

## **Vulnerability Assessment and Resilience Planning at Department of Energy Office of Environmental Management Sites**

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**Background/Objectives.** In August 2021, the Department of Energy (DOE) instructed all DOE sites and offices to develop a Vulnerability Assessment and Resilience Plan (VARP). The VARP aims to support the commitment DOE has made to managing the short- and long-term effects of climate change on its mission and operations. The purpose of these individual site VARPs is to identify climate-change related risks and to ensure that each site's mission-critical assets are resilient for any identified risks and challenges that might be encountered.

Savannah River National Laboratory (SRNL) and Lawrence Berkeley National Laboratory (LBNL) provided support for preparation the VARPs for eight DOE sites in the Office of Environmental Management (EM) complex.

**Approach/Activities.** The SRNL/LBNL lab team's focus was to provide each site with data that are consistent and also to collect site-specific data in a consistent manner for future analyses. Historical and projected climate data for each of the eight DOE-EM sites were downloaded to develop a risk matrix for each site. Sites include Hanford (Richland, WA), Moab Uranium Mill Tailings Remedial Action Project (Moab, UT), Oak Ridge (Oak Ridge, TN), Paducah Gaseous Diffusion Plant (Paducah, KY), Portsmouth Gaseous Diffusion Plant (Portsmouth, OH), Savannah River Site (Aiken, SC), Waste Isolation Pilot Plant (Carlsbad, NM), and West Valley Demonstration Project (West Valley, NY). Climate parameter projections assessed for each site include annual precipitation, extreme precipitation days, maximum daily precipitation, drought, annual average maximum temperature, extreme degree days, cooling degree days, heating degree days, flooding, and wildfire. Each site was provided risk analyses for each of the parameters using the representative concentration pathway (RCP) models: RCP 4.5 and RCP 8.5, also used by the Intergovernmental Panel on Climate Change.

Not only was the objective to provide sites with consistent data for ease of current and future analyses but was also to collect data in a similarly consistent manner. The sites provided mission-critical assets, various metrics, and documentation on historical climate events which were collated into a database which will be used to update the climate projections and risk assessments in the future.

**Results/Lessons Learned.** Based on the climate projections, each of the sites are expected to have a high risk of increased negative impacts due to higher temperatures. The remaining metrics are variable between sites. Resilience solutions were also developed for each type of site-specific asset that is projected to be impacted by various climate parameters.

The lab team and ultimately DOE-Headquarters can use this type of general reporting for making overarching decisions on how to protect assets resilient from expected climate hazards. This information will be used to refine the VARPs in the future to ensure long-term climate resiliency at DOE-EM sites.