DOE-ID NEPA CX DETERMINATION
Idaho National Laboratory

CX Posting No.: DOE-ID-INL-16-129 R2

SECTION A. Project Title: Electrical Power Grid Research R2

SECTION B. Project Description and Purpose:

Revision 2:

The work scope involves power system testing located at and around the CITRC Substation, in the surrounding CITRC facilities and area, as well as site wide. Testing of customer equipment and instrumentation would be conducted at the substation and on the power lines. Power Management would operate the high voltage substation equipment. Customer equipment would be operated within the substation, from inside vehicles or small shelters such as cargo trailers or tents. Equipment under test may be setup in open areas within the CITRC area, primarily at the existing Power Grid Test Bed User Sites (Sites A, B, C, and D) or throughout the INL site.

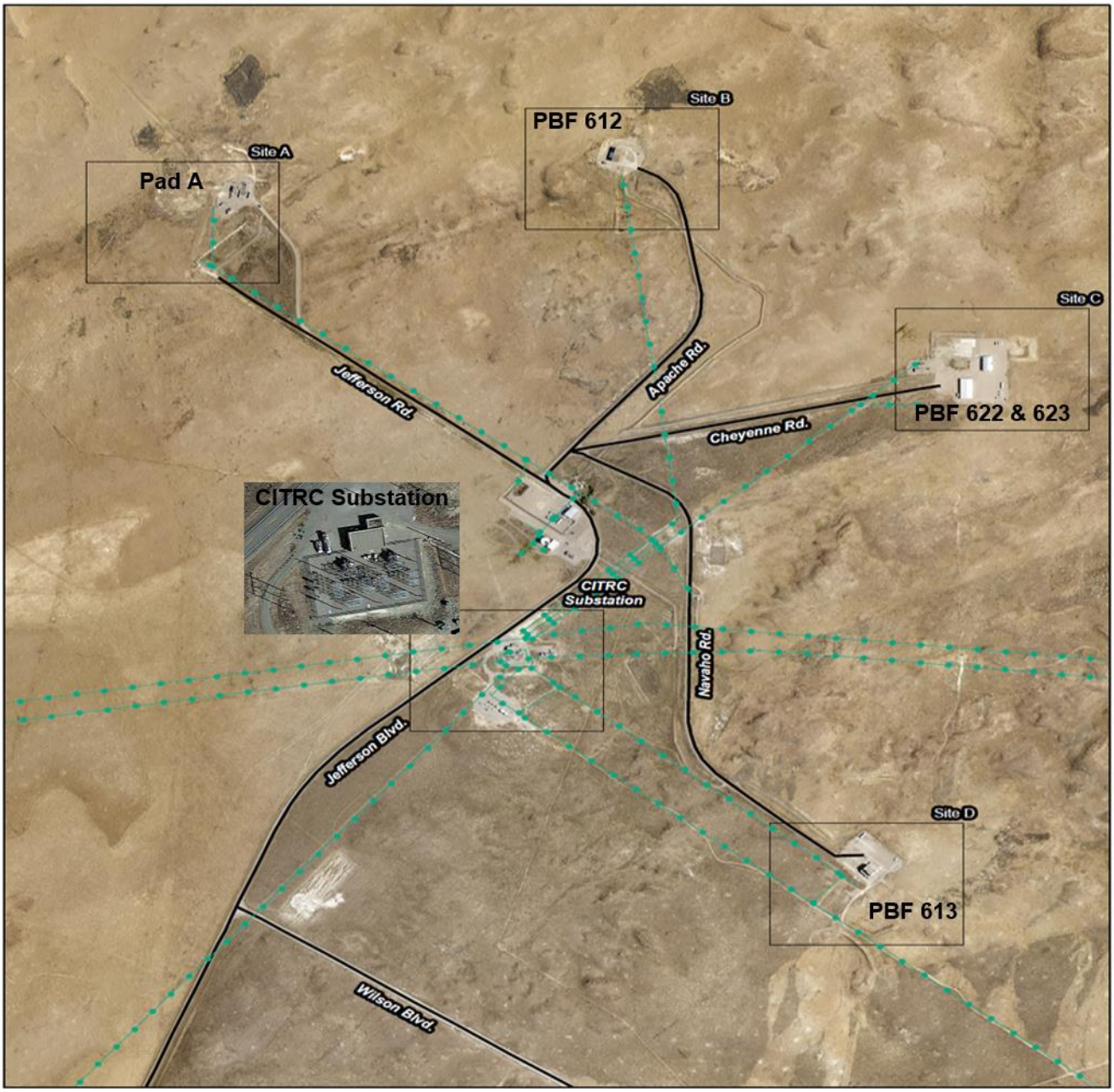

Figure 1: CITRC Area and Power Grid Distribution Test Bed

Additional activities would use the CITRC substation, the circuits coming out of the substation, and the facilities and User Sites (A-D) at the ends of the circuits (Figure 1). Test equipment would be installed on or around circuit 55 and PBF-612, circuit 56 and the Power Line Test Bed (aka Bode Test Bed), circuit 57 and PBF-623, circuit 52 and PBF-613, circuit 54, and circuit 53 and the Security Training Facilites (STF) area. Activities may also include the Scoville Substation and the 138 kV transmission line from Scoville Substation to Special Power Excursion Reactor Test (SPERT) Substation, and from

SPERT Substation to MFC Substation (shown in Figure 2). Test locations at areas other than the established facilities will be accessed by vehicle using existing roads (paved, gravel, or two-track), or via foot traffic.

