. More information on the policies and procedures for the management of cultural resources in the face of climate change are available in section 3a.

Federal Asset	Current Climate Hazard Impact or Exposure	Future Climate Hazard Impact or Exposure
Archaeological sites, historic structures, and traditional cultural properties	Wildfire could damage archaeological sites, historic structures, and traditional cultural	Wildfire threat is projected to increase

	properties.	
Archaeological sites, historic structures, and traditional cultural properties	Flooding could damage archaeological sites, historic structures, and traditional cultural properties.	Flooding threat is projected to increase
Archaeological sites, historic structures, and traditional cultural properties	Heavy precipitation could damage archaeological sites, historic structures, and traditional cultural properties.	Heavy precipitation threat is projected to increase.

2D. Climate Hazard Exposures and Impacts Affecting Mission, Operations and Services

SUMMARY OF KEY CURRENT AND PROJECTED CLIMATE HAZARD IMPACTS AND EXPOSURES		
Area of Impact or Exposure	Identified Climate Hazard	Description
DOE sites in the Southwest have experienced an increase in wildfires resulting in damage and disruption of operations that contribute to the mission. Wildfires have had the greatest impacts on site workforce and energy generation, transmission, and distribution systems.	Wildfire	Wildfire events have increased in duration, intensity, and frequency because of climate change. DOE has many sites located in the Southwest which experience wildfires often. These wildfires have caused damage to site buildings, land ecology, and forced facilities to shut down. Since 2000, wildfires in the southwest resulted in over $300M in damages.
DOE's sites in the Southwest have increasingly dealt with heat waves which have greatly impacted energy generation, transmission, and distribution systems, mission-critical equipment, and water and wastewater	Extreme Heat	While heat waves have not caused as much physical damage to DOE sites as wildfires and flooding have, they still have a large impact on sites. Heat waves have shifted outdoor worker schedules for safety reasons.

systems.		They have also overwhelmed building heating, ventilation, and air conditioning (HVAC) systems and water and wastewater systems. Heat waves have also applied increased pressure on mission-critical equipment and energy generation, transmission, and distribution systems. Heat and drought-related electricity spikes further exacerbate the energy and water feedback loop.
DOE has sites along the Gulf and East Coasts which are subject to sea level rise.	Sea Level Rise	Sea level rise has yet to affect DOE sites in a significant way. In the Northeast, DOE has sites that are located on the coast which could be subject to flooding caused by climate change induced sea level rise. Flooding could impact buildings and other infrastructure, causing damages and closures which would restrict the site missions.
DOE sites have been impacted by flooding related to heavy precipitation events and storms.	Flooding	DOE sites have been minimally affected by coastal or riverine flooding, but many have experienced flooding resulting from heavy storms and precipitation (e.g., atmospheric rivers in California). DOE sites hit by hurricanes or heavy precipitation have seen landslides which obstruct access to sites and destroy roads, as well as increase building mold and building flooding.

DOE's sites in the Midwest, Southwest, Southeast, Southern Great Plains, and Northwest have all been impacted by heavy precipitation because of climate change. Extreme precipitation events have had the largest impact on site buildings, site workforce, and water and wastewater systems.	Extreme Precipitation	Heavy precipitation events have caused flooding in DOE buildings and landslides which have caused damage to buildings and resulted in access disruptions.

Climate change has impacted DOE's ability to execute the mission. Since 2000, DOE sites reported 31 separate significant events each costing the Department over $1M with an aggregated cost of $518M. These major damages have impacted DOE's mission and affected a range of sites, operations, and infrastructure. For example, the Cerro Grande wildfire in New Mexico resulted in over $300M dollars in damages in 2000, with 7,500 acres of property burned; a 14-day operational shutdown; 45 buildings lost, 67 damaged, and 237 faced impacted operational readiness. In addition to the individual events that exceeded $1M in costs, sites indicated that there were many more events costing less than $1M in damages that were not reported in the VARPs. The aggregated cost value does not include these smaller and more frequent damages and impacts associated with climate change and extreme weather.

Although climate risks vary on a regional basis, the top climate risks facing the DOE complex are wildfire, heat waves, and extreme precipitation events. Sites in the Midwest are projected to experience increased drought and extreme weather, while the Northeast, Southeast, and Southern Great Plains sites may experience increased heat waves and storm activity. The Northwest and Southwest sites are projected to experience increased heat, extreme precipitation, and wildfire. Coastal facilities, particularly along the Gulf and East Coast may experience a combination of more extreme storm events such as hurricanes, along with sea level rise and storm surge. Based on historical events and climate projections, the most at-risk regions for DOE are the Northwest, Southwest, and Southeast.

When averaged across Northeast sites, tornadoes, ice storms, hurricanes, and winter weather received the highest risk scores across all asset categories. Additionally, lightning, and riverine flooding have severe effects on certain asset categories such as lightning effects on IT & telecom systems that are considered extremely vulnerable to lightning. On average, the highest at-risk asset categories in the region are IT & telecom, site buildings, and energy generation, transmission, and distribution systems.

In the Southeast, ice storms have the highest level of risk but only effect a few critical asset groups including site buildings, energy generation, transmission, and distribution systems, and IT & telecom systems. In contrast, heat waves and precipitation received high risk scores and impact nearly every asset category. Heat waves have an especially strong effect on water &

wastewater systems in the region. Risks from hazards such as lightning, hurricanes, and drought can also significantly impact specific asset groups. For example, site buildings and energy generation, transmission, and distribution systems received a high-risk score as it relates to lightning. Energy generation, transmission, and distribution systems, supply chains, and meteorology, security, and emergency equipment are the most at-risk assets in this region.

In the Midwest, tornados, riverine flooding, ice storms, and heat waves are the top climate risks of concern. Ice storms only impact a few asset categories, such as mission critical equipment and energy generation, transmission, and distribution systems. Based on the average site risk scores, mission critical equipment assets are the most vulnerable to all hazards, followed by energy generation, transmission, and distribution systems and site buildings.

In the Northern Great Plains region riverine flooding, strong wind, wildfire, precipitation, tornado, drought, winter weather, and lightning are currently the most critical risks to DOE sites. As climate change continues, riverine flooding, drought, wildfire, and tornados are projected to become even more frequent and intense.

In the Southern Great Plains, the most impactful risks to DOE sites are winter weather followed by heat waves and hail. The top asset categories of concern in this region are transportation & fleet, site buildings, and mission critical equipment. While not considered to be a major risk in the region, the impact of lightning on site buildings is high.

Among the most concerning climate risks identified by individual Departmental sites in the Northwest region are wildfires, drought, heat waves, and extreme precipitation events. The assets in this region that are most at risk are mission critical equipment followed by site buildings, IT & telecom systems, emergency management equipment, and cultural and archeological sites. These assets are highly vulnerable to wildfire and extreme winter weather.

In the Southwest region, wildfire stands out as the top risk of concern with projections of wildfires increasing in both frequency and severity. Other risks of concern include extreme heat events, extreme precipitation, thunderstorms, and wind events. Snowpack melt and atmospheric rivers also have high risk factors. Mission critical equipment is the most vulnerable asset, followed by site workforce, and site ecology & land preservation. Site workforce is particularly vulnerable to cold waves and poor air quality.

2E. Impacts from and Exposure to Additional Hazards

Outside of precipitation, heat waves, and wildfires, other hazards including winter weather and hurricanes have caused extensive damage to DOE sites and work. DOE sites located in the Southern Great Plains and Midwest are often impacted by winter weather events which have cost the sites a combined $35.2M in site closures between 2012 and 2022. Another DOE site located in the Midwest has lost approximately 100 working days attributed to flooding, winter weather, and storms between 2013 and 2019. DOE has several sites near the Gulf Coast, where hurricanes occur often and have caused approximately $58M in damages since 2008. Hurricane impacts have driven up the costs of repairs forcing sites to reduce the scope of mission activities. While hurricanes are expected to become more intense because of climate change, resilience solutions

implemented by these sites has the potential to reduce potential magnitude of hurricane costs and damages.

