**Deactivation and Remediation Contract Tour Script**
**May 17 -19, 2016**

(S) – Stop and walk through
(P) – Pause and remain on Bus
(D) – Drive-by

**Tour Day 2 – May 18, 2016**

## IN THE PARKING LOT PRIOR TO BOARDING BUS

"Welcome to the Paducah Gaseous Diffusion Plant (PGDP) and tour number 2. While yesterday's tour was centered on activities and facilities outside the plant, this tour will focus on facilities inside the plant. Safety shoes are not required; however, shoes worn shall be closed-toe, non-slip soles, above the ankle if possible, and made of leather or other substantive materials (not cloth). No high heels.

Security requirements dictate that all participants remain with the tour group for the duration of the tour. There are also several prohibited items that are not allowed at PGDP. These items include real or simulated firearms and ammunition, stun guns, alcoholic beverages, illegal drugs and paraphernalia, explosives, hand-held weapons, chemical irritants, and items prohibited by state and federal law. Other items not allowed on the tour include copying or transcription devices, electronic recording devices, cameras, radios, cell phones, laptops, tablets, cameras, two-way pagers, thumb or portable hard drives, gaming devices, smart watches, Fitbits, and knives with blades more than 2.5 inches long. Contraband brought to the PGDP will be confiscated.

Please be aware that all hand carried items (packages, briefcases, handbags, purses, etc.) will be inspected by security prior to boarding the bus. DOE will not be responsible for securing any items during the tour. Please keep hand-carried items to a minimum."

## IN THE PARKNG LOT AT BUS LOCATION

*Monitor passenger boarding to check for prohibited items. Remind passengers as they board about electronic device restrictions.*

*Ensure all participants have boarded,*

*Depart for site.*

## ON BOARD BUS BEFORE BUS LEAVES THE PARKING LOT

"Welcome aboard. I assume you all secured your electronic devices as required. We will be narrating this tour to enable you to familiarize yourselves with the facilities and projects inside the plant. Please understand that you cannot verbally ask questions during the tour. Discussions should be minimized so that everyone can hear the script. All

questions must be written and submitted in accordance with guidance provided previously. You have been provided with a checklist request form for the Bidders' Choice Tour that will take place tomorrow. Please provide the completed checklist when you exit the bus at the end of the day."

**Enter Post 15**

**1) C-200 Guard and Fire Headquarters (P) – pause and point out facility.**

"In front of you as we enter the plant is the C-200 Guard and Fire Headquarters. The plant's fire and security forces are housed in this facility. The PGDP maintains a fully staffed group of well-trained, and equipped emergency responders that are capable of responding in a timely and effective manner to site emergencies. The PGDP fire department operates 7 days a week/24 hours per day and maintains equipment comparable to that found in larger cities in Kentucky. Emergency response equipment includes a 100-foot elevated platform ladder truck with foam-making capability, two advanced life support ambulances, a 1,500 gallon per minute pumper, a Haz-Mat truck, a wildland fire unit and a Heavy Rescue/Equipment truck. The plant also has mutual-aid agreements with surrounding communities so that additional resources are available during an emergency.

Fire services personnel are Commonwealth of Kentucky Certified Firefighters, Emergency Medical Technicians, Hazardous Material Technicians and Confined Space Rescue Technicians. Paramedics with Advanced Life Support capabilities also respond with the Firefighter/EMT's from the site's medical facility currently operated by Health Works Medical, LLC to comply with NFPA response requirements. Firefighters are also responsible for maintaining physical fitness requirements set forth by the National Fire Protection Association. In addition to the rigorous training requirements, fire services is responsible for life safety code inspections of every facility on site and testing of over 400 sprinkler systems.

The future of the C-200 Guard and Fire Headquarters are currently being evaluated. New NFPA and OSHA safety regulations have resulted in this evaluation. The current age of the fire equipment requires new equipment to be considered. The C-200 building was not designed to accommodate the size of new equipment.

Security operations are comprised of Protective Force members and Security staff professionals. The Protective Force operates 7 days per week/24 hours per day, and is responsible for the implementation of the plant's security plans and policies. Included in the ongoing evaluation of the C-200 Guard and Fire Headquarters is the indoor shooting range located on the west side of the building. This range was constructed back in the early 80's and a new modular range meeting current ventilation, filtering and HVAC regulations is being evaluated."

**2) C-100 Administrative (S) – Stop, read information, then tour facility.**

"On your right is the C-100 Administration Building. It is one of the oldest structures on the property. The facility is two stories of offices and a basement used primarily for storage. The C-100 building has office space for approximately 175 people that is currently being shared by the infrastructure and deactivation contractors. It houses the site servers, contains a medical facility, a records vault for classified information that is in the process of being emptied, and a variety of office spaces and conference rooms. Currently this facility also serves as the primary automated access control entrance location for pedestrian traffic into the limited area.

We will now be exiting the bus to walk through this facility."

***Get off the bus and enter the C-100 facility at the cafeteria entrance.***

"We are now in the cafeteria area. This facility in the past provided breakfast and lunch to plant workers. The cafeteria is no longer in service. Food trucks now offer lunch in the parking lot to the south of the C-100 building.

We will now move to the office area. We will not be entering any offices but feel free to look into any doors that are open. Also remember to use caution and utilize handrails when ascending and descending stairs."

***Walk through the ground floor area to the stairs, through the second floor office area, and back downstairs to the entrance to the medical facility.***

"We are now at the entrance to the medical facility. The site's medical facility is currently operated by Health Works Medical, LLC under contract to the deactivation contractor. This full service clinic operates from 7:00 am to 3:30 pm Monday thru Friday and provides services ranging from pre-employment physicals to full advanced life support. The clinic is staffed with two registered nurses, two paramedics, and a clinician who is either a physician's assistant, a nurse practitioner, or a physician. On the off shift one of the clinicians is on call 7 days a week 24 hours a day and is able to respond to the plant or local hospitals. We will walk through the medical facility and then go over to the C-710 Laboratory. Please be alert to traffic as we pass through parking areas and cross streets."

***Walk through the medical facility and out of the east entrance.***

**3) C-710/C-709 Laboratory – read information after walking over from C-100. Bathroom break if necessary at C-709**

"In front of us is the C-709 Plant Laboratory Annex and the C-710 Technical Services Building. These facilities house laboratories with an array of old and modern analyzers and test equipment, offices, a conference room, and vault for records retention and storage. The Laboratory maintains a suite of analytical services that are tailored to meet some of the needs of the site including remediation and deactivation activities/projects, operations support, and production of working reference material.

Offsite laboratories are still utilized by the remediation and deactivation projects.

The operation of the on-site analytical facilities to provide analytical laboratory services will be at the discretion of the Contractor. In the event the Contractor performs some analytical services on-site, the services shall be available to other DOE on-site contractors.

Regardless of the Contractor's decision with regard to continued laboratory operations, the Contractor shall disposition samples, sample returns, and/or waste from analytical services provided by the previous contractor that may be present and associated with C-709 and C- 710 laboratory facilities within 6 months of transition. The Contractor shall disposition all sources, fissionable/fissile materials, chemicals, other materials, and excess Government Furnished Equipment remaining in the facility that the Contractor does not use to support its operation of the Analytical Laboratory (including ancillary facilities) or remains after transition from the previous contractor within 6 months of transition.