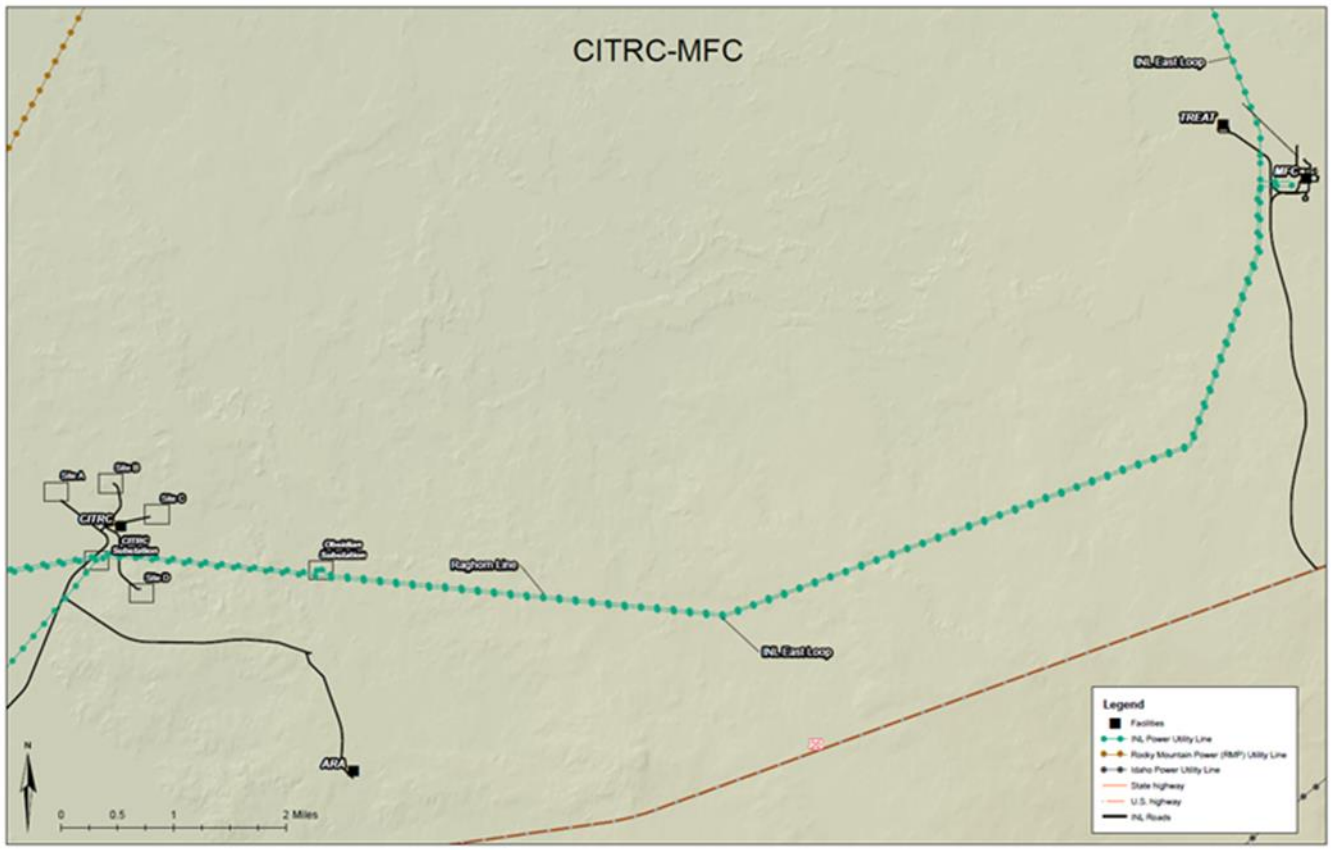

Figure 2: Transmission and Distribution Test Circuits between CITRC and MFC

Project activities would include normal Power Management practices and operations, and placement of sensors and measuring equipment at various locations in and around the substation, on or around the power lines, and in or around the facilities/buildings. The proposed action would evaluate, test and/or demonstrate sensors, power grid equipment and systems, or other devices that are on or near power lines. Some of these units may be passive in nature and would not interact with the power lines in a manner that would cause damage. They may touch the power line or move on the line and associated equipment. The units may be placed on the line, support structure, or placed near the lines on the ground. The units may also be installed in-line with the systems. Active testing with the potential to cause damage or power outages would be performed with permission from the utility owner.

Other testing activities may involve mechanical, chemical, thermal or explosive interactions. These units have the potential to cause a) a power line to fail, b) a short to ground, c) a phase to phase short, or d) a combination of these or similar events. The testing also has the potential to cause other equipment attached or associated with the power grid to fail. The power line or parts of the power line may fall to the ground. Testing units would touch the power line or move on the line and associated equipment. The units would be on the line, support structure or placed near the lines on the ground. The units would also be installed directly into the power system. Such testing would typically be conducted at established test pads and facilities designed to support electric power systems testing.

Testing may involve 1) placement of sensors in pre-drilled/dug holes in the ground, covering the sensors with dirt, gathering data generated by the sensors, and retrieving the sensors from the holes; 2) placing sensors in holes dug on-site during testing activities; 3) placing sensors/equipment in facilities and/or on roofs, and gathering data from the sensors/equipment; and 4) power line testing of sensors/equipment on power lines.

All power line related work would be managed and performed by the INL Power Management organization.

Occasional use of a gasoline-powered portable generator would be necessary to provide AC power to vehicle mounted sensors. Automotive batteries (12-volt sealed lead-acid) would also be used for remote power activities.