Section 3: Implementation Plan

3A. Addressing Climate Hazard Impacts and Exposure

1. Addressing Climate Hazard Exposures and Impacts Affecting Federal Buildings

Prioritized Actions to Address Climate Hazard Exposures and Impacts Affecting Federal Buildings		
Climate Hazard Impact/Exposure	Priority Action	Timeline for Implementation (2024-2027)
Extreme heat: 100% of DOE Federal buildings are projected to be exposed to more days with temperatures exceeding the 99th percentile of daily maximum temperatures (calculated annually), from 1976-2005.	DOE sites have identified resilience solutions such as: • HVAC upgrades, including single pass cooling unit and vacuum pump upgrades. • Chiller building equipment upgrades. • Installation of exhaust fans in storage warehouses.	DOE sites have planned several building-related resilience solutions for implementation between 2024 and 2025. Solutions such as single pass cooling unit and vacuum pump upgrades are planned for implementation in 2024. DOE sites also plan to leverage performance contracting, where appropriate, to accomplish larger equipment upgrades. For example, a DOE site has included chiller equipment upgrades in an Energy Savings Performance Contract expected to be awarded in 2025.
Extreme precipitation: 100% of DOE buildings are projected to be exposed to more days with precipitation amounts exceeding the 99th percentile of daily maximum precipitation amount (calculated annually) from 1976-2005	DOE sites have identified resilience solutions such as: • Drainage system maintenance. • Roofing upgrades on critical facilities. • Increased on-site stormwater management capacity to manage higher flows. • Installation of solar powered pumps on roof to clear blocked drains. • Implementation of enhanced inspection and	DOE sites have planned several building-related resilience solutions for implementation between 2024 and 2027. These solutions are mostly infrastructure upgrades and enhancements.

	operations and maintenance program for stormwater systems and roads.	
Increased wildfire risk: 14% of DOE Federal buildings are projected to be exposed to high or very high risk of wildfire.	DOE sites have identified resilience solutions such as: • Fire-safe design and infrastructure upgrades. • Cut clear zones to reduce fire fuel around buildings.	DOE sites have planned several building-related resilience solutions for implementation between 2024 and 2027. Infrastructure upgrades and wildfire fuels mitigation efforts are ongoing.

DOE buildings were the most vulnerable asset identified in DOE site VARPs. To increase the resilience of the Department's Federal real property, DOE plans to use both structural and non-structural building modifications. The most common type of resilience solution are HVAC upgrades to increase efficiency and reduce energy load. These solutions include increasing chiller capacity, adding heat recovery systems, and implementing system automation.

Operational/managerial upgrade solutions are the second most frequently identified. These solutions include plans or policies to mitigate or respond to climate hazards. Plans may include solutions such as landscape upgrades to improve drainage, creating or updating fire management plans including vegetation management to reduce fire load, and rescheduling outdoor worker shifts to avoid extreme temperatures.

The third most common solution type is energy and water upgrades. Solutions in this category include transmission line improvements, waterline replacements, and the installation of backup power, microgrids, and energy storage solutions. A range of solutions have been identified by sites to enhance resilience of the energy system including those solutions identified above, as well as elevating or moving equipment to avoid floods, strengthening pipelines and powerlines, or moving them underground to reduce wind or ice damage and risk from wildfire.

In addition to physically enhancing resilience in facilities, DOE sites are considering how to keep workplaces safe for employees during extreme weather events. Several DOE sites plan to enhance communication systems to alert employees about climate hazards and their impacts at their workplace. Other DOE sites have adopted building management changes such as enhanced indoor air quality standards for filtration, to keep employees safe at work when there are wildfires in the area.

DOE has also implemented internal policies to promote resilience considerations in new capital assets. The recently updated DOE Order 413.3B, *Program and Project Management for the Acquisition of Capital Assets*, includes requirements to adopt practical measures to incorporate climate adaptation and resilience in the design of all capital asset projects having a total project cost greater than $50M. DOE Order 436.1A, *Departmental Sustainability*, requires the

incorporation of location-specific resilience design criteria for new construction and major renovations. These policies combined with the implementation of resilience solutions, will enhance the resilience of DOE buildings to climate hazards.

2. Addressing Climate Hazard Exposures and Impacts Affecting Federal Employees
Exposures to Federal Employees

Prioritized Actions to Address Climate Hazard Exposures and Impacts Affecting Federal Employees		
Climate Hazard Impact on and/or Exposure to Employees	Priority Actions	Timeline for Implementation (2024-2027)
Extreme heat: 100% of DOE Federal employees are duty-stationed in counties projected to be exposed to more days with temperatures exceeding the 99th percentile of daily maximum temperatures (calculated annually), from 1976-2005	DOE sites have identified resilience solutions such as: • Implement real time physiological monitoring of outdoor workers. • Use safety best practices, including notification tools, safety liaisons, and protective equipment to prepare for working in extreme temperatures. • Reconfigure outdoor worker shift structure to avoid exposure to excessive heat.	One DOE site has funded real time physiological monitoring of outdoor workers for implementation in 2024. After seeing the results, DOE will decide if the solution should be expanded to other sites. Some sites have reconfigured the shift structure of outdoor workers. For 2027, DOE will work with DOE sites so that outdoor workers have a shift structure that protects them from excessive heat.
Extreme precipitation and increased flooding: 100% of DOE Federal employees are duty-stationed in counties projected to be exposed to more days with precipitation amounts exceeding the 99th percentile of daily maximum precipitation amount (calculated annually), from 1976-2005	DOE sites have identified resilience solutions such as: • Reconfigure outdoor worker shift structure to avoid exposure to severe storms. • Ensure personnel have access to and training with the vehicles and equipment needed to work in different road conditions. • Establish processes for third-party hazard assessment to determine potential safety concerns at a flooded site. • Maintain external	Some sites have reconfigured their shift structure of outdoor workers. For 2027, DOE will work with DOE sites so that outdoor workers have a shift structure that protects them from excessive precipitation. Most resilience solutions for increased flooding have not yet been planned for implementation at DOE sites. Between 2024 and 2025, DOE HQ will work with DOE sites to identify resilience solutions for flooding.

	partnerships, including with local fire and rescue, to ensure timely notifications of and response to inclement weather conditions. • Dispatch appropriate fleet equipment to allow personnel to evacuate safely.	These solutions will be planned for implementation between 2026 and 2027.
Increased wildfire risk: 17% of DOE Federal employees work in a county at high risk of wildfire.	DOE sites have identified resilience solutions such as: • Ensure that notification and communication systems are in place to prevent DOE personnel from entering areas where wildfires have been identified. • Adopting enhanced indoor air quality standards for filtration. • Establish official guidance for managers to consider before assigning employees to work in areas where smoke from wildfires is present. • In partnership with land managers, determine appropriate mitigation measures for industrial fire precaution levels. • Create and maintain a defensible space around DOE sites to slow or stop the spread of wildfires.	Many of the wildfire resilience solutions identified are already operational at some DOE sites. Between 2024 and 2025, DOE HQ will work with sites who have not identified or implemented wildfire resilience solutions for the workforce, to identify barriers and assist in overcoming these.

The VARP included site workforce as a critical asset for inclusion in the vulnerability assessment. Climate hazards have had and will continue to have direct impact on the DOE workforce's ability to execute the mission. The table above includes the resilience solutions DOE

sites identified in their VARPs for the four main climate hazard vulnerabilities identified in the Federal Mapper App.

