Department of Energy
Idaho Operations Office
1955 Fremont Avenue
Idaho Falls, ID 83415

NATIONAL HISTORIC PRESERVATION ACT SECTION 106
FINDING OF ADVERSE EFFECT

Date: June 3, 2024

Subject: Proposed Relocation of the Materials and Fuels Complex Mock-Up Shop at the Idaho National Laboratory

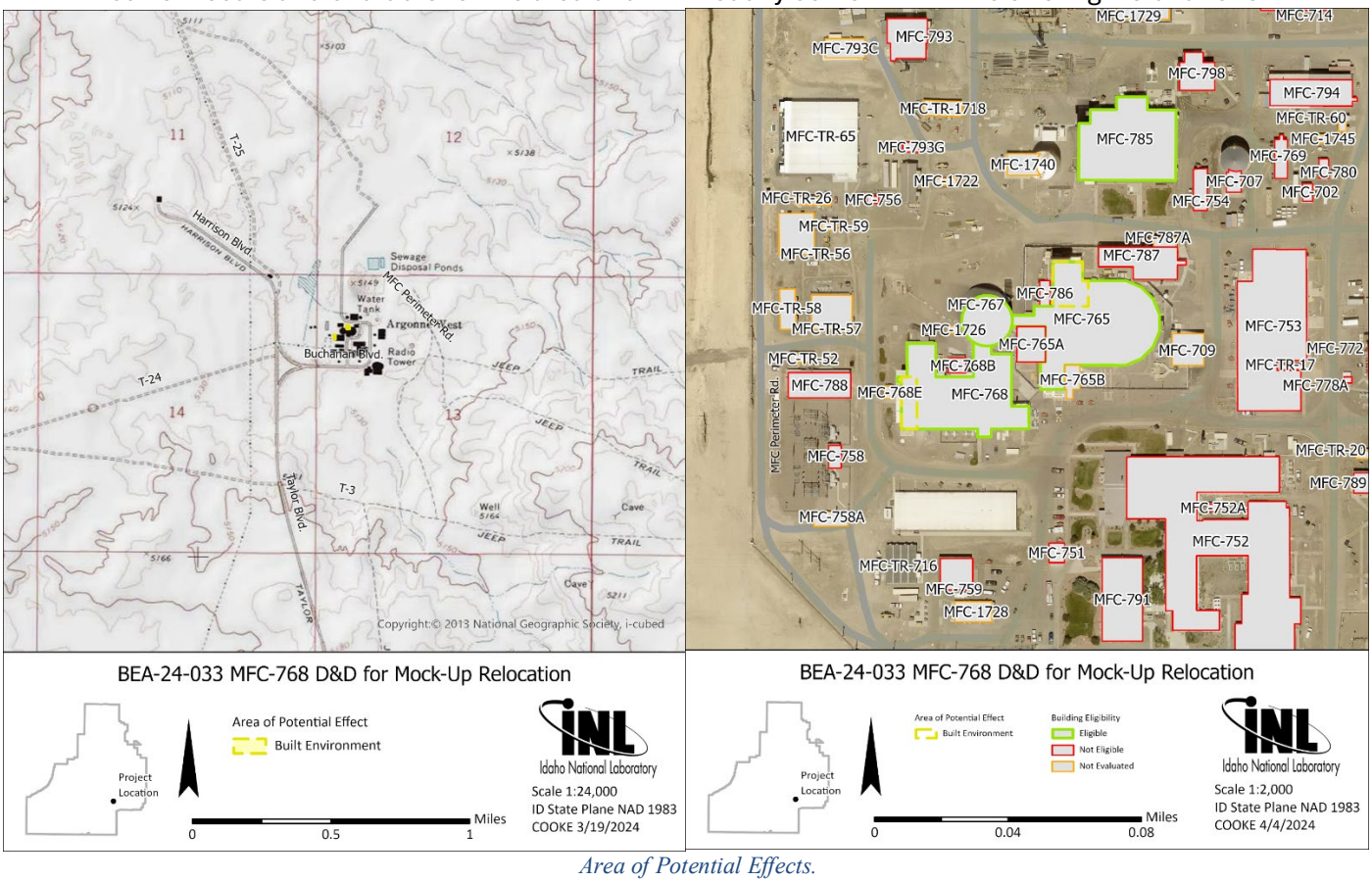
In accordance with 36 CFR § 800.6(a)(4), the Department of Energy, Idaho Operations Office (DOE-ID) is making the information below available to the public regarding Section 106 review for the subject undertaking to provide an opportunity for members of the public to express their views on resolving adverse effects of the undertaking. **Comments should be emailed to Betsy Holmes, DOE-ID Cultural Resource Coordinator, at holmesbs@id.doe.gov on or before July 3, 2024.**

Description of the Undertaking and Area of Potential Effect (APE): The Idaho National Laboratory (INL) Site is an 890-square mile Department of Energy site operated by the Department of Energy, Idaho Operations Office (DOE-ID) with a focus on nuclear energy research and environmental cleanup. The scope of this task is to relocate the machining capability of the Materials and Fuels Complex (MFC) Mock-Up Shop from MFC-765 Fuel Conditioning Facility (FCF) to MFC-768 Power Plant Building. This task requires demolition at the planned new location for the machining capability, supporting facility modifications, and installation of machining equipment, both new Government Furnished Equipment and reused equipment. Supporting facility modifications include providing a conference room / breakroom and office area with appropriate amenities and supplying all necessary utilities for the machine tooling. Although most systems and components located within the planned demolition area are already retired, there remain several in-service systems. These in-service systems, such as the Purified Water Distribution System, Potable Water System, and Fire Water System will be reconfigured as necessary to maximize free space available for the relocated machining capability.

Relocation of the Mock-Up Shop machining capability will allow for future expanded FCF function that fits within the scope of the facility's Nuclear Facility Status. The Mock-Up Shop itself, and the activities carried out within, are not Nuclear Facility Function related with respect to regulatory requirements. Therefore, the machining capability does not warrant location within a Nuclear Facility to accomplish its mission. The Water Treating Area and Mezzanine level have been designated as the new MFC Mock Up Shop machining capability location and associated conference room/breakroom and office area, respectively. Following demolition, repairs will be made to old equipment pads and any curb will be removed. Self-leveling epoxy will be applied to repair flooring flush and concrete will be painted/coated. Modifications to MFC-768 will be made to accommodate for shop layout, machine tool capabilities, remote handling system capabilities, assembly/testing area capabilities, shop utilities, and office space.