Access to setup, operate, and monitor the instrumentation may be by vehicle on paved, gravel, and two-track roads. All setups would be temporary and would be removed upon completion of testing. Some instrumentation would be unmanned but visually monitored periodically during testing.

Some testing/work activities have the potential to cause fires. These activities would include fire engineer and Fire Department involvement. At times, the Fire Department would be pre-staged with the researchers to extinguish fires that result from successful research or demonstrations. In addition, portable generator operation has the potential to cause fires. The INL Fire Marshal would establish requirements for mitigation and control of the fire hazard including, but not limited to, placing a 30-foot buffer area around any heat producing equipment (the vehicle and generator), prohibiting smoking, and having fire

extinguisher(s), shovels, and communications (radios, cell phones, or pagers) on site. Additional requirements could include cooling the generator prior to refueling and providing secondary containment for the generator to prevent drips and spills.

The following hazard mitigations are in place:

- Fire crew stationed near the test site
- Protective barrier placed around test area
- Containment bladder
- Short clock cycle on electrical protection (bushing will be de energized faster that would be found in a public utility environment)

Proposed work will support a DOE-sponsored, national level program designed to show potential physical consequences of cyber-attacks on critical infrastructure as well as to demonstrate mitigation strategies and technologies to prevent them. The goal of the project is to create a representative system for testing that is isolated and separate from production facilities and air-gapped from Power Management SCADA.

The work leverages existing electric power test infrastructure at CITRC User Site A and will temporarily place power grid related equipment and equipment trailers at CITRC User Site D, near PBF 613, to test at scale new technologies developed for DOE to enhance grid resilience through sensor detection of anomalous communications and improvements in protective relay design. No failure or damage to equipment is expected.

User Site A

Existing test equipment at User Site A (Figure 3) will be operated as configured.