Aside from these four climate hazards, DOE sites identified resilience solutions for their workforces in the face of other hazards, such as tornados and lightning. Although the relationship between these hazards and climate change is not clearly established, these weather events are disruptive to the workforce and their resilience solutions can also provide adaptive capacity for climate hazards. The resilience solutions for tornados included conducting assessment to identify tornado-based safety enhancements and emergency response training for all personnel. For lightning, DOE sites included fire fuels mitigation activities like controlled burns, to limit the potential for lightning to create a forest fire.

The resilience solutions listed above to address the impacts of climate on DOE's workforce are illustrative and not comprehensive. DOE HQ will continue to support DOE sites in developing and implementing resilience measures to ensure the safety of the workforce and the ability to execute the mission.

3. Addressing Climate Hazard Exposures and Impacts Affecting Federal Lands, Waters and Associated Cultural Resources

Through the VARP process, DOE learned that cultural resources are particularly vulnerable to climate hazards, and the risk is projected to increase. Several DOE sites have incorporated climate change adaptation and mitigation principles into their policies, programs, and procedures to protect historic properties and cultural resources.

Prioritized Actions to Address Climate Hazard Exposures and Impacts Affecting Federal Lands, Waters and Associated Cultural Resources		
Type of Land or Water Asset	Climate Hazard Impact on and/or Exposure to the Asset	Priority Action
Archaeological sites, historic structures, and traditional cultural properties at Los Alamos National Laboratory	Wildfire hazard is projected to increase.	After the Cerro Pelado Fire (April - July 2022), the Cultural Resources Program prioritized wildfire fuels mitigation work, such as fieldwork, updating archaeological site information and boundaries, and flagging historic properties for avoidance.
Tribal Cultural Resources at Nevada National Security Site (NNSS)	Wildfire hazard is projected to increase.	The Nevada Field Office (NFO) established a Land Management Council (LMC) to effectively prevent, plan for, and respond to wildfires. The LMC includes a

		representative from the NFO to ensure that cultural resources are considered appropriately in wildfire prevention, planning, and response.
Tribal Cultural Resources at Nevada National Security Site (NNSS)	Flooding is projected to increase.	The NFO is initiating work on drainage improvements to prevent damage from flash floods. Project teams have engaged with cultural resources staff early in the planning stages for these projects to ensure cultural resource compliance activities are integrated into the project schedules.

To guide the Department in meeting the Tribal consultation responsibilities outlined in the Memorandum on Tribal Consultation and Strengthening Nation-to-Nation relationships, DOE Order 144.1, *Department of Energy American Indian Tribal Government Interactions and Policy* outlines Departmental, programmatic, and field responsibilities for interacting with American Indian Governments. DOE Order 144.1 also establishes the DOE Tribal Energy Steering Committee, which provides a formal mechanism to help DOE tribal liaisons deal promptly with cross-cutting tribal energy concerns and to identify opportunities for synergy across various sectors within DOE.

DOE Order 436.1A, *Departmental Sustainability* requires DOE sites to engage with Tribal authorities regarding DOE operations that affect Tribal cultural resources or lands of ancestral, ceremonial, or other Tribal significance. DOE plans to present the 2024 Climate Adaptation Plan (CAP) at the National Conference of State Legislatures, State and Tribal Government Working Group meeting in May 2024. In this meeting, DOE will engage with Tribal governments on climate adaptation activities. DOE will continue to assess the impacts of climate change on cultural resources at DOE sites and engage with Tribal authorities to include these in DOE's climate adaptation and resilience efforts.

Advancing the America the Beautiful Initiative

DOE's missions of nuclear safety & security, legacy waste cleanup and long-term stewardship, and scientific research depend on the stability of the landscape and environment throughout the Department. Climate change impacts continue to accelerate the alteration of ecological processes and functions, resulting in reduced biodiversity, species loss, and diminished ecosystem services that contribute to climate hazards. These conditions place DOE operations and personnel at increased risk.

The America the Beautiful Initiative (ATB) seeks to support and advance locally led conservation across the Nation. Many of the conservation efforts advanced by ATB also support

climate adaptation and resilience. The table below includes examples of ATB activities at the intersection of conservation and climate adaptation and resilience.

America the Beautiful Activities that Advance Climate Adaptation and Resilience	
Focus Area #2: Support Tribally Led Conservation and Restoration Priorities	
Idaho National Laboratory Collaborative Invasive Weed Management and Soil Stabilization for Cultural Site	The lands managed by DOE's Idaho Operations Office (DOE-ID) now designated as the Idaho National Laboratory (INL) Site are part of the ancestral territory of the Shoshone-Bannock Tribes. Archaeological sites, land, water, plants, animals, and geologic features on the INL Site and far beyond evince Shoshone-Bannock Tribes' past and present cultural heritage. The Tribes, DOE-ID, and the INL contractor are cooperating on a project to restore native vegetation to the Birch Creek site to stabilize soils and protect cultural resources in the area. Based upon soil sampling data, the site will receive amendments to prepare the soil for hydroseeding native plant seeds and hand-planting sagebrush seedlings grown from seed harvested on the INL Site. Weed management activities at caves reduced musk thistle propagation, which allows other beneficial vegetation to establish in the area and stabilizes the soil. Soils that are susceptible to erosion are an indication of compromised ecosystem function; stabilizing those soils through weed control and restoration of native species improves the resilience of the local ecosystem to stressors like climate change. Other weed management projects, such as tumbleweed removal, also improved access to the caves by humans and bats. Additionally, with Tribal consent, DOE-ID and the INL contractor planted approximately 11,000 sagebrush seedlings near Middle Butte where sagebrush had been lost to wildland fire. Restoring sagebrush generally adds vertical complexity and increases primary productivity in a fire-affected plant community, resulting in more efficient use of water and nutrients and higher long-term ecosystem stability.
Bonneville Power Administration (BPA) and the Columbia River Inter-Tribal Fish Commission	The Columbia River Inter-Tribal Fish Commission, which represents a collection of four Columbia River Basin Tribes including, Confederated Tribes of the Umatilla Indian Reservation, Yakama Nation, Nez Perce Tribe and Confederated Tribes of the Warm Springs Reservation of Oregon, initiated a long-standing climate change assessment project with BPA

	starting in 2009. The objective of the project is to assist tribes in developing strategies for responding to climate change impacts to first foods on their ceded lands through the development of data analyses and decision support tools. The major work elements currently include maintenance of an interactive website and database allowing users to access climate projections and forecasted changes to tribal land areas, as well as updated climate change information. Staff also collaborate with the River Management Joint Operating Committee to estimate changes in Columbia River mainstem hydrology and water quality resulting from climate change impacts.
Focus Area #3: Expand Collaborative Conservation of Fish and Wildlife Habitats and Corridor	
Idaho National Laboratory (INL) Sagebrush Habitat Restoration and Sagebrush Ecosystem Reserve	Idaho Fish & Game (IDFG) has identified sagebrush steppe as one of the most important ecosystems for wildlife in Idaho and the Idaho National Laboratory Site remains one of the best remaining examples of an intact sagebrush steppe ecosystem in the region. DOE-ID is working to restore these important habitats that were impacted by fires or other disturbances by planting sagebrush seedlings, reducing invasive species, and developing conservation plans for key species such as sage-grouse and bats. DOE-ID has also set aside 74,000 acres of sagebrush steppe habitat as an ecosystem reserve. In many cases, these conservation efforts are undertaken in collaboration with Federal and state stakeholders, such as USFWS, BLM, IDFG, and the Idaho State Office of Species Conservation. In addition to these ongoing efforts, INL identified several new conservation opportunities in the INL Climate Vulnerability and Resilience Plan. Intact sagebrush steppe ecosystems are inherently resistant to stressors like climate change and non-native species invasions. Healthy native plant communities are also resilient after disturbances like wildfire. Conservation and restoration initiatives like those listed above are critically important for maintaining ecosystems that can adapt to changing environmental conditions.
BPA Longley Meadows Fish Habitat Enhancement Project	The Longley Meadows Fish Habitat Enhancement Project site is within the Upper Grande Ronde River in Northeast Oregon. The long-term rehabilitation vision of the Confederated Tribes of the Umatilla Indian

	Reservation is to improve physical and ecological processes by rehabilitating and restoring the project area to achieve immediate and long- term benefits to several aquatic species. Historic floodplain and stream channel impacts including, but not limited to historical logging, agriculture, railroad and road construction, livestock grazing and vegetation clearing, have contributed to significant habitat degradation. The project focused on rehabilitating and restoring hydrologic processes, habitat and network connectivity, riverine biotic community, and riparian vegetation in a significant four-mile reach of the river and included a 67% increase of active floodplain acres. These floodplain restoration actions support greater ecosystem resilience in the face of extreme weather events, such as flash floods and wildfires.