You will notice that on the east end of C-710 is a fluorine cylinder that is piped to laboratory rooms upstairs and downstairs. The fluorine gas is transferred into 5 liter metal bulbs and is used for passivation and for making gas standards for Gas Chromatographs (GC) or Ultraviolet (UV) Analyzers to support in-situ cell treatment (ICT) and for maintaining a fluorinating environment in process piping.

While we will not be going downstairs, there are several functional laboratories and other facilities in that area. The Barrier Laboratory is being used to fill fluorine gas metal bulbs. There is a machine shop and material testing laboratory for tensile strength and hardness measurements. Also located downstairs is a relatively new Scanning Electron Microscope (SEM) which is used for surface examination and chemical element identification. The downstairs area also includes the records vault, men's and women's change area, conference room, Non Destructive Assay (NDA) Laboratory and Instrument Laboratory. The NDA Laboratory supports calibration and minor repair of neutron slab detectors and gamma detection instruments. Frequently used field equipment include video probes, portable helium leak detectors, and a portable X-Ray Fluorescence (XRF) instrument for material verifications.

We will be walking through both the C-710 and C-709 facility and will be ascending and descending stairs. Please use handrails at all times. We will not be going into any office or laboratory areas, but please feel free to look into any open doors or through the glass windows. Restroom facilities are located at the end of this walkthrough and will be available for use."

***Enter C-710 east/west wing and read once everyone is inside***

Lab facilities on this wing support cleaning and passivation of parts and pigtails with fluorine ($F_2$) and chlorine trifluoride ($ClF_3$). There are mass spectrometers for technetium and metals analyses. These facilities also support various activities associated with working reference material production. Other capabilities include measuring surface

areas, pellet density, crush strength, and response to material exposure to corrosive gases. These facilities are also being used for sample preparation.

***Enter C-710 south/north wing and read once everyone is inside***

On this wing there are a number of offices for lab personnel. The C-709/C-710 facility has office space for about 45-50 people. This wing also houses the gas chromatography laboratory with two new corrosive gas chromatographs for measuring fluorine and chlorine gas in support of ICT and for verifying the fluorinating environment in process piping. Labs on this wing have Fourier transform infrared (FTIR) spectrometers to measure $ClF_3$, $UF_6$, and treatment breakdown products. This wing also contains the radiochemistry laboratory. This laboratory supports alpha and gamma analyses, Tc-99 analysis by liquid scintillation, and gross alpha/gross beta analyses by gas proportional counter. This includes analyses for uranium 238, 235, 234; transuranic elements Neptunium, Plutonium, and Americium; and the radioactive decay product Thorium.

***Move on to C-709 and read once all have gathered near the restrooms***

It should be noted the C-709 facility has no CAAS coverage and thus no fissile operations can be conducted. Equipment in these labs can support fecal coliform analysis, measurement of uranium in safety samples, analysis of fluoride by ion selection electrode, and conductivity analysis. Radiological sample preparation by extraction and separation are performed in these facilities. These labs also support alpha spectrometry, proportional counting for gross alpha/gross beta, and gamma spectrometry.

***Rest room break and then continue on with the tour***

**4) C-302 and C-304 Office Facilities – After touring C-710/C-709, pause in front of C-302/C-300 area and read information. This information includes #6 also.**

"The C-302 and C-304 facilities contain over 75 offices, conference rooms, and training rooms. Both facilities have self-contained HVAC systems."

**5) C-300 Central Control Building – Read information while in front of C-300. After reading, board the bus which will be in front of C-304.**

"The Central Control Facility monitored, coordinated, and controlled critical plant processes, power distribution, utilities, communications, plant alarm systems, and emergency operations. Cabling supplied electronic information about the plant's process systems to this building. The Central Control Facility currently houses three main functions: the plant shift superintendent, the cascade coordinator, and the emergency operations center.

<u>Plant Shift Superintendent/Nuclear Facility Manager (PSS/NFM)</u>: The Plant Shift Superintendent is the senior manager on shift. The PSS has the authority and responsibility to make decisions to ensure the safe operation of the plant. The PSS is responsible for overall operations of the plant and initially acts as incident commander in the event of a plant emergency.

Cascade Coordinator: The Cascade Coordinator monitors, and coordinates shift operations in the process areas to ensure safe and efficient operations.

Emergency Operations Center (EOC): In the event of a plant emergency, the Shift Superintendent may choose to activate the EOC and bring together a team of managers and technical advisors to direct activities and develop strategies."

**7) C-310 Product Withdrawal (P) – pause and point out facility**

"The C-310 Product Withdrawal facility is on your left. Enriched uranium was withdrawn from the cascade at this facility. This building is equipped with withdrawal positions to accommodate either 2 ½ ton (30B) or 10-ton (48X) product cylinders. The large tower next to the west side of the building is a 200-foot stack used to vent gases from the enrichment process. Monitors on the stack ensured the gases emitted from the stack were not harmful and met environmental standards. The stack is regulated by a Title V Permit between Kentucky and the Contractor.

Uranium hexafluoride or $UF_6$ gas recovered during deposit removal activities in the other process facilities will be transferred via piping to this facility where it will be pumped as a gas into 10-ton cylinders. C-310 will also be used to trap out any residual $UF_6$ from the treatment gases used during deposit removal activities, before they are discharged through the 200-foot stack. We'll talk in more detail about the deposit removal process at our next stop."

**8) C-333 Process Building (S) – stop in parking lot and read information while on the bus.**

"We are now at the C-333 Process Building. The enrichment process at PGDP occurred primarily in the four large process buildings referred to as C-331, C-333, C-335, and C-337. All of these facilities are Nuclear Hazard Category 2 facilities which enriched uranium by gaseous diffusion. The PGDP enrichment process consisted of approximately 1,760 stages arranged in two parallel cascades. Through different valve configurations, the plant was able to enrich uranium at higher assays up to 5.5 wt. % $U^{235}$.

The larger process buildings, C-333 and C-337, are approximately 1100 feet long by 970 feet wide, and 83 feet high. Each large process building contains approximately 25 acres under roof.

The smaller process buildings, C-331 and C-335, are approximately 804 feet long by 640 feet wide, and 68 feet high. Each smaller process building contains approximately 12 acres under roof.

The enrichment, or separation process, took place on the second floor of the process building inside a heated housing that helped ensure the $UF_6$ stayed in a gaseous form. The $UF_6$ was pumped through many tubes installed inside a diffuser vessel called a converter. The gas was pumped through the converters by large compressors powered by

electric motors. Motors for the large process equipment were rated up to 3,300 horsepower.

As the $UF_6$ gas passed through the tubes, the molecules separated slightly. The $U^{235}$ atoms, which made up less than one percent of the uranium in its natural state, passed through the tubes more easily. As the gas moved through the cascade, more separation occurred at each stage. At the top of the enrichment process, the uranium had been enriched so that it contained between 1 and 5 percent of the fissionable $U^{235}$ atoms. The remaining uranium, stripped of most of its $U^{235}$ atoms, moved to the bottom of the enrichment process and was removed and stored in cylinders as depleted uranium.

The electrical equipment and instrumentation to support and control the enrichment process is located on the first floor of the building along with an Area Control Room where the buildings' processes are monitored.

Due to the nature of the uranium enrichment process, inner surfaces of the process equipment may have a thin coating of solid uranium hexafluoride, similar to a coating of dust. Additionally, due to enormous surface area of the uranium process systems within the Paducah cascade, a significant amount of uranium has been chemically and physically adsorbed to the inner walls of the piping and cell components. This deposited uranium is commonly referred to as the in process uranium hold-up. In addition, the equipment will contain uranium deposits caused by wet air in-leakage. The moisture in the air upon entering the cascade reacts with $UF_6$ to form various uranium oxy-fluorides with the most common being $UO_2F_2$ and are deposited near the leak.