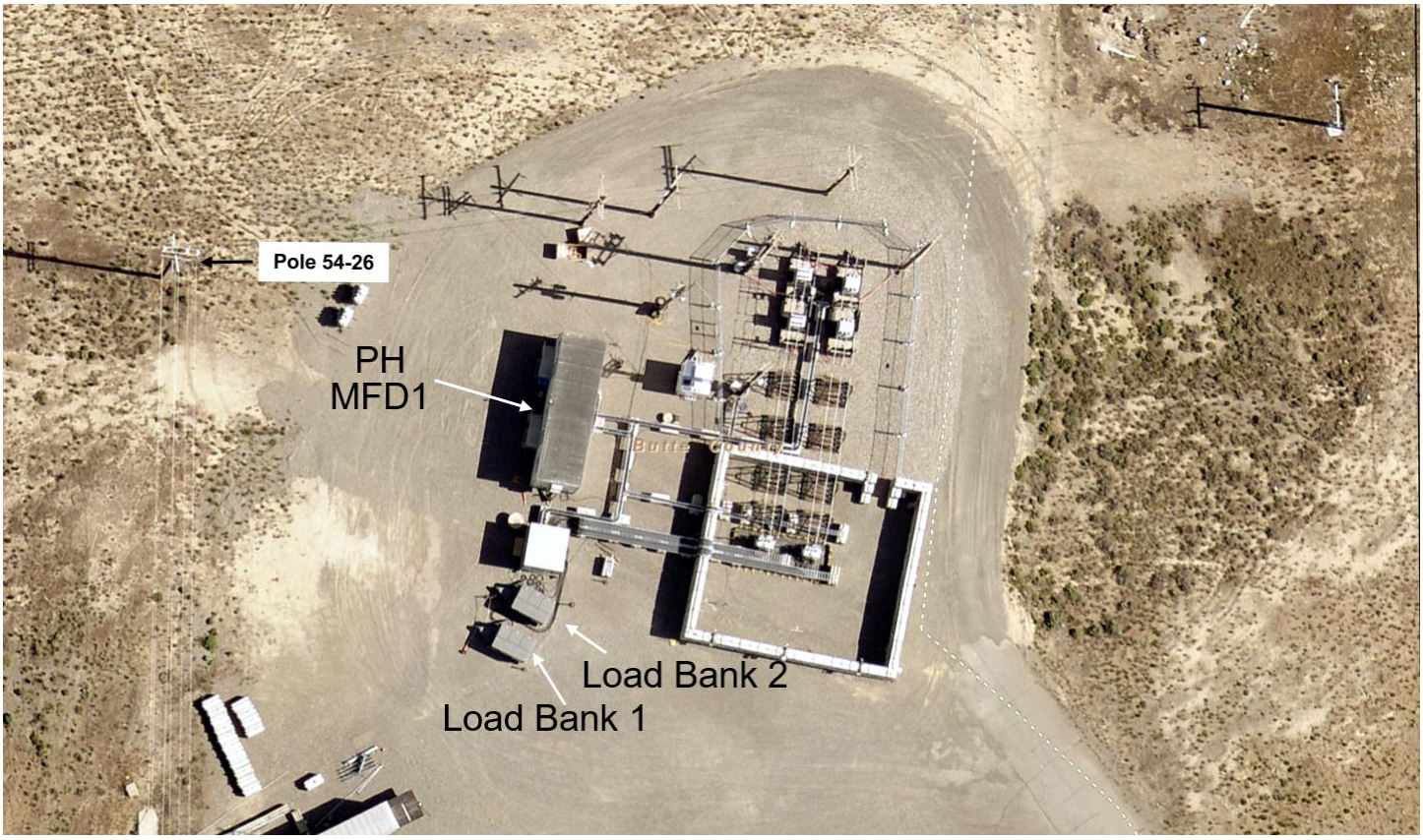

Figure 3: CITRC User Site A with two Load Banks. Pale Horse (PH) nad Master Fault Detector are also included (MFD).

User Site D

User Site D will be temporarily configured with multiple equipment trailers and electric grid infrastructure related equipment to be used for testing. The equipment and trailers will be placed, to the maximum extent possible, on the 130’ x 130’ area (which includes an existing 50’ x 50’ graveled and grounded test pad) previously surveyed by Cultural Resources (Figure 4).