DOE's Conservation Action Plan (December 2021) responds to the America the Beautiful challenge to conserve 30% of U.S. lands and waters by 2030. It highlights the intersection of landscape conservation and climate resilience for DOE missions, including co-benefits such as carbon sequestration, wildlife fire risk reduction, and preservation of biodiversity and ecosystem services.

In addition to the America the Beautiful goals, the White House issued Executive Order 14072, *Strengthening the Nation's Forests, Communities, and Local Economies*, which called Federal agencies to deploy nature-based solutions to improve the resilience of lands, waters, wildlife, and communities to the impacts of climate change. Separately, CEQ issued guidance to agencies on ecological connectivity to help combat climate-change-driven fragmentation of habitat and associated loss of biodiversity. DOE's conservation approach reflects each of these goals.

The Department's most expansive approach to the America the Beautiful goals is the issuance of DOE Order 436.1A, *Departmental Sustainability*, which provides conservation as a mission-relevant land use goal. The Order recognizes the significance of ecosystem health as an element of both climate resilience and mission assurance. It directs DOE to manage natural resources to protect land, water, and biodiversity; deploy nature-based solutions; and incorporate principles of environmental stewardship and environmental justice into sustainability activities, to support DOE missions. The Order encourages application of research at DOE's National Laboratories and National Environmental Research Parks to inform conservation-based land use planning and decisions. The National Environmental Research Parks are outdoor laboratories that provide opportunities for environmental studies on protected lands that act as buffers around DOE facilities. Finally, the Order directs DOE to engage with Tribal authorities to address concerns and leverage resources using applicable Indigenous Knowledge. In 2024, DOE will continue to incorporate the requirements into contracts and track programmatic progress.

Another DOE cross-cutting program is the Sustainable Climate-Ready Sites (SCRS) program, which launched in 2023 with twelve participating DOE sites. SCRS recognizes participating sites for excellence in natural resource and habitat conservation, improvements in adaptation and resilience to climate change, and other environmental benefits. Fully realized, the voluntary program covers approximately 2.4 million acres of DOE-managed land. In 2023, most participating sites reached "Leading" status for habitat-quality subcategories of "Species Stewardship" and "Partnerships." This means they self-identified that they demonstrated protections for native and sensitive species, migratory birds, and pollinators. They also partnered with adjacent landowners to address larger ecological challenges such as habitat fragmentation, wildland fire risk, and invasive species proliferation. Most sites showed robust performance in the SCRS Landscape Conservation subcategory, which focuses on directed landscape restoration efforts.

DOE continues to make progress on existing conservation measures and develop new projects. In 2024, the Department will establish a community of practice on conservation to identify new goals supportive of America the Beautiful, collaborate to overcome barriers to shared challenges, and share best practices on implementation of resilience-enhancing conservation policies, programs, and projects.

3B. Climate-Resilient Operations

1. Accounting for Climate Risk in Planning and Decision Making

The VARP guidance promoted the use of multidisciplinary teams to ensure coordination and knowledge sharing across organizations, and the integration of resilience planning into the planning and budget process at a site. Many sites incorporated processes in their VARPs to ensure monitoring of progress, evaluation of implemented resilience strategies, incorporation of VARP outputs into site plans, and periodic reassessments of climate information. Each DOE Program Office is overseeing implementation of VARPs at their sites. DOE sites have implemented adaptation and resilience programs to identify and implement critical resilience measures, as well as to include resilience considerations in facility modernization and recapitalization projects.

2. Incorporating Climate Risk Assessment Into Budget Planning

DOE continues to comply with OMB Circular A-123, *Management's Responsibility for Enterprise Risk Management and Internal Control* by producing an agency Risk Profile as part of the implementation of an Enterprise Risk Management (ERM) capability coordinated with strategic planning, strategic review, and internal control processes. Climate change is included as a risk in the DOE Risk Profile, to ensure that climate risks are included in budget formulation. DOE prepares a consolidated agency risk profile annually. The consolidated risk profile takes into consideration reporting organizations' risk profiles as well as their Financial Management Assessment, and Entity Assessment submissions from the Department's A-123 Application. Likewise, on an annual basis, DOE requires each Under Secretary and Headquarter Office to prepare and submit a risk profile taking into consideration the risk profiles from Field Offices, M&O Contractors, and non-M&O Contractors. DOE program and staff offices are asked to

integrate budget formulation process and link risk, budget, and performance together to ensure DOE's resources and funding requests appropriately address risks.

To support the advancement of DOE's climate adaptation and resilience, the Department will request a Sustainability and Climate Crosscut from the Program Offices. This effort will collect information across the Department, in advance of the FY 2026 budget build process, to establish a baseline of efforts and initiatives in the sustainability and climate arena. The Crosscut includes categories for Climate Resilient Infrastructure and Operations and Climate Science Modeling and Climate Literacy.

3. Incorporating Climate Risk Into Policy and Programs

Climate Adaptation and Resilience

DOE issued the revised Order 436.1A, *Departmental Sustainability* in April 2023. This Order establishes an agency-wide integrated, performance-based approach to implement sustainability and climate action in DOE operations. The Order directs the Department to implement an approach that minimizes or eliminates emissions of greenhouse gases and other pollutants at DOE-owned and operated sites and facilities; increases adaptation and resilience to the impacts of climate change; protects public and worker health; conserves and restores ecosystems and preserves native landscapes, watersheds, and biodiversity; and delivers environmental justice.

DOE O 413.3B, *Program and Project Management for the Acquisition of Capital Assets*, was revised concurrently and now includes requirements to adopt practical measures to incorporate clean energy sources, climate adaptation, resilience, and sustainability early in the design where total project cost is greater than $50M. These two Orders provide the policy driver for climate adaptation and resilience at the Department.

DOE Order 436.1A requires all DOE sites to write annual Site Sustainability Plans, which should include discussions of climate adaptation and resilience efforts as well as environmental justice and community engagement programs. The FY 2024 Site Sustainability Plan Instructions required DOE sites to discuss investments to support environmental & energy justice efforts in the site's community, as well as actions taken to incorporate and/or expand environmental justice into operations, planning, decision making, and procurement activities. FY 2024 Site Sustainability Plan reporting showed that many DOE sites engage their local communities through science education and workforce development. DOE sites also participate in Community Outreach Networks with their Tribal partners. These meetings bring several Federal agencies and Tribal partners together to inform each other on their activities and services.

DOE has several key policies which will be reviewed for the incorporation of climate adaptation and resilience capabilities:

- DOE Order (O) 150.1B, Continuity Programs
- DOE O 470.4B Chg 3, Safeguards and Security Program
- DOE O 420.1C Chg 3, Facility Safety
- DOE O 470.3C Chg. 2, Design Basis Threat

- DOE O 461.1C Chg 1, Packaging and Transportation for Offsite Shipment of Materials of National Security Interest
- DOE O 430.1C Chg 2, Real Property Asset Management

Nature-Based Solutions

DOE Order 436.1A was revised to include the deployment of nature-based solutions. Revision to DOE O 436.1A reads,

> "DOE elements must: (1) Manage land and natural resources to ensure the protection of land, water, and biodiversity (including pollinators and migratory birds), including deployment of nature-based solutions, recognizing the co-benefit of resilience enhancement such as wildfire risk reduction, preservation of ecosystem services, carbon sequestration, and minimization of regulatory restrictions associated with endangered and threatened species."