One method to remove uranium deposits and hold-up in the process equipment is chemical treatment of the equipment. This is accomplished using a mixture of Chlorine Trifluoride ($ClF_3$), Fluorine ($F_2$), and Nitrogen ($N_2$). This is referred to as In-Situ Chemical Treatment or ICT. Two key pieces of equipment used to perform this work will be the Sodium Fluoride Trap Cart or NaF trap cart referred to as NTC and the Analytical Test Buggy or ATB. The analytical test buggy contains pumps for recirculating the treatment gases and for monitoring reaction levels during the ICT operation. The NaF trap cart contains eight traps housed in a large oven. $UF_6$ gas liberated during the ICT process is trapped out in this cart. When combined together, this equipment is referred to as the Portable Cell Treatment Cart System, or PCTC.

The PCTC will be connected to the cell by means of a copper tubing. During ICT, the treatment gas is charged to the equipment and then recirculated over an extended period days. The $ClF_3$ in the treatment gas reacts with the $UO_2F_2$ and creates $UF_6$ which is trapped out by the NaF trap cart.

Once the traps are loaded with $UF_6$ the cart is "regenerated." This process consists of heating and running fluorine and nitrogen through the traps. The $UF_6$ liberated from the cart is trapped out in a set of cold traps and later transferred to C-310 where it is pumped

into 10-ton cylinders. A refrigeration blanket will be used to cool the cylinder walls to allow the $UF_6$ gas to freeze out in the cylinder. We'll be talking more about the ICT process and equipment in the C-337 facility later on today's tour.

Some process systems do not lend themselves to the ICT process. This could be due to size or configuration, or the deposit composition may be such that chemical treatment is not possible. In these cases, mechanical removal would be another method for uranium deposit removal. During this process the equipment is removed and the deposit and/or hold-up is decontaminated to acceptable levels.

The goal of deposit removal is to allow a facility to go from a Nuclear Hazard Category 2 Facility to a Radiological facility and to facilitate disposal of the equipment and piping into a potential onsite waste disposal facility. This will result in a significant reduction in Surveillance and Maintenance costs and prepare the building for future utility isolation and demolition.

We will now exit the bus and tour the facility. Inside the C-333 building we will be stopping at various locations to provide additional information. Please stay together as we walk through the facility. We will be going up and down several flights of stairs and entering/exiting air locks through doors. Keep an eye on your walking surfaces, hold handrails, and be alert for vehicle traffic in the area. Also please do not place your hands on or across any of the radiological ropes that you will encounter on the upstairs portion of tour. Safety glasses are required in this facility."

***Exit the bus***

***PCB Troughing***

"PCBs were used extensively in the uranium enrichment process. The lube oil system in the process facilities leaked oil that migrates into the ventilation systems and came into contact with PCB impregnated gaskets. Although the lube oil has been removed from the lube oil system, residual lube oil remains in the ventilation system and continues to leak. Additionally, water in-leakage (primarily rain intrusion) has resulted in water entering the ventilation system and coming into contact with the PCB impregnated gaskets. These systems occasionally leak due to age, vibration, and thermal cycling. Troughs and a collection system, like the one above, have been installed under the areas that have a high potential to leak. There are over 16,000 PCB collection troughs (ranging from 4½ to 6 feet in length) installed inside the cascade buildings (e.g. C-310, C-315, C-331, C-333, C-335, and C-337). The Contractor will be responsible for surveillance and maintenance of the PCB collection and containment trough system including disposition of the collected PCB lube oils/water. The PCB troughing, air monitoring, and waste disposition is regulated under the TSCA FFCA. The Contractor shall develop and implement a process to mitigate the continued migration of liquids into the ventilation systems."

***Transformer (fed from C-531)***
"The plant has four switchyards onsite. There was one switchyard for each of the four large process buildings. In the last two years, a project was undertaken to reconfigure the power system. Now, all power into the limited access area comes from the C-531 switchyard. We'll tell you more about that effort later in the tour. But for now, please notice the large diameter red electrical cable going into this transformer. This is one of the cables which was installed as part of the reconfiguration project. All power into this facility is now fed from the C-531 switchyard. Not all transformers though are energized in this facility. Only those necessary to support current Stabilization and Deactivation needs."

***Building Heaters***
"During plant operation, heat produced from the motors and compression of the $UF_6$ gas, heated the buildings. Normal ambient temperatures in the facilities ranged from 90 degrees on the ground floor to over 100 degrees on cell or second floor. Since shutdown, supplemental electric heat has been added to keep the temperatures above freezing in the facilities during winter. Over 700 30kW heaters, like this one here, are located throughout the process facilities and are used to heat the ground and cell floors."

***Display cell – Ground Floor***
"We are looking at a cut away of a single stage of process equipment. A stage consists of a motor, compressor, converter and interconnecting piping. There are 8 stages in a 000 size cell, and there are 60 cells in a 000 facility, such as this facility. A cell is the smallest portion of the cascade that can be isolated. Deposit removal will be performed on cells by means of the chemical treatment process."

***Dresser Seal (Point out dresser seal, coupling shaft, rocker, and bearing as information is read)***
"In preparation for chemical treatment, several modifications must be performed on the cell. One of those is installation of a dresser seal similar to what you see here. The coupling shaft between the motor and compressor is first removed to allow for removal of the rockers and bearings. Once these are removed the exposed shafts are cleaned to remove any residual organic material and then the dresser seal is installed. The dresser completely encapsulates the exposed shaft and ensures a tight system prior to initiating chemical treatment."

"We will now go upstairs to view the inside of a cell housing. As mentioned previously, please do not place your hands on or across the radiological boundary ropes."

***At upstairs display cell – Ensure everyone is together before reading script***
"On the left is the type of heater that will be used to heat the inside of the cell housing during chemical treatment. The goal is to maintain the piping and chemical treatment gas

at approximately 120 degrees. This will enhance reaction rates of the chemical treatment process. Four or more of these heaters will be connected to the cell housing.

On the board in front of you is the typical flow path for the cell treatment gas through the analytical test buggy, NaF trap cart, and cell. To the right of the flow drawing is a picture of a typical hot tap into the cell piping. Two hot taps, one at the top and one at the bottom of the cell, will be installed. Copper tubing is connected to the hot tap and run downstairs to the PCTC system. Gas is pulled from top of the cell, through the recirculation pumps on the analytical test buggy. $UF_6$ gas liberated from the cell is then trapped out in the NaF trap cart. The gas then flows through the analytical test buggy before being returned to the bottom of the cell. Behind and to your right is a 000 size converter. This gives you an idea of the size of the equipment which the ICT process will be performed on.

We will now go up into the viewing room to see inside the cell housing. Due to the smaller area in the room, we'll split the group and take one group at a time. Half come me and the other half please stay with the escorts."

***In Viewing Room***

"In front of you is a view of the inside of a 000 cell housing. The blue represents the depleted uranium gas flow and the red represents the enriched uranium gas flow. The enriched gas goes upstream and the depleted gas went downstream. Separation of the $U^{235}$ and $U^{238}$ took place inside each converter.