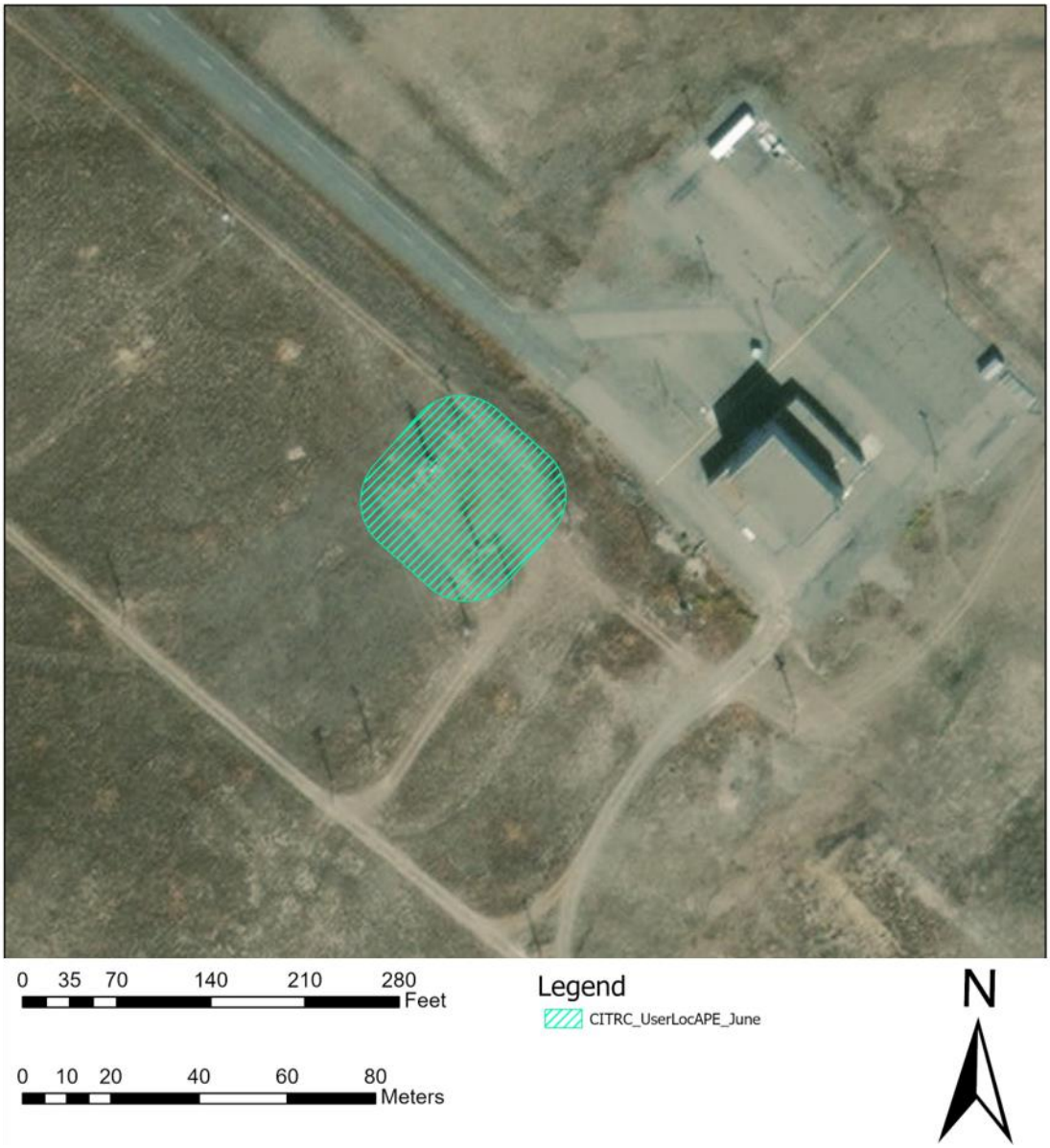

Figure 4: CITRC User Site D Survey Area

Major equipment to be set up at User Site D (Figure 5) include the following:

- Protective Relay Permissive Communication (PRPC) and Master Fault Detector (MFD) command center trailer - 28’ (L) x 8’ (W) x 8’ 6” (H). This command center includes workstations, monitors, and power feeds to the workstation equipment.
- Mobile substation – 36’ (L) x 8’ 6” (W). The mobile substation includes standard electric power devices (e.g., transformer, breakers, switches, connectors, protective relays) that will be operated as intended.
- Solar PV array - includes a series-connected SA-24 Mobile PV Super Array (36’ (L) x 8’ 6” (W) x 12’ 10” (H)) and Intermodal PV Series panels.
- Portable wind turbine ~20’ (L) x ~20’ (W) x ~ 30’ (H) (location is notional - final location may be outside the previously surveyed 130’ x 13’ area to provide sufficient space to prevent damage to the powerline in the event of an unexpected tipover)