Site ecology and land preservation were also included as critical assets for assessment in the VARP. Many sites included nature-based solutions in their resilience portfolio.

Environmental Justice

DOE Order 436.1A includes the incorporation of environmental justice in sustainability activities. The Order also requires all DOE sites to write annual Site Sustainability Plans, which include discussions of environmental justice (EJ) and community engagement programs. FY 2024 Site Sustainability Plan Instructions ask sites to describe actions taken to incorporate and/or expand environmental justice into operations, planning, decision making, and procurement activities.

DOE also incorporates environmental justice in external funding programs. The Assisting Federal Facilities with Energy Conservation Technologies (AFFECT) program is managed by DOE's Federal Energy Management Program (FEMP) and provides funding to Federal agencies to help meet energy- and water-related goals by identifying affordable solutions, facilitating public-private partnerships, and leveraging best practices to promote energy leadership. The AFFECT Federal Agency Call directs agencies to orient their procurement and operations efforts to advance environmental justice and equity, in line with the goals of Executive Orders 14008 and 14057. Among the selection factors of the program, is the requirement to demonstrate the extent to which the project results in positive or negative cumulative environmental impacts to disadvantaged communities using the Environmental Protection Agency's EJScreen tool. DOE will continue to incorporate environmental justice considerations in external funding programs.

Many of DOE's programs promote climate adaptation and resilience, while also helping to advance environmental justice because they are covered programs within the Justice40 Initiative, which sets a goal that 40 percent of the overall benefits of certain Federal climate and other investments flow to disadvantaged communities that are marginalized by underinvestment and overburdened by pollution.

Tribal Nations

The Secretary of Energy led seven other agencies in signing MOUs with the Hopi Nation and Navajo Nation in December of 2023 to better coordinate Federal resources as the two Tribes respond to disproportionate impacts of climate change and the transition away from fossil fuels. The MOUs were led by the Office of Indian Energy Policy and Programs and coordinated through the White House Council on Native American Affairs (WHCNAA). The WHCNAA and participating agencies are involved in ongoing meetings with the Tribal leadership to coordinate and implement the MOUs.

In 2023, DOE and Department of the Interior signed a memorandum of understanding committing to work with the Yakama Nation, the Confederated Tribes of the Umatilla Indian Reservation, the Nez Perce Tribe, and the Wanapum Band of Priest Rapids to co-steward Laliik, or "Rattlesnake Mountain" in a manner that enables religious and ceremonial activities, protects natural and cultural resources, and allows Tribal members to use traditional resources. Conservation and restoration initiatives like this are critically important for maintaining ecosystems that can adapt to changing environmental conditions.

DOE's Office of Indian Energy Policy and Programs held two listening sessions on Tribal access to electricity in 2021 and 2022, with a focus, in part, on assessing Tribal resilience. The outcomes of those listening sessions were documented in a Tribal Electricity and Reliability Report to Congress in August 2023. The report noted increasing vulnerabilities from climate change have resulted in a rising demand for clean energy in Indian Country and noted the increased Tribal interest in establishing microgrids for resilience.

A DOE Field Office in New Mexico embarked on extensive listening efforts in surrounding communities, including the four Accord Pueblos, Cochiti, Jemez, Santa Clara, and San lldefonso, to inform implementation of Justice40 Initiative efforts. This included Pueblo participation in the site's Strategic Vision process. The site will incorporate Pueblo feedback, values, and opinions into the Strategic Vision to prioritize work scope for future nuclear legacy cleanup projects.

Co-Benefits of Adaptation

DOE Order 436.1A was revised to recognize the co-benefits of resilience enhancement. Revision to DOE O 436.1 A reads, "DOE elements must: (1) Manage land and natural resources to ensure the protection of land, water, and biodiversity (including pollinators and migratory birds), including deployment of nature-based solutions, recognizing the co-benefit of resilience enhancement such as wildfire risk reduction, preservation of ecosystem services, carbon sequestration, and minimization of regulatory restrictions associated with endangered and threatened species."

4. Climate-Smart Supply Chains and Procurement

DOE is still identifying its most at-risk supply chain and services. DOE is developing guidance for a Supply Chain Vulnerability Assessment (SCVA). The SCVA will require DOE sites and National Laboratories to assess first-tier supply chain climate hazard risks for critical supplies and services and determine resilience strategies to offset these risks. Once DOE sites have completed the SCVA (estimated Spring 2025), DOE will be better able to characterize vulnerabilities within its supplies and services and DOE will identify trends and highlight opportunities for improvement across the complex. In addition, sites will have identified priorities, developed strategies, and established goals based on the assessment of climate hazards risks in internal DOE supply chains. In the meantime, DOE has attempted to identify critical supply chains in the chart below based on existing Departmental reports.

Five Most At-Risk Supply Chains

At risk Supplies/Services	Climate Hazard(s) Impacts	Progress Towards Addressing Hazard(s)
Critical minerals	Access to critical minerals, such as lithium, and cobalt, are essential to developing a clean energy industry in the United States. Climate hazards such as wildfire, extreme precipitation, and flooding may impact transportation	The Office of Energy Efficiency and Renewable Energy funds the Critical Materials Institute to diversify the supply, develop substitutes, and drive

	routes for these critical minerals.	recycling and reuse of critical minerals and materials
Electricity & energy distribution systems	In the 2021 VARP energy distribution & generation systems were listed as one of DOE's most vulnerable assets to climate change. Energy generation & distribution systems were particularly vulnerable in Southwest, Midwest, Southeast, and Northeast regions of the U.S.	While some DOE sites identified energy distribution & generations systems as vulnerable to climate change and have determined resilience solutions, more cost-effective solutions are needed by sites to ensure that DOE sites can withstand energy supply disruptions.
Construction materials, workers, and projects	As climate change hazards such as extreme precipitation increase, there will be more delays in construction projects. Additionally, construction workers face increased exposure to climate hazards such as heat waves and extreme weather events.	Several DOE sites have identified that outdoor workers, such as construction workers, are vulnerable to climate hazards in their site VARPs. Resilience solutions to be implemented at DOE sites include real time physiological monitoring of outdoor workers, reconfiguring the shift structure of outdoor workers.
Batteries	As DOE strives to electrify its operations, there is an increased need for batteries. The battery supply chain is complex, and production is significantly centered outside of the U.S. There is significant potential for climate hazards to affect the battery supply chain due to the many tiers of the supply chain and locations involved in battery development.	In 2022, DOE issued two notices of intent to provide $2.91 billion to boost production of the advanced batteries that are critical to rapidly growing clean energy industries. The Department intends to fund battery materials refining and production plants and recycling facilities to build resilience in the acquisition of batteries.
Semiconductors	Significant water resources are required to produce semiconductors. The intensification of drought throughout the U.S. and globally increases the potential to negatively affect the semiconductor industry.	DOE's Semiconductor Supply Chain Deep Dive Assessment identified that the significant longer-term vulnerabilities include the environmental impact of semiconductor use and

		manufacturing due to explosive growth from electrification and artificial intelligence. The energy efficiency of semiconductors must be addressed as deployment to new sectors continues to grow. To address the environmental impacts of semiconductor manufacturing, development, and use, DOE identified several key opportunities: 1) Investment in the development and deployment of silicon carbide. 2) Investment in research, development, demonstration, and commercial application for conventional semiconductors with a biennial energy efficiency doubling goal.