We will now talk a little about technetium contamination in the process equipment you see in front of you. Technetium-99 entered the Paducah cascade during feeding of reprocessed spent reactor fuel from Hanford and Savannah River between 1953 and 1977. While most of the Technetium-99 has been removed from the cascade, enough technetium remains to impact disposal options. The proposed onsite waste disposal facility final waste acceptable criteria has not been established; however, the Oak Ridge Environmental Management Waste Management Facility Technetium-99 WAC is 172 pCi/g. Analyses of barrier samples recently removed from converters indicate the concentration of technetium is two orders of magnitude above the Oak Ridge WAC.

During enrichment operations technetium was an operational concern in areas near the purge cascade located in C-310 facility. Significant amounts of technetium-99 were removed by conducting hot air treatments at approximately 250 degrees. Currently testing at Savannah River National Laboratory is processing samples from Paducah to evaluate technetium-99 removal using various temperatures with air, vacuum and steam. This testing should assess the feasibility and the results can be used as guidance to conduct cell treatments for technetium-99 removal. Heating a shutdown cascade cell to elevated temperatures in the 200 degree plus range for treatment is challenging. Additional developmental efforts are being considered to heat the process equipment

using in-situ microwave technology. The ultimate goal of gas phase decontamination is to remove the technetium to levels below the free release levels and/or meet the potential Paducah Waste Acceptance Criteria (WAC). The Contractor shall develop, select and implement an approach to treat the converters to reduce technetium levels to an acceptable level."

"We'll now go back down and allow the other group to come up to the viewing room."

***Repeat script for viewing room for second group.***
***Read below after second group has viewed inside cell housing.***

"We'll now go back downstairs. Please use caution descending the stairs and going through the doors."

***Seal Exhaust Pump Station***
"In front of us is the C-333 Seal Exhaust Station. The Seal Exhaust and Wet Air Stations provided an exhaust for the seal cavities on the $UF_6$ compressors, purge and evacuation pumps, booster pumps, and for wet air evacuation. Each process building and C-310 contain at least one of these stations.

The seal exhaust system evacuates air and/or nitrogen leaking through seals, thus preventing this in leakage from entering the $UF_6$ system. The wet air evacuation system is used to evacuate equipment or portions of the cascade that have been opened to atmosphere for maintenance or prior to returning those systems to service. This evacuation removes contaminants that may interact with the process gas to form deposits or undesirable by-products within the $UF_6$ enrichment cascade. The wet air system may also be used to assist in final evacuations in obtaining a $UF_6$ negative or in sweeping of dry air through various cascade systems or components. This is to reduce the level of hydrogen fluoride prior to open the system for maintenance. Depending upon location (e.g., C-310, C-331, C-333, C-335, and C-337), there may be either seal exhaust, wet air, or combined seal exhaust/wet air pumping stations.

The systems are made up of vacuum pumps, traps filled with alumina, valves, and headers. Oil mist eliminators are installed on the vacuum pump discharges to filter visible oil from the exhaust and return the collected oil to the pump reservoir. The alumina traps, located on the suction side of each pump, remove traces of $UF_6$ from the gas before entering the pump. These stations will be necessary to support ICT and will require disposition post ICT to reduce fissile material levels in the facility to below criticality incredible levels."

"We will now return to the bus."

**9) R-114 Rail Cars (P) – Pause and point out railcars.**

"Of the over 8.3 million pounds of R-114 onsite, over 2.5 million pounds of R-114 is stored in 16 railcars and 3 ISO containers. The remaining R-114 is stored in process equipment throughout the process buildings. An additional 12 ISO containers are currently available and 12 additional railcars are being procured this year for additional onsite storage. Some of these ISOs and railcars will be used by the current deactivation contractor for storing of R-114 removed from the process equipment in support of in-situ chemical treatment."

**10) C-746-Q Hazardous and Low-Level Waste Storage Facility (P) – Pause and point out facility.**

"In front and on the right is the C-746-Q Hazardous Low-Level Waste Storage Facility, which is a Nuclear Hazard Category 2 Facility. This prefabricated metal building of approximately 33,000 $ft^2$ stores RCRA and LLW. Material that requires nuclear criticality storage is located here. Adjacent to C-746-Q is C-746-Q1. C-746-Q1 is a 16,335 square foot unit that is part of the C-746-Q facility designed to manage both solid and liquid hazardous wastes. Wastes are stored in containers. This unit currently is permitted for the crushing of light bulbs and for chemical treatment of hazardous wastes in containers."

**11) C-745-X Converter and Compressor Storage Pad (P) – Pause and point out storage pad.**

"The C-745-X yard in front and on the left is one of two yards (the other is C-745-Y) where failed process converters and compressors are stored. This equipment will require uranium deposit removal. These yards are designated as Hazard Category 2 facilities."

**12) C-533 Switchyard (P) – Pause and point out switchyard**

"On the right is the C-533 Switchyard. As originally designed, electrical power came into the plant at 161,000 volts through eighteen overhead transmission lines from TVA's Shawnee Steam Plant, Electric Energy, Inc.'s Steam Plant (EEI) at Joppa, Illinois, and from Kentucky Utilities system into four switchyards. The four switchyards were C-531, here at C-533, C-535, and C-537. In the switchyards the 161,000 volt power flowed through 98 large oil circuit breakers to 35 large main power transformers. These main power transformers reduced the 161,000 volt power to 14,000 volts for further distribution throughout the plant. While all the power entered the plant over the TVA, EEI, and KU power lines, the plant purchased power from various utilities throughout the Midwest. Additionally, the four switchyards had interconnectivity between them that allowed power to be transferred between the switchyards and between the power suppliers. The 161,000 volt switchyards were designed to allow redundancy to assure continuous uninterrupted power delivery to the plant. Kentucky Utilities and Jackson Purchase Electric Corporation supply lower voltage power to a few auxiliary facilities at the plant, such as the C-103 building and the C-746-U landfill.

The plant typically used between 700 – 2,000 megawatts of electrical power each hour, depending on the plant's production targets and availability of reasonably priced power.

The plant was built and modified over the years of operation to a capacity to use up to around 3,000 megawatts.

The shutdown of production has greatly reduced the power level and has enabled modifications to the electrical distribution system. In 2015, the site completed the reconfiguration of the site's 14,000 volt power distribution system, allowing the shut-down of normal 14,000 volt system components in the C-533, C-535, and C-537 switchyards. All power within the limited access area of the plant currently originates from the C-531 switchyard.

The ultimate goal is to demolish the four switchyards. However, due to the power contracts and the 161,000 volt power line configurations, portions of the C-531, C-535, C-537 and this C-533 switchyard are still in service to allow the power suppliers to transfer 161,000 volt power through the switchyards. The plant operates those portions of the switchyards required to support this effort. TVA is currently working on a project to reconfigure the area 161,000 volt power lines that will disconnect the eighteen overhead 161,000 volt power lines from our switchyards and to provide only two 161,000 volt lines into the C-531 switchyard."

**13) C-315 Tails Withdrawal (P) – pause and point out facility**

"On the left is the C-315 Tails Withdrawal Facility. Here, the uranium that was depleted of most of its $U^{235}$ atoms was pulled from the cascade process and drained into 14-ton cylinders for storage. This facility filled between 1 – 4 cylinders per day. Once filled, the cylinders were moved with cylinder haulers to storage yards."

**14) C-531 Switchyard (P) – Pause and point out switchyard**

"On the right is the C-531 switchyard. As stated previously, this switchyard currently provides all power within the limited access area of the plant.