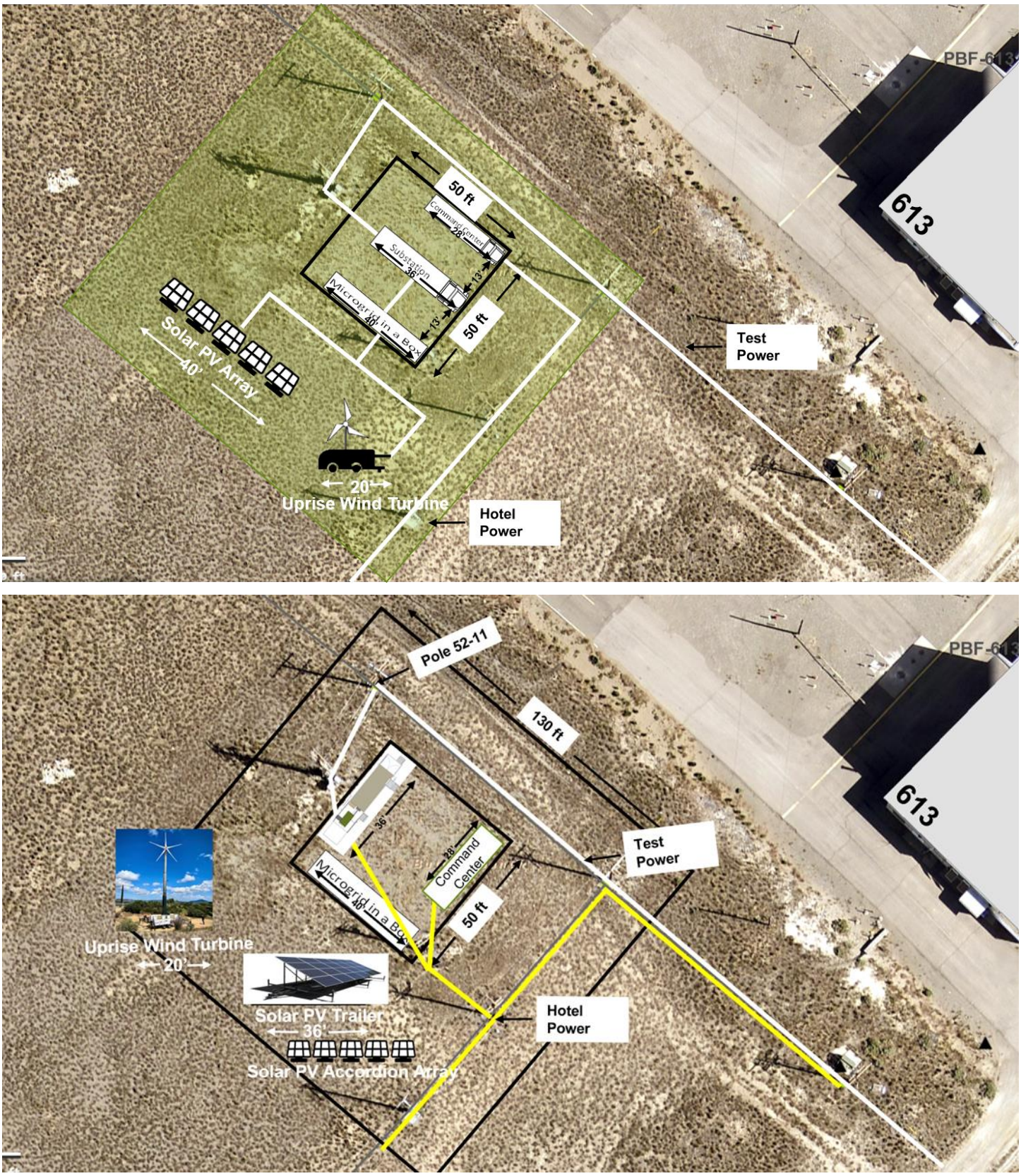

Figure 5: CITRC User Site D Equipment Layout

Power for the trailers and equipment will be provided from existing "Hotel" utility power provided at User Site D. The existing 10kVA pole top transformer will be replaced with a new 37.5kVA pole top transformer by Power Management prior to testing. Equipment grounding will be achieved through connection to the existing ground grid located underneath the 50' x 50' gravel pad (connection to designed and facilitated by Power Management). Some placements of

ground rods may be necessary depending on distance of equipment/trailers from the existing ground grid. Power and communications cables and communications fiber will be surface mounted on the ground and terminated with plug and play connectors.

Revision 1:

Based on funding constraints, the scope and location of the proposed work have been modified. The Environmental Aspects, Work activities, Conditions and Directions have been modified to address the reduced work scope and potential impacts.

The work is proposed to be performed at the National Security Test Range rather than near Materials and Fuels Complex (MFC). The work is no longer expected to have the potential for catastrophic failure. A new power pole will not be required. No potential for fire danger exists. Brushing oil may be released to a secondary containment. The test set up and execution will remain the same with one exception: Instead of the bushing being connected to a single phase on the transmission line, a High Potential (Hipot) meter will be connected to the bushing. The Hipot is a meter that is used in industry for testing power related components. The Hipot runs off a 120V 30amp circuit which will be powered via a small portable generator. An Air Permitting Applicability Determination (APAD) for operation of the generator will not be required since it will be on-scene less than one year. The work is expected to take place during October-November 2016.