The APE consists of two discontiguous areas. The first is the current mock-up shop in MFC-765 (Fuel Conditioning Facility [FCF]; Rooms 27, 28, 36, and 36A). The second includes the first floor and the mezzanine in the southwest corner of MFC-768 (EBR-II Power Plant; Room 1 [Water Treating] and Room 9 [Equipment Room]) and a small area at the north end of the third floor (COR2). As the undertaking proposed no ground disturbance, there is no potential to affect archaeological historic properties.

The project includes two exterior modifications; however, neither of these would introduce visual effects. Removal of the exterior fiberglass panels (first floor and mezzanine level, west elevation and west end of south façade) will not introduce visual effects. The corrugated metal panels proposed to replace the fiberglass will not project beyond the envelope of the building and will be painted to match the remaining fiberglass panels. As the proposed replacement panels will not project beyond the building envelope and will visually retain the historic fenestration pattern, there would be no visual effect to surrounding historic properties. The installation of the heating, ventilation, and air conditioning (HVAC) unit and ducting on the north elevation would not introduce visual effects to surrounding historic properties, as that elevation currently supports industrial walkways and other air handling equipment. The HVAC unit and ducting is appropriate to the current scale and character of the area and will visually conform with the existing installations.



Area of Potential Effects.

Description of Steps to Identify Historic Properties: Built environment historic properties were identified based on an inventory of MFC properties completed in 2021.

Description of Affected Historic Properties: Two historic properties are present within the APE: MFC-765, Fuel Conditioning Facility, built in 1962, and MFC-768, Experimental Breeder Reactor (EBR)-II, built in 1961. See attachment for property descriptions.

Description of Undertaking's Effects on Historic Properties:

Excluded Activities

Several proposed alterations to the project area within MFC-768 fall under Excluded Activities established in the 2023 Programmatic Agreement (Programmatic Agreement among the Department of Energy, Idaho Operations Office, the Idaho State Historic Preservation Office, and the Advisory Council on Historic Preservation Concerning Management of the Manner in which the Department of Energy Will Meet its National Historic Preservation Act Responsibilities on the Idaho National Laboratory Site, https://www.id.energy.gov/Home/CommitmentAndAgreement). These include:

- Plugging floor drains, removing concrete curbing and equipment pads, floor repair and releveling, and relocating Auxiliary Cooling Tower fan temperature indicating controllers fall under Excluded Activity Type 1A. Routine Maintenance: Minor modifications to or removing components to increase effective use of space.
- Rerouting in-service plumbing systems, such as the Purified Water Distribution System, the Potable Water System, and the Fire Water System identified in the scope, falls under Excluded Activity Type 1B. Routine Maintenance: Installation or repair of plumbing systems.
- Replacement of roll up door No. 102 falls under Excluded Activity Type 2C. Preservation and Replacement-in-Kind Materials: Replacement of fixtures or components of a property with in-kind materials.
- Replacement of the life safety system components falls under Excluded Activity Type 4B. Security and Safety Systems: Installation, maintenance, and repair or modification of personnel safety systems and devices within the built environment.

Visual Effects

MFC-768: Visual Effects

Exterior modifications to MFC-768 would not introduce visual effects to surrounding properties. The proposed replacement of the c. 1975 fiberglass panels on the first floor and the mezzanine level on the west elevation and the west end of the south facade will not introduce visual effects as the proposed new metal panels will not extend beyond the envelope of the building and will be painted to match the remaining fiberglass panels in the center bay of the south façade, retaining the appearance of the fenestration pattern, though not the utility of it.

The installation of the HVAC unit and ducting on the north elevation would not introduce visual effects to surrounding historic properties, as that elevation currently supports industrial walkways and other air handling equipment. Therefore, the new HVAC will adhere to the existing color, scale, and character of its environment and will not introduce visual effects.

Demolition and Construction:

MFC-765: FCF Mock-up Shop

All equipment is free-standing, and no modifications will be made to the building to facilitate removal.

MFC-768: Power Plant
Removal of the fiberglass panels on the first floor and the mezzanine level on south façade and west elevation removes a material component installed during the period of significance, though one that itself was a replacement of the original lucite panels. This represents a loss of historic fabric and introduces the potential for altering the design of the building by altering the fenestration pattern. The project proposes to replace the fiberglass with corrugated aluminum panels that match the profile pattern of the corrugated fiberglass pattern. CRMO and the project staff have worked to minimize the potential effect by agreeing that the aluminum will be painted to match the color of the current fiberglass panels on the west wall, as well as those that are to remain on the south façade, as closely as possible. This would maintain the visual appearance of the original fenestration pattern, but allow for a more durable, weathertight exterior, making this activity preservation positive for the property as a whole.

The apertures for the fiberglass panels will be enclosed with corrugated metal paneling. The proposed new interior metal panel will coordinate with the existing interiors walls that are also corrugated metal. The loss of natural light sources affects the integrity of design of MFC-768's interior, creating a greater reliance on artificial light sources. Because artificial light sources have been in place since the property's construction due to the size and interior spans of the building, the loss of natural light represents a relatively minor change to the interior.

Removal of the piping, lab space, and control panels removes contributing elements that convey the property's historic identity as the utility plant for MFC in an irreversible way. Construction of office space in the mezzanine introduces a personnel component to a historically industrial space, partially altering the historic character of the interior.

Applicability of Criteria of Adverse Effect:

MFC-765: FCF Mock-up Shop
The removal of equipment from the current mock-up shop in MFC-765 (FCF) will incur no effects to the property.

MFC-768: Power Plant
Constructed in 1961 as the power plant of the EBR-II Reactor Plant Building (MFC-767), MFC-768 supported the turbine generator and EBR-II control room for the reactor and power system. The generator was one of the EBR-II power cycle's three transfer systems. After the first and secondary systems, heat was generated as steam and flowed to the turbine generator, which converted the mechanical energy into electrical energy. The power supplied by the EBR-II provided all of the power for Argonne National Laboratory-West with additional power sold to National Reactor Testing Station (NRTS) and to Idaho Power, making it the first co-generator in Idaho.

MFC-768 is classified as a Reactor Support Facility, with the following character-defining features:

- Construction materials – use of commercially available or prefabricated materials, such as concrete block, poured concrete, pumice block, reinforced concrete, and metal panels.
- Design – tendency for irregular forms, multi-story heights including high and low bays, minimal fenestration installed only where necessary and with a tendency toward multi-light windows, minimal ornamentation, and, most importantly, building forms that accommodate specific internal equipment (e.g.: the form of the building follows the function of the equipment inside it).

- Contributing elements – elements necessary for the safe operation of the building, such as control equipment and specialty equipment necessary for the safe handling of radioactive materials, including hot or warm cells, manipulators, cranes and other heavy equipment, canals, passageways, pools, and devices or modified building materials meant to provide radiation shielding.