The revised Departmental Order 436.1A includes a requirement to assess climate-related supply chain impacts based on E.O. 14057 and 14008 as well as DOE's 2021 Climate Adaption and Resilience Plan. This update requires DOE sites to "conduct mission critical supply chain vulnerability assessments (SCVA) and incorporate the results in procurement processes." Guidance is currently being drafted for sites to meet this requirement. The SCVA process will result in a climate risk analysis of the first tier of DOE's supply chain and resilience strategies to address critical supply vulnerabilities.

Some DOE sites have already begun to secure and build climate and procurement resilience into their supply chains. For example, East Tennessee Technology Park (ETTP) initiated a Sustainable Supply Chain Council (SSCC) in April 2022. This initiative has led to increased interface with ETTP's primary suppliers to evaluate supplier performance and encourage, support, and improve the GHG transparency of supplier's products. In addition, the SSCC has implemented a testing campaign for environmentally preferable products.

The National Nuclear Security Administration is drafting a 2030 supply chain vision aligning with President Biden's 2021 Executive Order 14017, *America's Supply Chains*, and the Secretary of Energy's call to enhance supply chain knowledge and decision-making. The vision aims to shape future supply chain decisions to increase data integration, cost-effectiveness, and supply chain resiliency. If adopted, it will foster visibility and resilience by delivering integrated, increasingly carbon-neutral, and intelligent supply chain activities.

Additionally, the GreenBuy and GreenSpace awards program provides resources for sites to buy sustainable products that: lower health and environmental impacts, are purchased regularly and a significant part of DOE spending, reduce maintenance costs, reduce waste management costs, perform and are readily available, reinforce behavior change, are covered by standards reflecting multiple attributes (preferably third-party certified), contribute to Leadership in Energy and Environmental Design (LEED) points for existing buildings and new construction, and conform to the Federal Guiding Principles for High Performance and Sustainable Buildings. In FY 2024, the GreenBuy awards will begin to incorporate EPEAT Climate+ products in the scoring criteria and incorporate goals for EPEAT Climate+ product purchasing in the FY 2025 GreenBuy Priority Products List.

5. Climate Informed Funding to External Parties

As a part of the Bipartisan Infrastructure Law, DOE's Grid Deployment Office (GDO) administers a historic $10.5 Billion (B) investment via the Grid Resilience and Innovation Partnerships (GRIP) program to enhance grid flexibility and improve the resilience of the power system against growing threats of extreme weather and climate change. The first funding opportunity of the GRIP program provided up to $3.46B in investments across 58 projects The second funding opportunity will provide up to $3.9B. Among the recipients of the first round of investments were Tribal, state, and local governments. For example:

- Alaska Energy Authority's Railbelt Innovative Resilience Project (GRIP funded $207M): The Railbelt Innovative Resiliency Project is a partnership between the State of Alaska, four Railbelt Regional Electric Cooperatives, a Railbelt municipal utility, the Regulatory Commission of Alaska, and local labor unions to incentivize transmission development and resilience and reliability improvements in Alaska's three Railbelt regions.
- Regional Grid Improvements to Address Reliability in Georgia (GRIP funding: $249M): The Georgia Environmental Finance Authority and the Family of Companies that supports the Georgia electric cooperatives are collaborating on a project that will improve grid resilience across the state through investments in battery storage, local microgrids, and advanced grid control systems, as well as new transmission lines to link rural and hard-to-reach communities across the state.

DOE's GDO also awards Grid Resilience State and Tribal Formula Grants to states, Tribes, and territories. These grants will distribute $2.3B over five years to strengthen and modernize America's power grid against wildfires, extreme weather, and other natural disasters that are exacerbated by climate change. To date, GDO has awarded 52 participating states and 103 Tribal entities a combined total of more than $772M.

Since, 2010, DOE's Office of Indian Energy Policy and Programs has provided funding for Tribal communities to become more energy independent, build resilience, and reduce the impacts of climate change. In addition to the $75M committed to Tribal energy projects selected in 2023, between 2010 and 2022, the DOE Office of Indian Energy Policy and Programs invested over $120M in more than 210 Tribal energy projects implemented across the contiguous 48 states and Alaska. These projects, valued at more than $215M, are leveraged by over $93M in Recipient cost share. Since 2018, the DOE Office of Indian Energy Policy and Programs has directed

funding specifically to Tribal community resilience, with a standing topic area in Funding Opportunity Announcements focused on the installation of integrated energy systems for autonomous operation (independent of the traditional centralized electric power grid) to power Tribal facilities during emergency situations. This funding has gone to support many resilience efforts, including climate driven community relocation efforts such as the Quinault Indian Nation, and for many Alaska villages which are directly and significantly impacted by climate change.

In 2024 – 2027, DOE will continue to offer funding through the above-mentioned programs to increase the resilience of communities and their energy against the growing threats of extreme weather and climate change.

3C. Climate Training and Capacity Building for a Climate Informed Workforce

Training and Capacity Building	
Agency Climate Training Efforts	*Percent of the agency's Federal staff that have taken a 60+ minute introductory climate training course.* Two percent of DOE's Federal staff have taken the DOE Climate Change 101 course that was introduced in 2023. Federal staff may have taken other introductory climate training that is not accounted for in this report.
	Percent of the agency's senior leadership (e.g., Sec, Dep Sec, SES, Directors, Branch Chiefs, etc.) that have completed climate adaptation training. Less than one percent of the agency's senior leadership have taken the DOE Climate Change 101 course. Senior leadership may have taken other introductory climate training that is not accounted for in this report.
	Percent of budget officials that have received climate adaptation related training. Less than one percent have taken DOE Climate Change 101 course. These staff may have taken other introductory climate training that is not accounted for in this report.
	Percent acquisition officials that have received climate adaptation related training. No acquisition analysts are listed as having taken the DOE Climate 101 course. These staff may have taken other introductory climate training that is not accounted for in this report.
	Additional efforts the agency is taking to develop a climate informed workforce. DOE is leveraging existing programming through the Energy Facility Contractors Group (EFCOG) Sustainability & Environment Working Group (SEWG), FEMP's Early Career Professionals Program, and Earth Day celebrations to promote

	climate literacy. DOE is evaluating a mandatory training requirement for the DOE workforce.
Agency Capacity	*Number of full time Federal staff (FTE) across the agency that have tasks relevant to climate adaptation in their job description.* DOE does not maintain a central system with position descriptions for Federal or contractor staff. Information available on climate tasks in some position descriptions is detailed in the narrative below. DOE uses the Clean Energy Corps as a staffing strategy to hire for roles related to the impact of climate change on the DOE mission.

Agency Climate Training Efforts

DOE launched Introduction to Climate Change (Climate 101) in June 2023. Climate 101 is a 60-minute e-learning course available to all DOE Federal and contractor employees. The course is made up of three lessons: Climate Change Overview, Impacts of Climate Change, and Responses to Climate Change. Climate 101 includes case studies from DOE sites to help employees understand how climate change impacts the DOE mission. The course is currently optional and as of December 31, 2023, nearly 300 Federal employees, about two percent of DOE Federal staff, have completed the course. DOE's Learning Management System (LMS), Learning Nucleus, is available to DOE Federal and contractor employees. Some M&O contractors have their own LMS and Climate 101 has been made available for upload into these systems.

DOE encountered limitations in assessing how many senior leadership, budget, and acquisition officials took Climate 101. Learning Nucleus only had position titles for about one third of the Federal employees that completed the course. From the available data, Climate 101 has been taken by a limited number of members of the Senior Executive Service (SES) and Office Directors (non-SES). In addition, a limited number of budget analysts have been recorded taking the training. DOE will continue to promote the Climate 101 course to leadership and personnel in acquisition and budget offices, as well as explore pathways to make the Climate 101 course mandatory for all employees. DOE will also work with the National Training Center, which maintains Learning Nucleus, to improve the completeness of data in Learning Nucleus.