Original EC:

To address the need for reducing threats to critical infrastructure, research is conducted at Idaho National Laboratory to study critical infrastructure vulnerabilities on various systems, including power grid testing. The proposed action would analyze failure mechanisms of transformer bushings supporting the nation's power grid. Project activities include set-up of a transformer bushing in a commercial off-the-shelf (COTS) test stand designed specifically for transformer bushings. When operating, a transformer bushing is bolted to the top of the transformer or test stand with the lower half inside and surrounded by mineral oil. To replicate an operational scenario, a containment vessel will be attached to the test stand and filled with approximately 3 gallons of mineral oil. The test bushings also contain approximately 4 gallons of mineral oil.

Work will take place during FY 2016 at the Materials and Fuels Complex (MFC) test pad. Other potential locations, such as Critical Infrastructure Test Range Complex (CITRC) and Test Area North (TAN) were evaluated in an effort to reduce impacts to vegetation, but these locations lack correct infrastructure.

The test stand would be located near the INL 138kV transmission line, and a tap line would connect the bushing to a single phase of the transmission line. The bushing would be energized, and data would be collected to obtain baseline measurements. The bushing would then be de-energized, and approximately half of the oil inside drained. Then the test process would be repeated.

Upon completion of the baseline tests, the bushing would be removed and replaced with a new bushing. A series of artificial failure mechanisms would be introduced to the porcelain part of the bushing that would normally be outside the transformer.

A physical barrier consisting of stacked jersey barriers or sandbags would surround the test apparatus. This barrier would contain any debris in the event that the failure mechanisms create enough pressure to expel the porcelain or any other materials. The physical barrier would also minimize the radius of area that could be affected by fire hazard due to flying debris. A secondary containment bladder would be placed under the test stand (within the protective wall) and filled with a ballast material such as gravel. This would contain any oil spilled if the porcelain is breeched.

Access to setup, operate, and monitor the instrumentation would be by vehicle on paved, gravel, and two track roads. All setups would be temporary and would be removed upon completion of testing. Some instrumentation would be unmanned but visually monitored periodically during testing.

Project activities include normal Power Management practices and operations. Active testing with the potential to cause damage or power outages would be performed with permission from the utility owner.

Occasional use of gasoline-powered portable generator would be necessary to provide AC power to instrumentation. Automotive batteries (12-volt sealed lead-acid) would also be used for remote power activities.

Several work activities have the potential to cause fires. These activities would include fire engineer and Fire Department involvement. At times, the Fire Department would be pre-staged with the researchers to extinguish fires that result from successful research or demonstrations. In addition, portable generator operation has the potential to cause fires. The INL Fire Marshal would establish requirements for mitigation and control of the fire hazard including but not limited to, placing a 30-foot buffer area around any heat producing equipment (the vehicle and generator), prohibiting smoking, and having fire extinguishers (s), shovels, and communications (radios, cell phones, or pagers) on site. Additional requirements could include cooling the generator prior to refueling and providing secondary containment for the generator to prevent drips and spills.

The following hazard mitigation are in place:

- Fire Crew stationed near the test site
- Protective barrier placed around test area
- Containment bladder
- Short clock cycle on electrical protection (bushing will be de energized faster that would be found in a public utility environment).

All bushings and oil were manufactured after 1982 and are PCB-free. Installation of a temporary power pole may be required to route power from the transformer to the test bushing.

The secondary containment and temporary power pole would be removed upon completion of the test, and the area would be revegetated if necessary. The proposed location is outside of the Sage Grouse Conservation Area. If sagebrush is destroyed, it would be replaced in accordance with the No-Net-Loss-of-Sagebrush Policy in the Candidate Conservation Agreement.

SECTION C. Environmental Aspects or Potential Sources of Impact:

Air Emissions

Project activities may involve exhaust from operation of heavy equipment, but these emissions are expected to be well below reportable levels. The project may use a portable generator. This type of portable equipment is exempted under state air regulations. If fugitive dust is expected during project activities, reasonable precautions would be taken to prevent particulate from becoming airborne. This is in accordance with the methods specified in the Rules for the Control of Air Pollution in Idaho (IDAPA 58.01.01.650-651). Steps taken to control fugitive dust at the INL Site (such as application of water or other suppressants) must be recorded in the project records.