In order to demolish the remaining C-531 switchyard, a new switchyard to replace the C-531 switchyard is tentatively planned in the future to be constructed near C-755 Trailer Complex. The construction, along with operation and maintenance of the new switchyard, will be the responsibility of the power supplier. The Contractor, however, shall maintain and operate the 14,000 volt power distribution (low side) systems at the PGDP site.

Along with the new switchyard comes the requirement to connect it to the plant's 14,000 volt distribution system. The design and installation, except for the final routing and tie-ins, will be completed by others. The Contractor shall make the final tie-ins. The tie-ins shall include the final routing and connections of approximately sixteen 14,000 volt interlocked armor cables to the 14,000 volt breakers in the new switchyard and the final routing, vault penetrations, and connections of twenty-four new 14,000 volt cables to existing paper insulated lead covered cables in six underground cable vaults."

**15) C-611-R and C-611-O Water Tanks (D) – drive by slowly and point out towers**

"Up and to the left are the C-611-R (checkered) and C-611-O (blue) Water Tanks. The checkered tower provides water to the plant's high pressure fire water protection system. This tower is 325 feet tall and holds about 325,000 gallons of water. It is one of the largest water towers in the United States. The fire water tower provides water to more than 100,000 sprinkler heads installed in the plant that cover approximately 8.5 million square feet of buildings and equipment. The high pressure fire water system covers all the process buildings.

The blue water tower provides water for the plant's sanitary water supply. This tower is 185 feet tall and holds approximately 250,000 gallons of water. The water tower also supplies water to the fire protection systems not covered by the high pressure fire water (checkered tower) system."

**16) C-360 Toll Transfer and Sampling Building (S) – stop in parking lot and read first two paragraphs before exiting bus.**

"We are at the C-360 Toll Transfer and Sampling facility. This facility provided systems for receiving, sampling, transferring, and shipping cylinders containing $UF_6$. All operations necessary for fulfilling enrichment service contracts for private industry were performed at this facility. Feed material, as well as the plant's enriched product, were weighed and tested here to ensure they met industry standards. Four autoclaves, similar to the ones housed in the vaporizer facilities, were used to sample and/or transfer $UF_6$.

We will be exiting the bus and walking through this facility. We will be going up and down stairs. Keep an eye on your walking surfaces and hold onto handrails. Also please do not place your hands on or across any of the radiological ropes that you may encounter on the tour. Safety glasses are required in this facility.

***Exit bus***

***Laboratory Area (Point out sampling stations and control/alarm panels while reading.)***
"This is the laboratory area. It contains four sampling stations where $UF_6$ purity samples were obtained for each cylinder transferred. On your right there are also control and alarm panels for monitoring and controlling building operations.

As with the viewing area of the display cell in C-333, we'll split the group and take half down to the basement area. The basement area houses a transfer station and scales, cold traps, evacuation drums, technetium traps, and associated piping. Once downstairs we'll point out this equipment. All piping, drums, transfer stations, and traps, must be removed and dispositioned to meet criticality incredible and waste acceptance criteria."

***After the group is downstairs, point out;***

- ***transfer station***
- ***location of Technetium traps***

- ***surge drums***
- ***relief drums***
- ***piping housing***
- ***cold trap***

***High-bay Area (Point out equipment while reading)***
"The high-bay work area contains four autoclaves, accountability scales, and cranes and crane doors that allow movement of overhead cranes and cylinders into and out of the truck alley. Cylinders were brought in with cranes and placed into autoclaves. The autoclaves utilized steam to heat the cylinders. Once heated the cylinder contents were sampled and transferred downstairs for transferring into a smaller 2 ½ ton cylinder. The autoclaves also contain traps for trapping out technetium during the transfer process. Roll up doors are provided at truck entrances, rail entrance, and entrances to maintenance areas."

***After the group is downstairs, point out;***

- ***transfer station***
- ***location of Technetium traps***
- ***surge drums***
- ***relief drums***
- ***piping housing***
- ***cold trap***

***Water Treatment Trailer***
"This system was designed and built to treat contaminated rainwater that accumulated in a basin during the C-410/C-420 D&D effort. The system consists primarily of a pre-filter (sand and gravel filter) with two trains of vessels in parallel. Each train consists of a carbon filter, and 2 resin beds (for removal of Tc-99 and total uranium) in series. Each train is capable of treating approximately 50 gallons per minute with a total throughput capacity of approximately 100 gallons per minute when both parallel trains are in operation. This treatment system achieved 93%–98% reduction in the Tc-99 and total uranium concentrations."

"We'll now board the bus and continue the tour."

**17) C-637 Cooling Towers and Pump house (P) – pause and point out cooling towers**

"On your right are the C-637 Cooling Tower and Pump house. There are four sets of cooling towers and pump houses which were used to remove heat from the enrichment process. One set of cooling towers and a pump house were dedicated to each process building. Heat, generated by compression of the $UF_6$ gas inside the compressors, was transferred to the R-114 systems. The R-114 systems were then cooled by water. The heat from the R-114 was passed to the water as it flowed through condenser tubes. Once

through the tubes, the water flowed by gravity through underground pipes and over the top of the cooling towers. As the water flowed over the towers it was cooled by exposure to air. The cooled water drained into the basins below the towers where it was pumped back to the process building to repeat the cycle.

The cooling towers are no longer in service and only one pump house, C-631, is in operation to support the high pressure fire water system."

**18) C-337A $UF_6$ Feed Facilities (Vaporizers) (P) – pause and point out vaporizer**

"On the left is the C-337A $UF_6$ Feed Facility. PGDP has two feed vaporizer facilities, each located adjacent to the large enrichment process buildings. Feed material for the enrichment cascade was manufactured from mined uranium or partially depleted or enriched $UF_6$. The C-337-A Vaporizer was one of two feed points for $UF_6$ for enrichment into the plant. The feed facilities were used to convert the uranium hexafluoride from a solid to a gaseous state and to transfer the material into the cascade for enrichment. To accomplish this, cylinders were heated inside cylindrical pressure vessels called autoclaves which are approximately 22 feet long with an internal diameter of about 6 feet. The feed facilities provided an uninterrupted feed supply to any point in the cascade. Each feed facility was also equipped with two 20-ton cranes used to move cylinders. The scales used for weighing cylinders in the feed facilities have a capacity of 40,000 pounds and were accurate to plus or minus 2 pounds. The autoclaves were steam heated.

Adjacent to the facility is a shipping container. This container holds technetium traps removed from C-360 in the past. These traps will require disposition to meet criticality incredible levels for this facility."

**19) Proposed Waste Disposal Site 5A (D) – Drive by slowly and point out area**

"On your right is the Proposed Disposal Site 5A. DOE is evaluating candidate sites for the On Site Waste Disposal Facility. Site 5A is one of the five candidate sites evaluated in the Remediation Investigation/Feasibility Study that passed the Threshold Screening and therefore carried forward for further evaluation. Site 5A is located on an interior portion of DOE-owned property, located primarily outside of the secured area of PGDP, with approximately 24% of the site within the secured portion of the PGDP plant. This site is approximately 135 acres. The majority of Site 5A land is designated as DOE-owned property licensed to West Kentucky Wildlife Management Area. The western portion is designated DOE-owned industrial land use. This is another view of the 135 acre site we viewed previously on yesterday's tour. A portion of the site will cover the area currently occupied by the C-637 cooling towers and the C-745-H yard in front and to the right of you."

**20) C-537 Switchyard (D) – Drive by slowly and point out switchyard**

"On your right is the C-537 Switchyard that was previously discussed."