Removal of the water treatment equipment will remove some of the contributing elements of the property, permanently altering one of the character-defining features (see above), though the other two character-defining features (construction materials and design) will not be affected by this action. Removal of the piping, lab space, and control panels removes contributing elements that convey the property's historic identity as the utility plant for MFC in an irreversible way. Construction of office space in the mezzanine introduces a personnel component to a historically industrial space, partially altering the historic character of the interior.

Several elements of this project will alter characteristics of MFC-768 that contribute to its eligibility to the National Register of Historic Places (NRHP); namely removal of equipment and materials and changes in mission and use. Therefore, removal of the water treatment equipment on the first floor and the conversion of the mezzanine area will introduce an adverse effect to MFC-768.

Attachment: Historic Property Descriptions

MFC-765: Fuel Conditioning Facility

History

MFC-765 is the Fuel Conditioning Facility (or FCF) and it is in the central area of the MFC. Construction began in August 1959, and it was completed in 1962 with the building initially referenced as the Process Plant. By 1964, the facility was known as the Fuel Cycle Facility or the FCF.

The EBR-II and the associated FCF developed from the breeder reactor projects. After the EBR-I successfully tested the principles of breeding, Argonne National Laboratory (ANL) quickly turned its attention to designing and building the first pilot (or prototype) breeder reactor to examine breeder feasibility and an associated fuel cycle, with an emphasis on implementation in commercial reactors. In the early Cold War years, the U.S. military had priority access to highly enriched fuel, which motivated the Atomic Energy Commission (AEC) to learn more about breeder reactors to produce plutonium while sustaining uranium stores. Plans for the EBR-II and associated FCF began in 1953, but the facility's construction was completed in August 1962 and "hot operation" began in July 1963. In August 1963, testing operations began in the argon cell and the first melt refining process was completed on depleted uranium. In 1964, the process equipment was installed and in March, the argon cell became fully operational. In September 1964, one core subassembly and one blanket were transferred from the EBR-II; and the first irradiated reactor fuel was initiated. In spring 1965, the first subassembly created from recycled irradiated fuel was complete.

The property was designed to recycle the fast breeder reactor fuel from the adjacent EBR-II. Once the spent fuel was transferred to the FCF using an airlock corridor, it was disassembled and de-canned. The spent fuel was then melt-refined rather than chemically processed, which allowed the spent fuel to be processed on site near the reactor rather than shipped elsewhere. Once purified, the metal was recast into new rods and placed in new fuel assemblies before they were returned to the EBR-II. Processing was conducted using a remote control and contained in an inert environment behind shielded walls.

As the EBR-II bred extra fuel, the fuel cycling facility allowed the fuel to be recycled, fully exploiting uranium's potential energy. In theory, the FCF would facilitate the initial lifetime of uranium for the EBR-II supply. The fact that the EBR-II was a breeder reactor and produced more fissile material than it consumed only expanded the potential to recycle enough uranium to an infinite supply. As a result, the FCF became a very effective form of waste management system.

From 1964 to 1969, the EBR-II reactor successfully demonstrated the full process of a breeder-reactor power plant and on-site processing for metallic fuel. During this period the FCF remotely reprocessed and refabricated nuclear reactor fuel from the EBR-II in a closed cycle. By 1967, the facility also monitored the behavior of experimental and irradiated driver fuel for swelling and burnup limits. From 1965 to 1969, the FCF processed 35,000 fuel elements, produced 366 subassemblies, and assembled 66 control and safety rods.

Beginning in 1968, the FCF gradually decreased the processing and recycling of EBR-II spent fuel and began supporting experimental irradiation programs. In late 1969, the facility began handling and irradiating reactor components from the EBR-II and Transient Reactor Test Facility. From 1970 to 1971, the property was sometimes known as the Hot Fuels and Examination Facility (HFEF). In 1972,

MFC-765 was integrated with MFC-785 as the joint Hot Fuel Examination Facilities. MFC-765 was known as the HFEF-S while MFC-785 was the HFEF-N. The facility was modified and its name changed to the HFEF in 1972 and it was used to examine specimens using destructive (cut and prepared for further analysis) and non-destructive (including photography, weighting, measuring, and gamma-ray spectroscopy) techniques

In the 1980s when the EBR-II was used as the Integral Fast Reactor (IFR) prototype, the HFEF-S was altered to reprocess advanced plutonium-based spent fuels and the hot cell resumed its processing role as it had for the EBR-II. The assemblies were transferred from the reactor to the airlock and disassembled, broken down, refined, and utilized as new fuel pins. New equipment was added to perform remote reprocessing and refabricating of the fuel process for the IFR program and prove the feasibility of the IFR concept.

In 1993, the property was renamed the Fuel Conditioning Facility (also known as FCF) and on June 21, 1996, operations resumed. The facility's research continues to prove vital for pyrochemical processes in recycling oxide, carbide, and other advanced fuels and for demonstrating the feasibility of pyroprocessing technology for used nuclear fuel for the DOE's Fuel Cycle Research and Development Program.

Description

MFC-765 is a complex, multi-story, irregular-shaped building on a poured concrete foundation. The facility has several flat roofs and a variety of materials on its exterior including concrete blocks, stucco, raised seam metal panels, and corrugated metal panels. The western portion of the building has traditional rectangular-shaped sections, but the eastern side is predominantly a semi-circle in design. To the southeast of the building is a suspect stack, which provides a discharge point for the ventilation of the cells after the air has been filtered.

The south façade is the primary side and it can be broken up into two sections. The first (west) section is a single-story projection that extends past the second section and is composed of concrete block walls with some sections supporting stucco. This first section supports two metal overhead doors and a slight projection with a single metal-framed, fixed-pane window on both its west and east sides and one pair of metal personnel doors with inset lights on its south side. The building then recesses to the second (east) section and on the east side of this recession is one metal-framed, fixed-pane window and one metal personnel door with a gabled roof porch (Figure 1).

The first story of the semi-circular design has nine individual sides with corrugated metal panels above the concrete block walls. On its first side are ten pairs of metal-framed windows to the west of two metal personnel doors. To the east of the doors are two sets of metal-framed windows with 2/2/2/2 panes. The second, third, fourth, sixth, seventh, and eighth sides of the first story each have six metal-framed windows with 2/2/2/2 panes. All of the windows on the first story of the semi-circle have metal grating over them. On the fifth side of the first story are one metal personnel door and one metal overhead door with a metal overhang with a flat roof over the doors. On the ninth side are three pairs of metal-framed windows. To the right of these windows is a single-story concrete block projection with a flat roof and two metal-framed windows on its east side, and one metal-framed window and one metal personnel door on its north side (Figure 1, Figure 2, and Figure 3).

