A Case Study: Los Alamos National Laboratory's Climate Change Vulnerability Assessment and Resilience Plan

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Background/Objectives. President Joseph R. Biden issued Executive Order (EO) 14008, Tackling the Climate Crisis at Home and Abroad, in February 2021. In response to this EO, Department of Energy (DOE) published the Vulnerability Assessment and Resilience Plan (VARP) Guidance document, describing the process for how DOE sites should complete the vulnerability assessment and create a resilience plan. Los Alamos National Laboratory (LANL) completed its VARP in September 2022. This VARP is tailored specifically to LANL and is built upon numerous related studies, initiatives, and programs including three previous plans and policies that were leveraged and updated to provide a foundation for the VARP. LANL is at risk from several climate change impacts because of its location in the high desert of New Mexico and because the average age of facilities is high; more than 26 percent of the portfolio is 61 years or older, and 61 percent is more than 50 years old. The age and deteriorating condition of many facilities contribute to their vulnerability to climate hazards. The objective of the VARP is to help LANL to identify, prepare for, and meet challenges posed by climate change by (1) identifying any vulnerabilities that critical assets may have to climate hazards, and (2) recommending resilience solutions to mitigate those vulnerabilities.

Approach/Activities. The project scale of LANL's VARP included facilities, infrastructure, and personnel located throughout the 36+ square mile site. The VARP process consists of two parts: the Vulnerability Assessment (Steps 2 through 6) and the Resilience Planning (Steps 7 through 9). The steps of the VARP included (1) assembling a VARP planning team, (2) determining mission-critical assets, (3) examining historical climate events, (4) projecting future climate hazards, (5) characterizing impacts of climate hazards on critical assets, (6) creating a VARP Risk Matrix to highlight vulnerabilities, (7) proposing resilience solutions to address vulnerabilities, (8) determining a final Portfolio of Resilience Solutions, and (9) planning integration of resilience site-wide. Throughout the VARP, over 80 personnel were involved as subject matter experts (SMEs) in subjects including pollution prevention, sustainability, forest health, campus planning, environmental justice, climate science and modeling, engagement with surrounding communities, and many more.

Results/Lessons Learned. During the Vulnerability Assessment, LANL identified 141 critical assets and 10 climate change hazards. The VARP risk matrix revealed that two climate change hazards, wildfire and precipitation, posed a high risk to all critical asset types. Heat wave, flooding, thunderstorms, and strong wind events resulted in a combination of high and medium risks to all critical asset types. Four climate hazards had no impact to critical assets. During resilience planning, the team solicited ideas for resilience solutions from personnel across the Laboratory to address the critical assets and climate change hazards relationships that received a high risk score in the VARP risk matrix. A total of 48 projects were proposed for consideration. Each solution was evaluated against the hazard(s) which it addressed, expected effectiveness, feasibility, cost and funding type, and the timeline for the proposed project. The VARP team recommended 19 projects to include in a Portfolio of Resilience Solutions to increase LANL's resiliency against impacts of climate change. The estimated cost of implementing the final portfolio totals approximately $87 million.