**21) C-337 Process Building (S) – stop and tour facility. Safety glasses are required.**

"On your left is the C-337 process building. It is similar in dimension and contains the same size equipment as the C-333 process building we toured earlier. We will be touring a portion of this facility. As with the C-333 facility, this is a working facility so please be alert to your walking surfaces and for vehicle traffic. Safety glasses are required in this facility."

***PCB Transformer (Point out transformer)***
"In front of you is a PCB oil filled transformer. C-337 is the only process building which utilized this type of transformer. There are 60 installed transformers and 8 spares located in C-337. All of the PCB transformers in C-337 have been drained of PCB oil and rinsed to meet 40 CFR 761.60 requirements. The oil and rinsate have been sent offsite for disposition. Electrical power going into these transformers has been air gapped at both the switchyard and at the transformers."

***Loose Material (Point out loose material/valves, etc.)***
As part of the effort to reduce the fissile material to below criticality incredible levels, the Contractor will be required to disposition any fissile equipment/material located in the process buildings. These valves are only one example of the type of loose material the Contractor will be required to disposition. Others examples would include pumps, piping, etc.

***R-114 Station***
Each of the four process buildings contains an R-114 servicing station. These stations contain liquid transfer pumps, vapor pumps, air evacuation pumps and storage tanks. R-114 is valved through headers from the cell R-114 system to the drain tanks. Once draining stops, vapor pumps pull the remaining vapor and liquid from the system. The system is purged with air and then evacuated with the air evacuation pumps. The R-114 storage tanks in C-337 will hold approximately two cells worth of R-114 inventory. Once the tanks are full, the R-114 is pumped via a header to a charging station in the truck alley where an ISO container or railcar is connected. The current Contractor is in the process of removing the R-114 from the C-337 facility. Once the R-114 is removed from a cell, the R-114 drain line is required to be air gapped from the building R-114 headers. This is due to the extreme reaction potential between $ClF_3$ and R-114. Later we'll point out one such air gapped system. Once air gapped, the system is buffered to a positive pressure.

***Lube Oil Skid***
During operation, the process facilities contained over 380,000 gallons of lube oil for lubrication of equipment motors and compressor bearings. This oil was contained in piping and drain tanks located through the process buildings. To reduce the fire hazards, the lube oil has been removed and dispositioned offsite. Some equipment such as the Purge & Evacuation Pumps or P&Es as they are referred to, still require the use of lube oil to service the ICT activities. Therefore lube oil skids were procured and installed in C-337 and C-335. This is a self-contained unit that has the capability to maintain the oil

at a steady temperature and provide oil through piping to the P&E station. Once ICT activities are completed in this facility, the lube oil skid can be relocated to another facility.

***Compressor stored on Ground Floor (Point out compressors)***
Compressors removed from the cells are stored both on the ground and cell floor. These, along with converters stored on the cell floor, are part of the equipment that will require chemical treatment to reduce uranium deposits and hold-up. This equipment is sometimes referred to as orphaned equipment and/or spare equipment since it is no longer connected to the process. These orphaned/spare compressors and converters can be found in all four process buildings.

***Auxiliary Substation (73A1)***
This substation is one of over 24 auxiliary substations in C-337 which provides all the necessary power to support operations, surveillance & maintenance, and stabilization & deactivation activities for the facility. As mentioned prior, all power for this facility is now fed from the C-531 switchyard.

***Portable Cell Treatment Carts***
As mentioned prior, a key piece of equipment utilized to perform ICT will be the NaF trap carts and analytical test buggies. When combined together, this equipment is referred to as the Portable Cell Treatment Cart System or PCTC. The PCTC will be connected to the cell by means of a 1 inch diameter copper tubing. $UF_6$ liberated from the cell during in-situ chemical treatment will be trapped out by the NTC. The ATB contains pumps for recirculating the gases/$UF_6$ and for monitoring reaction levels during the ICT operation. Ten portable cell treatment cart systems have been fabricated and tested for use during ICT.

***Battery Room (Point out Unit 4 battery room)***
"Each unit within the C-331, C-333, C-335 and C-337 process buildings contain a 250 volt direct current (dc) battery room that supplied dc power for air circuit breaker controls, indications for alarms and for emergency lighting. Other selected buildings throughout the plant also contain dc battery rooms. These battery rooms require maintenance to supply relaying control power, breaker control power, and emergency lighting. Each battery room contains 120 lead calcium cells connected in series to supply a total of approximately 250 volt dc. A battery charger at each battery room automatically maintains the battery cells at full charge."

***Surge Drums Room (Point out wall/room)***
"Behind this wall are the surge drums. Each process building contains several banks of Surge Drums with each bank providing an evacuated volume of approximately 10,000 $ft^3$ to receive gases purged from the cascade equipment for interim storage. Gases purged from the cascade would be returned to the cascade when conditions allowed. The surge drums will be used for ICT similarly to historical cascade operations. The surge drums serve as an evacuated standby surge volume to receive treatment gas if treatment conditions require pressure to be relieved from the cell. Surge drums will also be used to

receive residual treatment gas when a cell treatment concludes. Residual treatment gas will be transferred to the surge drums by pressure differential or by means of the P&E pumps."

***Unit 5 Cell 1 (point out connection points for PCTC)***
These lines are connected to the hot taps which we mentioned earlier in the C-333 tours. These lines tie into the cell piping upstairs and will be connected to the PCTC systems by means of additional copper tubing. Each cell will require installation of these lines and approximately 40 sets of these lines have been fabricated. After use they will be disconnected and moved to the next cell in line for chemical treatment.

Our next stop will be in the Area Control Room. As mentioned prior this is a working facility so please stay close together and away from any operating panels.

***R-114 Air Gapped Header (point out air gapped header overhead. Location is behind transformer at U/5 C/1.)***

***Area Control Room Tour***
This is the Area Control Room or ACR. During enrichment operations, one operator maintained control of this area and monitored the entire facility operation. During ICT, only a portion of the equipment in this room will be utilized. This long panel in front of you is referred to as the P&E panel. It contains motor operated valve control switches, pressure recorders, surge drum monitors, P&E pump operating controls, and has the capability to trend temperatures and pressures on various pumps and headers. During ICT activities, the introduction of treatment gas into the cells will be controlled through this panel as will the operation of the P&E pumps. Additionally the computer monitors you see in front and to the right of you will allow the trending of various points such as temperature and pressure.

***Bathroom Break at the C-337 Change house area***

At this time we will return to the bus.

**22) C-350 Drying Agent Storage Building (P) – Pause and point out facility**

"On your left is the C-350 facility. This facility contains a charging station where a 160 pound Chlorine Trifluoride ($ClF_3$) cylinder is connected and fed into 2 – 2,000 $ft^3$ storage drums. Fluorine ($F_2$) is then added to the $ClF_3$ to create a treatment gas mixture for use during the in-situ chemical treatment process. The treatment gas can be delivered to any process building by way of a distribution system of piping and valves.

The yellow enclosure that you see is the recently installed fully enclosed and climate controlled safety shower."

**23) C-410D/K Fluorine Facility (P) – Pause and point out facility**

"On the far left by the orange windsock is the C-410-D and K facilities. The C-410D facility contains a charging station where a tube truck, containing a mixture of 80% nitrogen and 20% fluorine, is connected and fed into one of 3 – 1,000 $ft^3$ drums which are located in the C-410-K facility. Through a distribution system of piping and valves, the $F_2$ is delivered to C-350 for mixing with the $ClF_3$. The C-410-D facility is also used for fluorination of piping and equipment used during the in-situ chemical treatment process.