Figure 1. MFC-765, south and east façades (CEMML 2021)

Figure 2. MFC-765, east façade (CEMML 2021)

The second story of the semi-circular design recesses from the first story and has 16 individual sides with raised seam metal panel walls. Extending from the fourth side of the second story is a single-story, rectangular-shaped projection with a flat roof and single metal personnel doors on both its west and east sides. There is no other visible fenestration around this story (Figure 1, Figure 2, and Figure 4).

The third story of the semi-circular section of the building recesses from the second story and is more traditional with rectangular-shaped projections with corrugated metal panels on their exterior walls. Above the first section of the second story is one metal personnel door that is accessed via metal stairs down to the second story level. Above the second, third, fourth, and fifth sides of the second story is a single-story projection with a shed roof. Directly in front of this is another projection with raised seam metal panels, a shed roof, and a pair of metal personnel doors on its south side. Above the ninth section of the second story is a single-story projection with raised seam metal panels and one pair of metal personnel doors on its east side. Above the second story's eleventh, twelfth, and thirteenth side is a one-story projection with corrugated metal panel walls, a shed roof, and one metal personnel door on its north side. Directly in front of this projection is a smaller addition with raised seam panel walls and one metal personnel door on its north side (Figure 1, Figure 2, Figure 4, and Figure 5).

The north façade can be broken up into two sections with the first (east) section supporting the northern side of the semi-circular design. The second (west) portion has corrugated metal panel exterior walls and supports a high bay section with one metal overhead door on its north side and a fiberglass panel and an infilled metal panel over a door opening on its west side. The façade recesses to a flat-roofed projection that connects to the HFEF Substation (MFC-786) before recessing again to another flat-roofed projection with one metal personnel door on its north side and metal overhead door on its west side (Figure 5 and 6).

The west façade abuts MFC-765A and has no fenestration.

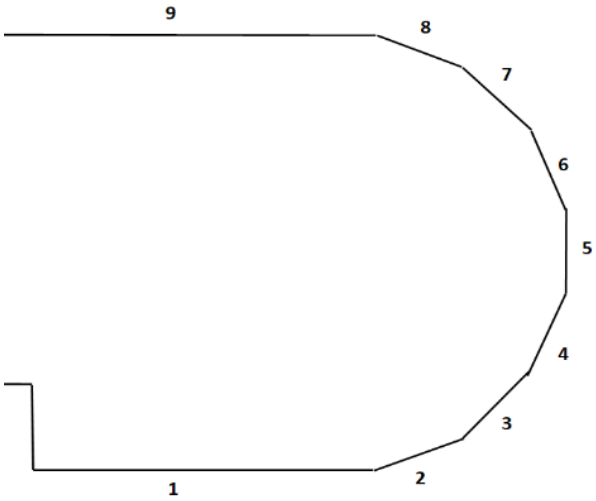


Figure 3. MFC-765, semi-circular design of first story

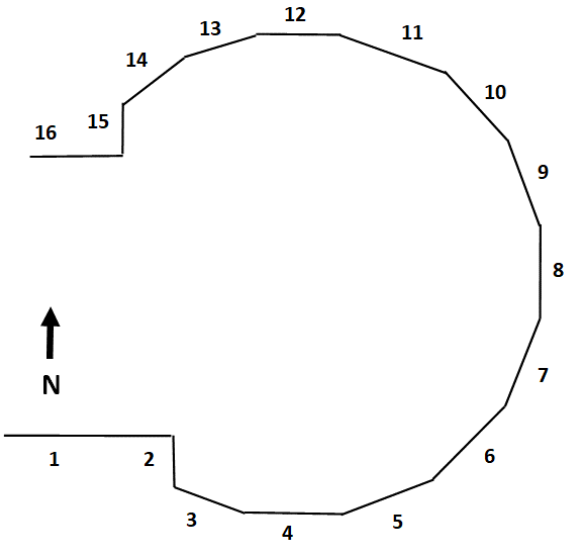


Figure 4. MFC-765, semi-circular design of second story

Figure 51. MFC-765, north façade (CEMML 2021)

Figure 6. MFC-765, north and west façades (CEMML 2021)

Interior

The facility supports four main operating areas including the reactor passageway (between the reactor and the FCF), the air cell, argon cell, and auxiliary areas, which are further broken down into the operating floor auxiliary areas, service floor areas, and roof area. Surrounding the air and argon cells is an operating area for personnel to remotely access the cells (Figure 7).

The processing facility is tied directly to the reactor system in the EBR-II Reactor Plant Building (MFC-767). When a used fuel assembly is removed, it is transported in a heavily shielded container known as an Inter-Building Coffin (IBC) via underground airlock and transported to the FCF. The passageway also serves as a sodium decontamination area (Figure 8).

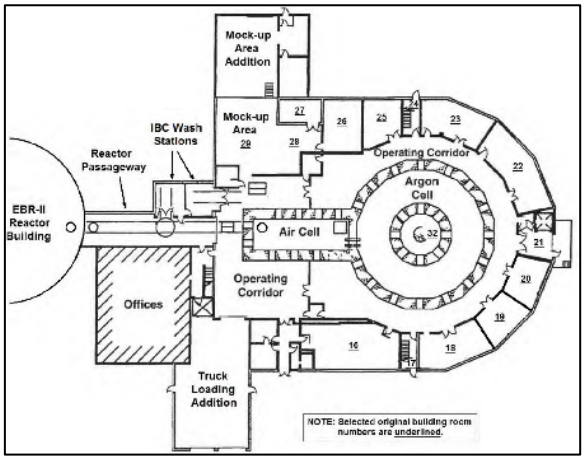


Figure 7. FCF general layout of the main floor, 1996 (U.S. Department of Energy 1996)

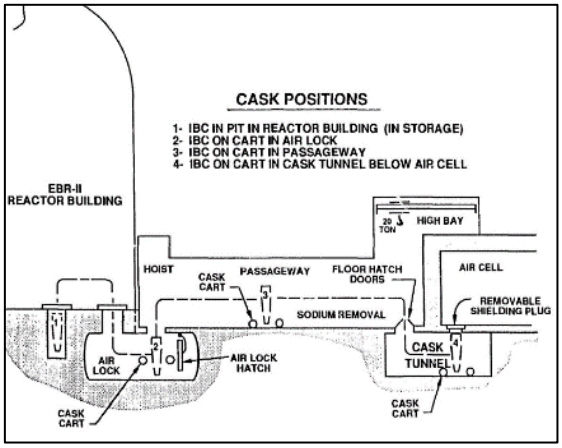


Figure 8. Cross section of airlock passageway in FCF (Forrester et al. 1989)

The air cell measures 15’ wide x 47’ long x 21’ high and is composed of high-density barite concrete. The cell supports the air atmosphere hot cell and is a radiation-shielded space to disassemble and reassemble the subassemblies. A remote-controlled manipulator disassembles the unit and extracts the 91 fuel elements, which are then transported into the argon cell. The air cell has nine viewing windows, a periscope opening, an optical peephole sleeve in the walls, a roof hatchway, two plugged viewing positions in the roof, one 5-ton crane, and two bridge-type manipulators (Figure 9). The east side of the air cell connects to the argon cell, which is in the semi-circular section of the building.