In addition to Climate 101, DOE has integrated climate literacy into existing meetings and programming across the complex. DOE uses Earth Day as an opportunity to promote climate literacy and sustainability education at Headquarters and the DOE sites. Every year, DOE holds an Earth Day photo and haiku contest to celebrate individual's relationship with the environment. For Earth Day 2023, DOE promoted the new Climate 101 course, held a sustainability tour around the Forrestal building, and released an updated guidebook with resources to encourage employees to incorporate climate friendly habits at home, in their commute, while making purchases, and in other everyday activities.

The Energy Facility Contractors Group (EFCOG) Sustainability & Environment Working Group (SEWG) promotes collaboration among DOE management and operating contractors to support meeting sustainability goals. The EFCOG SEWG holds bi-monthly webinars which showcase resources that enable DOE sites to have greater impact on sustainability, decarbonization, and environmental goals. The December 2023 webinar was focused on climate literacy.

The FEMP Early Career Professionals Program accepted the first cohort of diverse and passionate early career professionals in the energy and water fields in 2023. The goal of the program is to help professionals early in their energy and water careers develop a baseline of subject matter knowledge while building professional relationships to successfully carry out their Federal agencies' missions related to energy and water management. The first cohort includes professionals from Federal agencies and the private sector. The Program's curriculum included an introduction to climate change, which leveraged DOE's Climate 101 course.

DOE will continue to promote climate literacy through new and existing programming. In 2024, DOE will conduct webinars on climate change topics, including the Fifth National Climate Assessment, results of the VARP process, and climate tools. DOE will continue to leverage the existing Climate 101 course to ensure a baseline understanding of climate change for all staff and will also identify DOE job classifications which require additional tailored climate training. Existing training will be utilized as appropriate and will be updated with new information and case studies to ensure the content is current and impactful to a DOE audience.

Agency Capacity

DOE is committed to staffing roles related to climate adaptation and resilience. To facilitate hiring, DOE uses general position descriptions which can be used across many subject matter areas. These often do not include specific subject matter tasks. Instead, subject matter tasks, such as tasks relevant to climate adaptation, are included in performance plans. The process is similar for contractors. DOE uses general labor category descriptions to be used across many contracts. It is at the discretion of the contractor if they use subject matter tasks in internal job descriptions, but DOE does not have a centralized system with contractor job descriptions to assess climate adaptation related tasks.

Energy infrastructure is a critical asset for DOE, as well as the Nation. DOE's Clean Energy Corps supports climate resilience activities by facilitating the hiring of staff to research, develop, demonstrate, and deploy resilient, clean energy solutions. Since the inception of the Clean Energy Corps, DOE has hired over 870 of 1200 personnel needed to execute the provisions of the Bipartisan Infrastructure Law and Inflation Reduction Act. These personnel work in a wide variety of disciplines, such as finance, engineering, communications, and public policy.

3D. Summary of Major Milestones

Section of the Implementation Plan	Description of Milestone	Climate Risk Addressed	Indicators for Success
3A1. Addressing Climate Hazard Impacts on and Exposures to Federal Buildings	DOE sites implement building-related resilience solutions.	Several climate risks.	Implementation of resilience solutions for all identified climate hazards to DOE facilities.
3A2. Addressing Climate Hazard Impacts on and Exposures to Federal Employees	Between 2024 and 2025, DOE HQ will work with sites that have not identified or implemented resilience solutions for the workforce, to identify barriers and assist in overcoming these.	Several climate risks.	Implementation of resilience solutions for all identified climate hazards to the workforce at DOE sites.
3. Addressing Climate Hazard Exposures and Impacts Affecting Federal Lands, Waters and Associated Cultural Resources	In 2024, DOE will collaborate with Tribal governments to establish a process for engagement or consultation on climate adaption efforts at DOE sites which may have an impact on Tribes and cultural resources.	Several climate risks.	Implementation of a process for meaningful engagement or consultation with Tribes on DOE climate adaption efforts which may impact Tribes and their cultural resources.
3A3. Advancing the America the Beautiful Initiative	Establish a community of practice on conservation to identify new goals supportive of America the Beautiful.	Several climate risks.	Implementation of resilience-enhancing conservation policies, programs, and projects.
3B1. Accounting for Climate Risk in Planning and Decision Making	DOE will continue producing an annual agency Risk Profile which includes climate change.	Several climate risks.	Increased implementation of resilience solutions. With increased resilience, the risk priority of climate change will be lower.

3B.1. Accounting for Climate Risk in Planning and Decision Making –	DOE sites to revise VARPs using updated climate projections in FY 2025.	Several climate risks.	All DOE sites submit an updated VARP which includes updated climate projections and effective resilience solutions for every climate hazard.
3B.3. Incorporating Climate Risk into Policy and Programs	Ensure all M&O contractors have implemented the DOE Order 436.1A Contractors Requirement Document (CRD) in their contract.	Several climate risks.	All M&O contractors have implemented DOE Order 436.1A CRD by the end of FY 2024.
3B.4. Climate-Smart Supply Chains and Procurement	Complete DOE Supply Chain Vulnerability Assessment in FY 2025.	Several climate risks.	Implement resilience solutions related to supply chain.
3B.5 – Climate Informed Funding to External Parties	By July 2025, DOE will identify grants that can include consideration and/or evaluation of climate risk.	Several climate risks.	Grants identified as having climate risk considerations applicable, prioritize funding on climate-related criteria.
3C. Climate Training and Capacity Building for a Climate Informed Workforce	Increase percentage of Federal staff who have completed Climate 101.	Several climate risks.	All Federal staff complete Climate 101 training.

Section 4: Demonstrating Progress

4A. Measuring Progress

Key Performance Indicator: Climate adaptation and resilience objectives and performance measures are incorporated in agency program planning and budgeting by 2027.		
Section of the CAP	**Process Metric**	**Agency Response**
3A – Addressing Climate Hazard Impacts and Exposure	Step 1: Agency has an implementation plan for 2024 that connects climate hazard impacts and exposures to discrete actions that must be taken. (Y/N/Partially) Step 2: Agency has a list of discrete actions that will be taken through 2027 as part of their implementation plan. (Y/N/Partially)	Step 1. Y Step 2. Y
3B.1 – Accounting for Climate Risk in Decision-making	Agency has an established method of including results of climate hazard risk exposure assessments into planning and decision-making processes. (Y/N/Partially)	Y
3B.2 – Incorporating Climate Risk Assessment into Budget Planning	Agency has an agency-wide process and/or tools that incorporate climate risk into planning and budget decisions. (Y/N/Partially)	Y
3B.5 – Climate Informed Funding to External Parties	Step 1: By July 2025, agency will identify grants that can include consideration and/or evaluation of climate risk. Step 2: Agency modernizes all applicable funding announcements/grants to include a requirement for the grantee to consider climate hazard exposures.	Step 1: Y Step 2: Partially