Several upgrades are under evaluation for this facility in support of the ICT project. They include installation of relief valves on $F_2$ piping, leak detection and automatic shutoff valve for the $F_2$ tube truck, and the use of personal HF detectors for personnel operating the facility."

**24) C-600 Steam Plant (P) – Pause and point out package boilers**

"The C-600 steam plant is on your right. Steam is required for heating the buildings and to keep the process piping warm so the UF6 stays in the gaseous form. The steam plant has three shutdown boilers (two coal-fired and one oil-and/or gas-fired) with a combined capacity of about 300,000 pounds of steam per hour. The site has installed five (5) gas fired package boiler units (22,500 pounds/hour each) to meet reduced site demands resulting from termination of process operations. Two of the five units are capable of running on either gas or fuel oil. The new site demand, including cell treatment, of up to 100,000 pounds/hour can be provided by the installed package systems. A connection for a sixth package boiler is available should it be determined that additional steam capacity is required."

**25) C-400 Cleaning Building (S) – stop, read information and tour building. Bus will meet group on south end of building**

***Read outside on the southwest corner of C-400***

"We are on the Southwest corner of C-400. Before going into the facility you will notice rail tracks where through the years equipment could be delivered either to C-400 or the C-410/C-420 complex. Millions of pounds of uranium oxide have been delivered to Paducah from uranium suppliers to be processed at Paducah. Also, millions of pounds of $UF_6$ have been shipped from C-400 area after placing protective over pack covers over the cylinders from this location. Just to the west there is Nitric Acid tanks which supplied the acid to the facility. Uranium solid materials were dissolved by the acid to form uranyl nitrate which could be later processed to recover the uranium. This facility utilized different solvents, acids, and bases to clean equipment for disposal and for decontamination of the equipment for maintenance. As with other facilities, please watch your step, do not place your hands on or over radiological boundary ropes, and be alert to traffic. Safety glasses are required in this area."

***Stop Number 1: Compressor Pit and Spray Booth***

The large pit in front of us is where compressors could be disassembled by maintenance in order to recover usable parts such as the rotors, stators, and the compressor housing.

The parts were then cleaned and sent to C-720 to have the compressor rebuilt for further use. The pit is highly contaminated.

The C-400 Spray Booth to the front and left was used to clean large radiologically contaminated items. Items were usually sprayed with a hot, high pressure solution of water, sodium carbonate or steam and rinsed with diluted nitric acid. After cleaning in the spray booth, the items were rinsed using plant water or dilute nitric acid which was then discharged to the discarded waste system. When cleaning solutions were considered too contaminated to be effective for cleaning effectively, it was pumped to the C-400 Holding Tanks for processing in the dissolver units.

Throughout the history of the operation of the chemical processing performed in this facility the equipment and operations have required a high degree of Nuclear Criticality Safety oversight due to the various assays of the uranium processed. Procedures required sampling and analyses to determine the $U^{235}$ concentration or assay, in order for the Chemical Operations to know what storage containers and systems to be used. The smaller diameter storage tanks such as the Pencil Tanks to the left of the spray booth contained the higher assay uranium solutions which required rigorous NCS controls.

***Stop Number 2: Cylinder wash station and Degreaser and Cleaning Tanks***

$UF_6$ cylinders were used throughout the uranium enrichment process to store, transport, and transfer $UF_6$. The $UF_6$ was either in the form of a solid, liquid or gas depending upon its temperature and pressure. The cylinders were required to be recertified every 5 years. This required cleaning and pressure testing with a new valve being installed to meet the required standards. C-400 cylinder wash area was used to accomplish these tasks. A sodium carbonate solution or boric acid was used for cylinder decontamination.

In the distance you can see large tanks which were used to clean equipment ranging from very small to some of the largest components you have seen in the process buildings. These tanks were used to degrease, clean using acids and alkali solutions, and wash the items. The overhead crane allowed the movement of the equipment from one tank to another. Three of the tanks are brick lined and could contain asbestos. The tanks contained:

- Chromic acid
- Hydrochloric acid
- Nitric acid
- Sulfuric acid
- Alkali
- Cold and hot water
- Accumulation tank
- Trichloroethylene Vapor Degreaser

**(Stop 26)** ***Proceed to the east side of C-400 Office area to talk about the C-400 IRA Treatment System***

**26) C-400 Groundwater Treatment System (S) – Walk by facility as part of C-400 tour – read this information before we enter the C-400 building through the ventilation room on the east side.**

"What you see in front of you is the C-400 Treatment System. This equipment was utilized during the C-400 Interim Remedial Action. The C-400 project used electrical resistance heating technology to remove trichloroethylene (TCE) from the soils above the Regional Gravel Aquifer. This zone from 0 – 60' below the surface is referred to as the Upper Continental Recharge System (UCRS). The electrical resistance heating system consisted of a network of in-ground electrodes and vapor extraction wells distributed throughout zones of contamination in a three-phase heating pattern. The soil was heated to above the boiling temperature of TCE and the vapor extraction well then captured the TCE vapors. The equipment you see here converted the TCE from a vapor back to a liquid so it could be collected and shipped off for disposal."

In 2010, the Phase I system addressed two smaller areas to the west and east of the C-400 facility, removing approximately 535 gallons of TCE from the subsurface. A technical evaluation of Phase I, completed in 2010, documented the heating operations. The Phase I project was able to heat the UCRS as planned, but was unable to heat the lower Regional Gravel Aquifer (RGA) to target temperature.

Phase IIa, which was a continuation of the treatment used in Phase I, was completed in fall of 2014. Phase IIa focused on heating in the UCRS in a larger area to the southeast of the C-400 facility and removed approximately 1,137 gallons of TCE.

In 2015, DOE conducted a Phase IIb Steam Injection Treatability Study. The treatability study was designed to obtain data specific to understanding the behavior of steam injected into the RGA under variable injection scenarios. The steam injection technology indicated that steam may be a technically implementable means to heat the aquifer.

DOE is working with regulatory agencies on a plan for C-400 Phase IIb to treat TCE in the aquifer, 60 – 100 feet deep. The Contractor will implement the agreed upon plan."

***Stop Number 3: Fan Room – Read before entering the fan room.***

"We will now enter the C-400 building and continue the tour. The area we are going into is called the fan room. It contains large fans that pulled fumes from the cleaning tanks and discharged them out the large blue stacks that you see. We will be crossing over an elevated catwalk and then will proceed down a long hallway to the north side of the building. Please watch you footing and be aware of tripping hazards."

***Stop Number 4: Pulverizer***

"The pulverizer/screening and loading operation was used to pulverize and segregate green salt ($UF_4$) and ash receiver waste. This material was generated in the $UF_6$ Feed Plant operation. The transfer and crushing was done under dry conditions so large quantities of dust were produced. To control this problem a central dust collection system was connected to the pulverizer. Without this system operating properly, dust would spread throughout the northeast section of the building. Most waste materials were drummed and sent to C-746-Q or C-404. After processing the material was sent back to the feed plant for use in making $UF_6$. Another pulverizer which was smaller was used on the southwest side of the building. This same area later on was used to disassemble tube bundles out of converters during the late 1970s and early 1980s and to repackage $UF_4$ during middle to late 1980s."