The argon cell is a 16-sided, ring-shaped hot cell with an inert argon atmosphere composed of high-density barite concrete walls lined with zinc-coated sheet steel. The west side of the polygon connects to the east side of the abutting air cell and the remaining 15 sides have a shielded window or viewing device (Figure 10). The cell measures 22’ high with 16’-wide walls around the polygon. The argon cell supports two 5-ton cranes and six manipulators, all with bridges that pivot from the center of the cell. The air-tight cell is composed of pure argon, which minimizes fuel alloy corrosion during reprocessing. After removing the stainless-steel jacket from the fuel alloy, it is broken into smaller pieces using a remote-controlled mechanism. Through a process known as “melt refining,” the fission products are removed from the purified metal, and the latter is reused to create new fuel pins. In the second reprocessing station, the metal is injected into up to 100 casts (also known as recasting). Each pin is inspected and then inserted into a stainless-steel jacket with a small amount of sodium between the pin and jacket. This sodium is then melted to evenly distribute it throughout the fuel element. Finally, an enclosure is added and welded to the fuel element before it is transferred to the air cell where up to 91 fuel elements are added to create an assembly. The assembly is then returned to a coffin and transported back to the EBR-II.

The auxiliary areas on the operating level include the mock-up area, mold preparation room (or Thoria room), Cold-Line fuel pin and fuel element production equipment rooms, glove box laboratory (or dry boxes room), FCF machine shop, small decontamination room and the Degas Room/Measurements Laboratory/Precision Measurements Lab. The roof area is directly above the air cell and served as the radioactive equipment repair area and provided decontamination services for the in-cell cranes, manipulators, and large equipment.

Figure 9. Operators around the air cell (Argonne National Laboratory 1984)

Figure 10. Operators around the argon cell (Argonne National Laboratory 1984)

Alterations

Exterior

The building has been extensively altered from its original design (Figure 11).

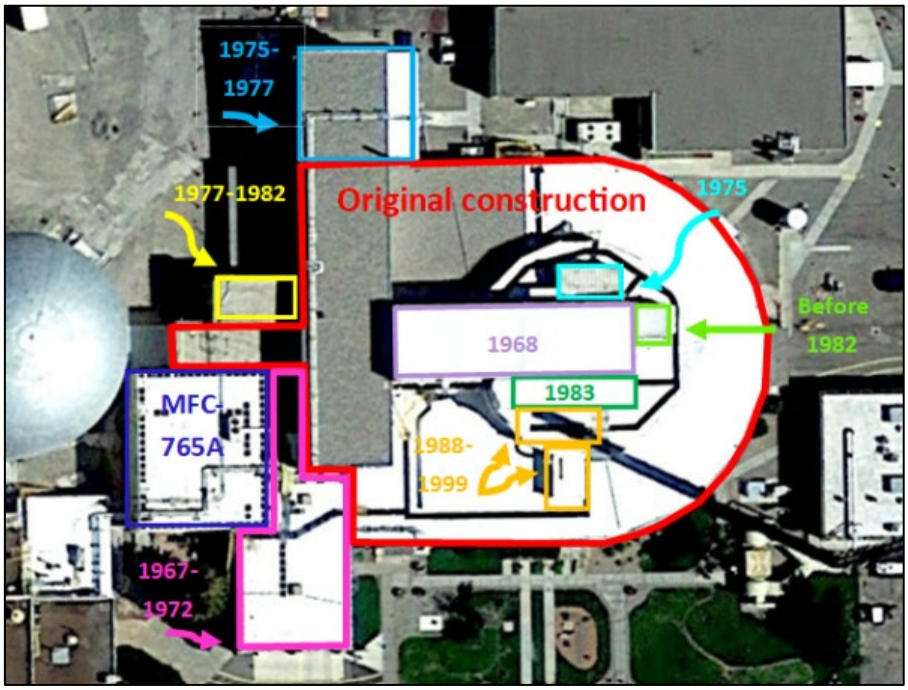


Figure 11. MFC-765 alterations

In 1993, the property was renamed the Fuel Conditioning Facility (also known as FCF) and on June 21, 1996, operations resumed. The facility's research continues to prove vital for pyrochemical processes in recycling oxide, carbide, and other advanced fuels and for demonstrating the feasibility of pyroprocessing technology for used nuclear fuel for the DOE's Fuel Cycle Research and Development Program.

Between ca. 1967 and 1972, an irregular-shaped addition was built on to the FCF's southwest façade and connected with the FCF Office Annex (MFC-765A) (Figure 11).

In order to support the repair radioactive equipment, a projection was built in 1968 over the argon cell and was known as the FCF Roof Area (Figure 11, Figure 12, and Figure 13).

In 1975, the single-story projection was added on the north side of the FCF Roof Area as a change room addition (Figure 11 and Figure 13).

Between 1975 and 1977, the building was extended with a projection to the north (Figure 11, Figure 13, Figure 14, and Figure 15).

The single-story addition was added to the west façade to the north of the airlock chamber between MFC-767 and MFC-765 between 1977 and 1982 (Figure 11, Figure 15, and Figure 16).