Discharging to Surface-, Storm-, or Ground Water

N/A

Disturbing Cultural or Biological Resources

A Cultural Resource Review survey is required for all ground disturbing activities (this includes, but is not limited to off-road vehicle travel, heavy foot traffic, mowing vegetation, and digging with hand/power tools) prior to beginning of work. Due to the sensitive nature of the CITRC area all work in this area will need to be reviewed and any ground disturbing activities my need to be monitored by INL CRMO personnel. A written Cultural Resource Review is also required for work performed at, and to, historic buildings PBF-612 and PBF-613.

A Biological Resource survey are also required prior to beginning of work. Biological resources applies to activities that have the potential to interact, disturb or affect wildlife or their habitat. If mowing is involved, the ECP is required to be Tier 1. Mowing is a ground disturbing activity and removes vegetation impacting biological resources. Surveying will need to be conducted to follow Migratory Bird Act guidelines (April 1 to October 1), and to determine the amount of sagebrush that may be impacted.

Generating and Managing Waste

Small amounts of industrial waste in the forms of rags, wire, plastic pipe, and similar project-related materials would be generated. All waste would be managed by Waste Generator Services (WGS).

Releasing Contaminants

When chemicals are used during the project there is the potential for spills that could impact the environment (air, water, soil).

Using, Reusing, and Conserving Natural Resources

Because this project may use petroleum products and possibly other potentially hazardous industrial chemicals, there is the potential for release of small amounts of contaminants into the air, water, or soil. Project personnel will use non-hazardous chemical substitutes in the place of hazardous chemicals if the non-hazardous substitutes meet the requirements/specifications of the requester. Project personnel will apply spill prevention/minimization measures during chemical use and storage. Project personnel will maintain an inventory of on-site chemicals purchased from off-site sources and records of any chemical releases.

SECTION D. Determine Recommended Level of Environmental Review, Identify Reference(s), and State Justification: Identify the applicable categorical exclusion from 10 Code of Federal Regulation (CFR) 1021, Appendix B, give the appropriate justification, and the approval date.

For Categorical Exclusions (CXs), the proposed action must not: (1) threaten a violation of applicable statutory, regulatory, or permit requirements for environmental, safety, and health, or similar requirements of Department of Energy (DOE) or Executive Orders; (2) require siting and construction or major expansion of waste storage, disposal, recovery, or treatment or facilities; (3) disturb hazardous substances, pollutants, contaminants, or Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)-excluded petroleum and natural gas products that pre-exist in the environment such that there would be uncontrolled or unpermitted releases; (4) have the potential to cause significant impacts on environmentally sensitive resources (see 10 CFR 1021). In addition, no extraordinary circumstances related to the proposal exist that would affect the significance of the action. In addition, the action is not “connected” to other action actions (40 CFR 1508.25(a)(1) and is not related to other actions with individually insignificant but cumulatively significant impacts (40 CFR 1608.27(b)(7)).

References:
The activities identified in this ECP are constent with 10 CFR 1021, Appendix B Categorical Exclsuion B3.6: Small-scale research and development, laboratory operations, and pilot projects, and B3.11: Outdoor tests and experiments on materials and equipment components.

Justification:
Project activities are consistent with 10 CFR 1021, Appendix B, CX B3.6 ”Siting, construction, modification, operation, and decommissioning of facilities for small-scale research and development projects; conventional laboratory operations (such as preparation of chemical standards and sample analysis); and small-scale pilot projects (generally less than 2 years) frequently conducted to verify a concept before demonstration actions, provided that construction or modification would be within or contiguous to a previously disturbed or developed area (where active utilities and currently used roads are readily accessible). Not included in this category are demonstration actions, meaning actions that are undertaken at a scale to show whether a technology would be viable on a larger scale and suitable for commercial deployment,"
And B3.11 “Outdoor tests and experiments for the development, quality assurance, or reliability of materials and equipment (including, but not limited to, weapon system components) under controlled conditions. Covered actions include, but are not limited to, burn tests (such as tests of electric cable fire resistance or the combustion characteristics of fuels), impact tests (such as pneumatic ejector tests using earthen embankments or concrete slabs designated and routinely used for that purpose), or drop, puncture, water-immersion, or thermal tests. Covered actions would not involve source, special nuclear, or byproduct materials, except encapsulated sources manufactured to applicable standards that contain source, special nuclear, or byproduct materials may be used for nondestructive actions such as detector/sensor development and testing and first responder field training.”

Is the project funded by the American Recovery and Reinvestment Act of 2009 (Recovery Act) ☐ Yes ☒ No

Approved by Jason Anderson, DOE-ID NEPA Compliance Officer on: 05/13/2021