	(Y/N/Partially)	
Key Performance Indicator: Data management systems and analytical tools are updated to incorporate relevant climate change information by 2027.		
Section of the CAP	**Process Metric**	**Agency Response**
3A – Addressing Climate Hazard Impacts and Exposure	Agency has identified the information systems that need to incorporate climate change data and information and will incorporate climate change information into those systems by 2027. (Y/N/Partially)	Partially
Key Performance Indicator: Agency CAPs address multiple climate hazard impacts and other stressors, and demonstrate nature-based solutions, equitable approaches, and mitigation co-benefits to adaptation and resilience objectives.		
Section of the CAP	**Process Metric**	**Agency Response**
3B.3 – Incorporating Climate Risk into Policy and Programs	By July 2025, 100% of climate adaptation and resilience policies have been reviewed and revised to (as relevant) incorporate nature-based solutions, mitigation co-benefits, and equity principles. (Y/N/Partially)	Partially
Key Performance Indicator: Federal assets and supply chains are evaluated for risk to climate hazards and other stressors through existing protocols and/or the development of new protocols; response protocols for extreme events are updated by 2027.		
Section of the CAP	**Process Metric**	**Agency Response**
3B.4 – Climate- Smart Supply Chains and Procurement	Step 1: Agency has assessed climate exposure to its top 5 most mission-critical supply chains. (Y/N/Partially) Step 2: By July 2026, agency has assessed services and established a plan for addressing/overcoming disruption from climate hazards. (Y/N/Partially)	Step 1: Partially Step 2: Partially
	Agency has identified priorities, developed strategies, and established goals based on the assessment of	N

	climate hazard risks to critical supplies and services. (Y/N/Partially)	
Key Performance Indicator: By 2027, agency staff are trained in climate adaptation and resilience and related agency protocols and procedures.		
Section of the CAP	**Process Metric**	**Agency Response**
3C – Climate Training and Capacity Building for a Climate Informed Workforce	Step 1: By December 2024 100% of agency leadership have been briefed on current agency climate adaptation efforts and actions outlined in their 2024 CAP. (Y/N/Partially) Step 2: Does the agency have a Climate 101 training for your workforce? (Y/N/Partially) If yes, what percent of staff have completed the training? Step 3: By July 2025, 100 % employees have completed climate 101 trainings. (Y/N/Partially)	Step 1: Partially Step 2: Y, two percent of Federal staff have completed the training. Step 3: Partially

4B. Adaptation in Action

The DOE Climate Adaptation Plan builds on the work from the 2021 Climate Adaptation and Resilience Plan to adapt to current and projected impacts of climate change. Now that DOE better understands the current and future climate risks that may impact DOE's mission and operations, the actions in this plan will assist the Department in building adaptive capacity and resilience.

Through analysis of the VARPs, DOE discovered challenges in implementing resilience solutions at the Department. The solutions identified through the VARP process do not fully address all the identified climate risks. To address this, DOE plans to develop comprehensive resilience solution sets to fully address all climate hazards. DOE will provide technical assistance, support, and analysis for DOE sites to identify resilience solutions for all identified hazards and begin planning for implementation.

DOE also found that 78 percent of solutions were not planned for implementation at the time of VARP completion, due to several reasons including lack of cost-effective resilience solutions. To increase the implementation of resilience solutions, DOE will collaborate with other federal agencies and the private sector organizations to identify innovative and effective resilience solutions and best practices. In addition, DOE will utilize funding mechanisms such as

performance contracts (e.g., use of utility energy service contracts or energy savings performance contracts and leverage other available funding sources to maximize resilience improvements including capital improvement funds, operation and maintenance funds, and grants, such as the Federal Energy Management Program AFFECT program.

During the development of the VARP, DOE identified missed opportunities to engage Tribes and stakeholders and share information to the communities surrounding DOE sites. DOE plans to pursue partnerships with organizations within DOE, other agencies, Tribal governments, and external stakeholders such as local utilities and communities. DOE plans to engage with Tribal partners through existing mechanisms to share the results of VARPs and the potential impacts for their lands. Through these partnerships, DOE will build adaptive capacity not only on the Department's physical infrastructure, but also for the communities where DOE employees live.

In the 2021 Plan, DOE committed to developing and deploying climate resilient technologies, tools, and practices throughout the DOE complex. DOE National Laboratories have created many tools to advance climate planning. For example, Argonne National Laboratory (ANL) created the Climate Risk and Resilience Portal (ClimRR) which allows individuals, governments, and organizations to examine simulated future climate conditions at mid- and end-of-century for a range of climate threats. DOE is planning to leverage ClimRR to help sites keep their VARPs updated with new climate information.

DOE will continue to advance the deployment of emerging climate resilient technologies through nuclear energy generation demonstration projects to support the design and licensing of innovative advanced reactor concepts that enhance the supply of clean electricity. The Demonstration of Microreactor Experiments (DOME) test bed will be available for use at the Idaho National Laboratory (INL) as soon as 2026. INL is also establishing the Microreactor Applications, Research Validation and Evaluation (MARVEL) microreactor which will serve as a unique nuclear test platform to demonstrate microreactor operations and end-use applications. MARVEL is planned to be completed at INL in 2027.

Successful implementation of this Plan will require collaboration and coordination across DOE, with other Federal agencies, stakeholders, and Tribal partners. DOE will continue to leverage its climate science expertise and engineering capabilities to continuously improve Departmental understanding of climate change impacts and identify appropriate adaptation strategies. By building the adaptive capacity of the Department, DOE can ensure that its mission and operations are resilient to disruptions from extreme weather and a changing climate.

Appendix A: Risk Assessment Data

The Federal Mapping App uses the following data:

Buildings

Buildings data comes from the publicly available Federal Real Property Profile (FRPP). The General Services Administration (GSA) maintains FRPP data and federal agencies are responsible for submitting detailed asset-level data to GSA annually. FRPP data is limited for several reasons. Some agencies do not submit complete asset-level data to GSA, building locations are denoted by a single point and do not represent the entirety of a structure or could represent multiple structures, and properties may be excluded based on national security determinations. However, FRPP is still the best available public dataset for federal real property. Furthermore, despite these limitations, this data is sufficient for screening-level exposure assessments to provide a sense of potential exposure of federal buildings to climate hazards.

Personnel

Personnel data comes from the Office of Personnel Management's (OPM) non-public dataset of all personnel employed by the federal government that was provided in 2023. The data contains several adjustments, including exclusion of military or intelligence agency personnel, aggregation of personnel data to the county level, and suppression of personnel data for duty stations of less than 5 personnel. Despite these adjustments, this data is still useful for screening-level exposure assessments to provide a sense of key areas of climate hazard exposure for agency personnel.

Climate Hazards

The climate data used in the risk assessment comes from the data in Climate Mapping for Resilience and Adaptation (CMRA) Assessment Tool. When agency climate adaptation plans were initiated in 2023, CMRA data included climate data prepared for NCA4. Additional details on this data can be found on the CMRA Assessment Tool Data Sources page. Due to limited data availability, exposure analyses using the Federal Mapping App are largely limited to the contiguous United States (CONUS). Additional information regarding Alaska, Hawai'i, U.S. Territories, and marine environments has been included as available.

DOE also used data from sites VARPs to understand their risks and the resilience actions necessary to mitigate the impacts of climate change. In this process, DOE site VARP planning teams reviewed historical weather data, climate projections, and the latest climate science to understand future climate scenarios. DOE sites assessed the potential impact of extreme weather events and climate change on the site-specific operational viability of critical assets, infrastructure, and programs. To ensure consistency in approach and comparability of results across the DOE complex, site used the climate scenarios represented by RCP 4.5 and RCP 8.5, in addition to any other scenarios deemed appropriate. DOE sites used the following tools to understand their historic and projected climate hazards:

Historic Hazards

DOE sites used the Federal Emergency Management Agency's (FEMA) National Risk Index (NRI) or the Potential Hazards tool within FEMP's Technical Resilience Navigator to provide a baseline for understanding historical hazards that could be affected by climate change.

Projected Hazards

Sites used the fourth National Climate Assessment (NCA) regional reports which describe specific climate hazards projected for geographic regions. Besides the NCA reports, other local plans, assessments, and resources were used. Sites also used the tools, graphs, and climate data in the Climate Resilience Toolkit, Climate Explorer, and Climate Impact Lab. In addition, National Oceanic and Atmospheric Administration's (NOAA) 2022 State Climate Summaries were used for state-level climate information and to provide historical climate variations, trends, and future climate model projections of climate conditions during the 21st century for each state.