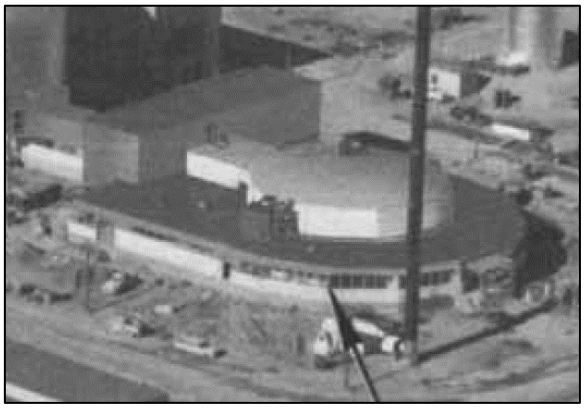


Figure 22. MFC-765, facing northwest, ca. 1964 (Koch et al. 1964)

Figure 13. MFC-765, facing southwest, ca. 1966-1968 (Argonne National Laboratory 1966)

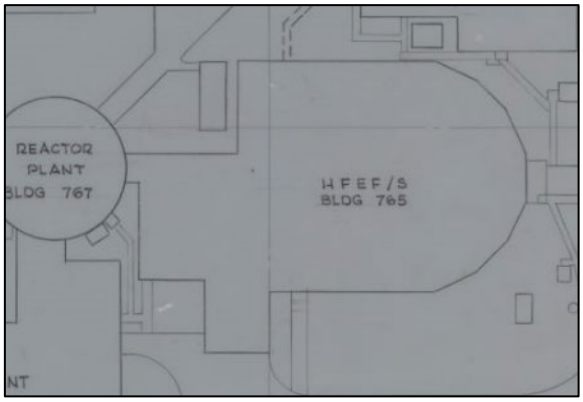


Figure 14. MFC-765 layout, 1974 (U.S. Atomic Energy Commission 1974)

Figure 15. MFC-765 layout, 1977 (Argonne National Laboratory 1977a)

At an unknown date prior to 1982, the single-story addition was added to the east side of the FCF Roof Area and in 1983, the single-story addition was added to its south façade to support the radioactive liquid waste modifications (Figure 11, Figure 13, Figure 16, and Figure 17).

At an unknown date after 1988, but before 1999, single-story projections were added to the south façade on the second story and on the south side of the third-story projection (Figure 11 and Figure 17).

The eastern side of the south façade has two metal personnel doors and historic imagery indicates that this section originally supported the longer of the two doors with the smaller personnel door added at an unknown date after 1988 but before 1999 (Figure 12 and Figure 17).

At an unknown date after 1999, the metal grating was added to the outside of the windows around the semi-circular section of the FCF.

Sections of the roof were replaced in fiscal year (FY) 2013 and FY 2015.

Figure 16. MFC-765 aerial imagery, 1982 (EG&G Idaho, Inc. 1982)

Figure 17. MFC-765, facing northwest, 1988 (Argonne National Laboratory 1988a)

Interior

In 1967, the computer system to process the FCF production data and surveillance was added to increase FCF operation efficiency. The information for each fuel pin was recorded on punched cards and transferred to the EBR-II computer center.

Also in 1967, a new vertical assembler-dismantler was installed in the FCF to expedite the experimental irradiations at the EBR-II. This automated equipment supported a manipulator that shielded the operator behind shielded walls and thick windows while allowing the examination of fuel and material experiments during irradiation. The assembler-dismantler also assembled and disassembled standard and experimental assemblies.

In 1977, undetermined modifications to the manipulator decontamination and repair facility were made.

In 1980, the cell exhaust system was modified and in 1981, the radioactive liquid waste process was improved.

In the mid-1980s, when the EBR-II was utilized for the IFR process, the FCF was rejoined to the EBR-II and the complex was restored to its original intent- a reactor and an associated recycled fuel facility.

In 1989, the HFEF-S was upgraded with new equipment to perform remote reprocessing and refabricating the fuel process for the IFR program.

In 2010, storage cabinet space in the southeast section of the building and the access control in the cask tunnel were altered.

In FY 2014, the fire suppression systems were either added or replaced and in FY 2015, the elevator upgraded.

Eligibility

In accordance with INL's property typology, MFC-765 is categorized as a Reactor Support Facility. Construction of the building began in August 1959, and it was completed in 1962 with hot operations beginning in July 1963. The FCF has been a crucial part of the EBR-II complex as the on-site reprocessing facility for the EBR-II, the first pilot breeder reactor to examine breeder feasibility. From 1964 until 1969, the FCF remotely reprocessed and refabricated the nuclear reactor fuel from the EBR-II. In 1968, the facility began supporting other experimental irradiation programs and in 1969, it began handling and irradiating components from the EBR-II and TREAT. In 1972, it became the HFEF-S and examined specimens using destructive and non-destructive techniques. In the 1980s, the facility reprocessed advanced plutonium-based spent fuel for the Integral Fast Reactor (IFR) Program and in the 1990s, it became the Fuel Conditioning Facility (alsoFCF) to conduct pyrochemical processing. The FCF has proven to be an ideal waste management system by recycling irradiated fuel, allowing uranium's potential energy to be fully utilized. The period of significance associated with the property is from its date of construction in 1962 until the present and due to its association with the on-site reprocessing facility, MFC-765 is significant under Criterion A.

The building is not directly associated with any significant individuals, making it not eligible for listing in the NRHP under Criterion B. The property is an example of a unique Cold War property that implemented exceptional engineering to contain the reactor passageway, air and argon cells, operating area, and auxiliary support rooms. The building was developed with a rounded design that enclosed the cells and operating corridor. Although traditional building construction could have been employed to surround these spaces, ANL-W engineers implemented a design where "form follows function." As a result of the building's unique engineering design and technical equipment, it is eligible under Criterion C. Finally, the facility is unlikely to yield information important to history or prehistory and does not retain significance to be eligible under Criterion D.

MFC-765 was constructed with a rounded section on its east side and a projection on its west side. Over the years there have been many alterations to all of the façades on both the ground level as well as the upper stories, greatly impacting the building's design, workmanship, and feeling. The fenestration and roof were also changed, but these modifications do not significantly impact the building's integrity. MFC-765 retains integrity of materials and the location, setting, and association remain with the retention of the surrounding MFC site, associated properties, and fuel reprocessing equipment.

MFC-765 meets the 50-year threshold for potentially historic properties and despite its diminished integrity, it is eligible for listing in the NRHP under Criterion A for its association with the on-site reprocessing facility for the EBR-II, the first pilot breeder reactor to examine breeder feasibility, and continued pyrochemical processes, as well as under Criterion C for its unique architectural design.

MFC-768: Power Plant Building

History

MFC-768 (Figure 18 and Figure 19) is the Power Plant and it is located in the central area of the MFC. The building was constructed in 1961 as the Power Plant for the EBR-II Reactor Plant Building (MFC-767). The facility supports the turbine generator, EBR-II control room for the reactor and power system, and personnel facilities (Figure 20). These mechanisms were intentionally placed away from the reactor to prevent any contact with radioactivity.

Figure 18. MFC-768, south façade (CEMML 2021)

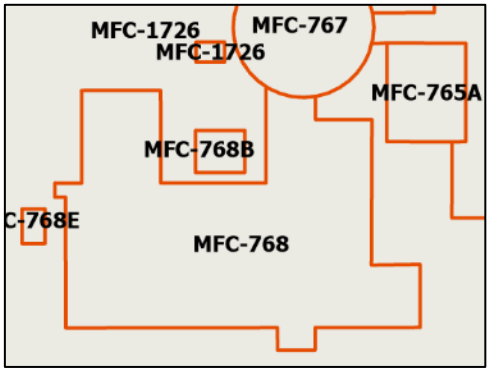


Figure 19. MFC-768 location

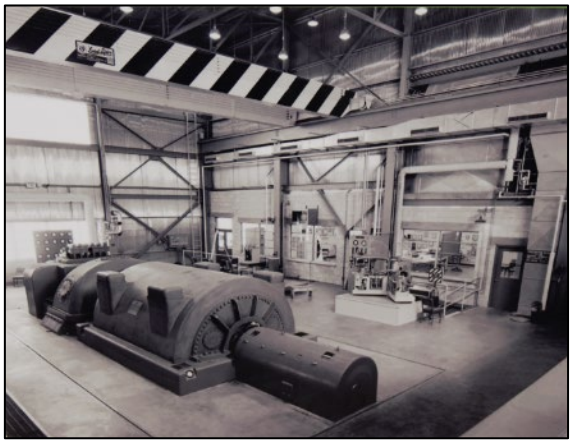


Figure 30. EBR-II turbine and generator (Imagery located at the EBR-I Atomic Museum)

The power plant's generator was one part of the EBR-II power cycle's three heat transfer systems. The primary system involved cooling from the primary tank, main heat exchanger, sodium pumps, and the reactor itself. The secondary system picked up the heat from the liquid sodium gathered from the primary system and carried it to the steam generator in the Sodium Boiler Plant (MFC-766) (no longer extant). Finally, the heat was then transferred from the secondary system to water, which generated steam and then flowed to the turbine generator in MFC-768. As of 1964, the generator and electrical power distribution system produced an estimated 20 million watts. The power supplied by the EBR-II provided all of the power for ANL-W with additional power that was sold to NRTS and to Idaho Power, ultimately saving AEC more than $1 million each year and becoming the first co-

generator in Idaho. From 1964 to 1994, the reactor generated over 2 billion kilowatt hours of electricity.

Description

MFC-768 is a multi-story, irregular-shaped building on a poured concrete foundation with a steel frame. The facility has concrete block walls with corrugated metal panels on its exterior walls and a flat roof with built up material and metal fascia around its perimeter. The south façade is the primary side and can be broken up into three sections. The first (western) section has one metal overhead door on the ground level, and on the upper levels are three pairs of metal-framed windows with 1/1/1/1 lights and six metal-framed, vertical sliding windows. This section also supports three pairs of metal grating that wrap around to the west façade, one metal vent, and five fiberglass panels. The second (central) section projects from the first section and has one pair of metal personnel doors with an inset light (that is sheltered by a flat roof overhang) and two metal-framed windows with 1/1/1/1 lights on the upper levels. The third (eastern) section recesses back to match the distance of the first section and has one metal-framed, fixed-pane window; and two banks of five metal-framed windows with the upper portions covered by corrugated metal paneling. None of these windows are operable and some of the openings are infilled (Figure 21).

The east façade can be broken up into four sections. The first (southern) section supports one metal personnel door and the second (northern) section recesses and has one bank of four metal-framed windows (with a corrugated metal panel over the top sections), one metal-framed, fixed-pane window, one metal overhead door, and one metal personnel door with an inset light. On the second story of the second section, the building recesses back and has four metal-framed windows with 1/1/1/1 lights and one metal personnel door with an inset light. The building again recesses on its third story and supports one metal personnel door. The third section of the east façade drops down to one story and is composed of concrete block walls with a flat roof and has one metal personnel door with an inset light. The fourth (northern) section recesses back to a hyphen on a raised poured concrete foundation with raised seam metal panels on its exterior walls and one metal-framed, fixed-pane window. This hyphen connects to the adjacent EBR-II Reactor Plant Building to the north (MFC-767) (Figure 22, Figure 23, and Figure 24).

Figure 41. MFC-768, south and east façades (CEMML 2021)

Figure 52. MFC-768, east façade (CEMML 2021)

Figure 23. MFC-768, third section of east facade (CEMML 2021)

Figure 24. MFC-768, east and north façades (CEMML 2021)

The north façade can be broken up into three sections. The first (eastern) section supports the western side of the hyphen mentioned on the east façade and has one metal framed, fixed-pane window. The building projects slightly westward and supports a single-story projection with corrugated metal panels with a metal personnel door with an inset light on its western side. Above the projection on the second-story level is one metal-framed window with 1/1/1 lights and two metal personnel doors (Figure 25). The second (central) section of the façade recesses again and has one metal-framed, fixed-pane window on its first floor. On this section's upper levels are one bank of five metal-framed windows with 1/1/1/1 lights and two fiberglass panels (Figure 26 and Figure 27).

The third (western) section of the north façade has a single-story projection with a flat roof. On this projection's east side are three fiberglass panels and on its north side are two metal personnel doors with an inset light and one pair of metal personnel doors. Metal stairs extend from the ground level to the roof of the projection and on the roof is another set of metal stairs that access a metal personnel door with inset light. Another set of metal stairs extends to the second story level and a metal personnel door surrounded by a flat-roof metal shelter. At the top level of this section is a single metal-framed, vertical sliding window (Figure 26 and Figure 27).

The west façade can be broken up into two sections. The first (northern) section includes the west side of the projection from the north façade and has one panel of fiberglass. The second (southern) section of the façade supports a single-story projection with raised seam metal panels on its exterior walls and on its shed roof and has a metal personnel door on its west side. This section of the façade also has a metal personnel door with an inset light that is surrounded by a corrugated metal shelter. The façade also supports one infilled corrugated metal panel, three fiberglass panels, and three pairs of metal grating that wrap around to the south façade (Figure 28).

Figure 65. MFC-768, first section of north façade (CEMML 2021)

Figure 7. MFC-768, second and third sections of north façade (CEMML 2021)

Figure 27. MFC-768, north and west façades (CEMML 2021)

Figure 28. MFC-768, west and south façades (CEMML 2021)

Alterations

There have been several alterations to the building's exterior that altered its original shape and design (Figure 29). In 1965, the single-story concrete-block addition was constructed at the building's northeast corner and abutted the passageway that connects to the EBR-II Reactor Plant Building (MFC-767) (Figure 30 and Figure 31). According to plot plans, the projection on the east façade was added in ca. 1974 and the one on the south façade added in ca. 1977 (Figure 31, Figure 32, and Figure 33). Between 2013 and 2016, the roof was replaced on the western part of the building.

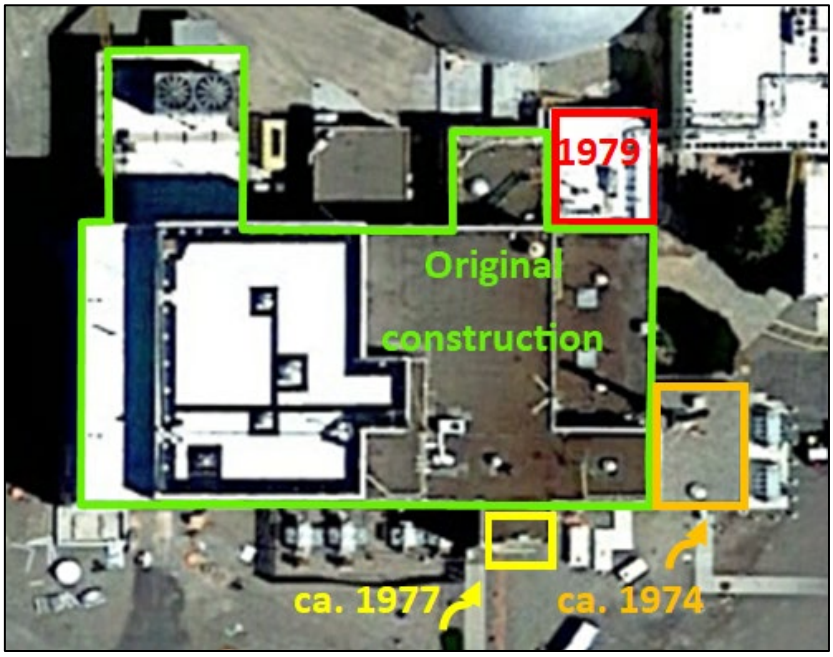


Figure 29. MFC-768 alterations

Figure 80. MFC-768, facing northwest, ca. 1964 (Koch et al. 1964)

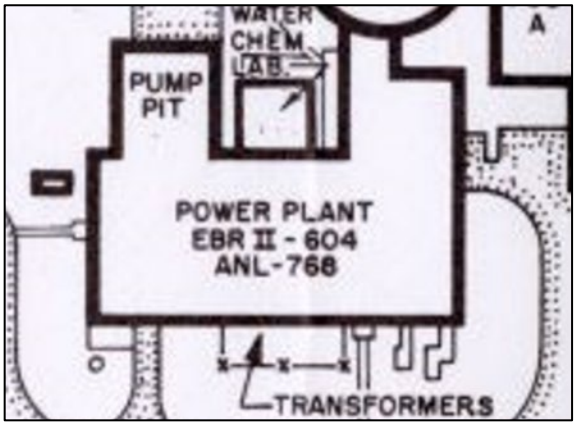


Figure 91. MFC-768 plot plan, 1974 (U.S. Atomic Energy Commission 1974)

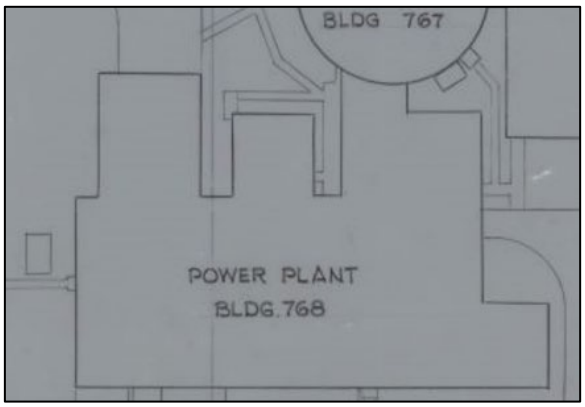


Figure 102. MFC-768 plot plan, 1974 (Argonne National Laboratory 1974)

Figure 33. MFC-768 plot plan, 1977 (Argonne National Laboratory 1977a)

The long panels of fiberglass replaced the original windows (or lucite) at an unknown date before 1975 (Figure 34 and Figure 35).

The metal paneling was added over the top part of the windows at the eastern end of the south façade at between 1999 and 2012 (Figure 36 and Figure 37).

Figure 34. MFC-768, south facade, after 1967 (Imagery located at the EBR-I Atomic Museum)

Figure 34. MFC-768, facing northwest, 1975 (Argonne National Laboratory 1975a)

Figure 36. MFC-768, south and east façades, 1999 (Argonne National Laboratory-West 1999)

Figure 37. MFC-768, south and east facades, 2012 (Argonne National Laboratory No Date)

Regarding interior alterations, the sulfuric acid system was expanded to connect to the cooling tower (MFC-757) (now demolished) in 1968. In 1979, the automatic sprinkler system was either added or updated and it was upgraded again in FY 2015. In 2007, the exhaust fan was replaced near the building's northeast corner.

Eligibility

In accordance with INL's property typology, MFC-768 is categorized as a Reactor Support Facility. MFC-768 was constructed in 1961 as the power plant of the EBR-II Reactor Plant Building (MFC-767) and supports the turbine generator and EBR-II control room for the reactor and power system. The generator was one of the EBR-II power cycle's three transfer systems. After the first and secondary systems, heat was generated as steam and flowed to the turbine generator, which converted the mechanical energy into electrical energy. The power supplied by the EBR-II provided all of the power for ANL-W with additional power sold to NRTS and to Idaho Power, making it the first co-generator in Idaho. The period of significance associated with the property is from its date of construction in 1961 until 1994 when the associated reactor was shut down. Due to its association with the EBR-II and its role as the first co-generator in Idaho, MFC-768 is significant under Criterion A.

The building is not directly associated with any significant individuals, making it not eligible for listing in the NRHP under Criterion B. Although the turbine and control room may be eligible under Criterion C for their engineering and design significance, MFC-768 itself is not eligible under this criterion as it is simple in design with no ornamentation and does not reflect any architectural or engineering significance on a national, state, or local scale. Furthermore, the facility is unlikely to yield information important to history or prehistory and does not retain significance to be eligible under Criterion D.

There have been several additions and alterations to the building. Projections were added to the north and east façade of the building, the west section of building's roof was replaced, and several windows were replaced with fiberglass panels or partially covered with metal paneling. Despite these alterations, the building's design, materials, workmanship, and feeling are relatively intact. The facility's location and setting are retained and the EBR-II reactor control panel and turbine generator remain, which supports integrity of association.

MFC-768 meets the 50-year threshold for potentially historic properties, retains a high level of integrity, and is significant for its association with the EBR-II's control room and turbine generator, making it eligible for listing under Criterion A of the NRHP.