***Also point out cleaning tanks again.***

***Stop Number 5: Test Loop***

"The Test Loop was built in the 1950s or 1960s and was used primarily to test compressors during the last uprating process. Different compressor blades were tested and compressors were surged until the compressor de-bladed to determine the quality of the blades and configuration. That whole area was used previously for conditioning converters and various compressor testing. $UF_6$ was pumped from C-335 Unit 4 to the test loop for testing the equipment. Also, fluorine was piped to a storage tank and was used during the 1950s and 1960s.

It was not practical to use the area for the huge uprating program in the 1970s and 1980s. Therefore, C-409 was built in the 1970s to handle the load of converters being processed. In the 1980s brake pads were tested here to come up with a replacement for the existing brake pads which contained asbestos."

***Stop Number 6: Laundry, Seal Area, Dry Honer, Dissolvers***

***Laundry***

"The C-400 laundry area contains equipment used for cleaning and drying rubber gloves, boots, and fabric materials. Detergents, surfactants, disinfectants, and alkali are used in conjunction with hot water in the cleaning process. Solutions are discharged via drain to the C-615 sanitary sewage plant. Air from the dryers is filtered and vented to atmosphere. Lint has been typically drummed and sent to storage.

While the laundry had the capacity to handle up to 13,000 pounds per month, currently only selected laundry for the security and fire department are handled here. The remainder of the laundry is shipped offsite for cleaning. "

***Seal Area***

"The seal areas at the far right corner of the facility were used during inspection, disassembly, and cleaning of the diffusion process equipment. Seal components were separated, segregated, and sent for cleaning elsewhere in C-400."

***Dry Honer***
"Glass bead and sand blasting media units have been used to remove difficult contaminants. These included dry and wet type units. The two types of abrasives used were glass beads (silica dioxide) and carborundum. The abrasive mixture and entrained contaminants were then drawn into a cyclone separator, where solids and air were separated. A wide variety of parts were cleaned using this equipment and all were reported degreased. In the past solid materials from the units were placed in the C-404 Landfill. Liquid from the wet system were discarded in the C-400 Discard Waste System."

***Dissolvers***
"The No. 5 dissolver is down and on the left. There have been 5 dissolvers in the C-400 facility to process different types of uranium waste streams. The dissolvers were designed to recover uranium from various uranium contaminated waste. The dissolver operation included acidification, precipitation, and flocculation. Acidification was performed using nitric acid to form uranyl nitrate. Addition of sodium hydroxide to achieve a pH of 10-12 was performed to precipitate uranium and other metals from the solution. Flocculation was performed by adding ferrous sulfate. After this process the solution was fed to a coated vacuum filter for dewatering. The filtrate was pumped to holding tanks for further treatment or discharge. The precipitate was then sent to the uranium recovery system. The waste streams processed were cylinder wash, spray booth, lab waste, compressor pit, hand table and MgF2 pellets.

Which dissolver used depended on the assay of uranium and the type of waste stream. The principle of operation were very similar but with some differences in chemicals used. The recovered uranium was either reused at Paducah or sent to Fernald for further processing.

At this time we will board the bus and continue the tour."

**27) C-752-A Waste Storage and Treatment (P) – Pause and point out this facility and C-753-A Waste Storage Facility.**

"On your left is the C-752-A facility. This is a permitted RCRA Waste Storage Facility. It is one of three active permitted waste storage facilities. It was completed in 1996 and is approximately 43,000 $ft^2$ in area. It stores TSCA, RCRA, and Low-Level Waste and is permitted to treat waste by a variety of treatment methods. Ignitable waste cannot be stored in C-752-A; it has to be stored in C-733. Waste water is also stored in C-752-A and can be treated via an activated carbon filtration unit that removes PCBs and TCE from wastewater. The facility contains a sprinkler system and an 18 feet x 40 feet waste treatment enclosure with an air filtration system for treating high-hazard wastes. There has been periodic maintenance performed to patch cracks in the floor to ensure compliance with permit requirements. Nearby is also the C-753-A Toxic Substances Control Act (TSCA) Waste Storage Facility."

**28) C-616 Liquid Pollution Abatement Facility (P) – pause and point out facility**

"On the left is the C-616 Liquid Pollution Abatement Facility. The PGDP recirculating cooling water systems were treated for corrosion control with a phosphate-based inhibitor for steel, a copper corrosion inhibitor, and a dispersant. Because a large quantity of cooling water was lost through evaporation in the cooling towers, the concentration of soluble salts and non-dissolved impurities would increase unless some means was used to control it. To control this at PGDP, a blowdown system was used. The corrosion inhibitors and other contaminants in the blowdown water prohibit it from being directly discharged to the receiving stream. The purpose of the C-616 Liquid Pollution Abatement Facility was to treat this blowdown water to lower the contaminant concentrations below the discharge limits.

Blowdown from the four cascade cooling tower systems was pumped into a collection system that routes the blowdown to C-616. The C-616 Liquid Pollution Abatement Facility uses both chemical and mechanical processes. Ferrous sulfate, calcium oxide, and a cationic polymer are used to precipitate contaminants in the blowdown water for removal. Clarifiers provide for the flash mixing of the chemicals with the incoming blowdown water and recirculating sludge, coagulation, and clarification within a single tank.

The facility is currently being used to reduce the phosphate levels in the four cooling tower water basins to below 50% of the permitted discharge limits. At transition, it is expected that this facility will be shut down. If needed to support the Contractor's activities, this facility will require restarting."

**29) C-757 Solid and Low Level Waste Processing (D) – Drive slowly around facility.**

"The C-757 Solid and Low Level Waste Processing Facility is a 10,000 $ft^2$ facility. It is being used by the current Deactivation and Remediation Contractor for waste management staging and processing."

**30) Burial Grounds, SWMUs 2, 3, & 4 (P) – (This also includes #31 and #32) Pause and point out burial grounds**

"In the plant's early years of operation, material and equipment removed from the PGDP facilities were buried in a series of on-site disposal areas. These burial grounds include both classified and non-classified material.

There are more than 60 acres of old waste burial grounds inside the security fence. They contain materials from household/commercial waste to radioactive, hazardous, and flammable wastes. SWMU 3, on the right, which is also called the C-404 Low-Level Radioactive Waste Burial Ground is a closed hazardous waste landfill managed through a post-closure RCRA permit.

SWMU 4, on your left, which is also called the C-747 Contaminated Burial Ground and the C-748-B Burial Area**,** is currently being characterized to better delineate areas of

higher contamination to determine the appropriate remedial action in the future as part of the CERCLA process.

SWMU 2, on your right, which is also called the C-749 Uranium Burial Ground, contains primarily buried uranium that was immersed in oils to address ignitability concerns. There has been an Interim Record of Decision in place to monitor the unit for releases. Final actions will be documented in a future Final Remedial Decision document.

Releases from these burial grounds may have affected, or have the potential to affect, groundwater underneath the areas. Remediation of these burial grounds has been broken into five subprojects which are SWMUs 2 & 3, SWMU 4, SWMUs 5 & 6, SWMUs 7 & 30, and SWMU 145. Decisions are pending on the various cleanup remedies."

**33) C-733 Waste Oil and Chemical Storage Facility (P) – Pause and point out area.**

"On the right is the C-733 Waste Oil and Chemical Storage Facility. It is 4,224 $ft^2$ covered structure enclosed by a wall on one side and fencing on the other sides. This building is RCRA permitted and holds flammable/ignitable hazardous material. Four 3,000-gal carbon steel aboveground storage tanks and associated piping formerly used for batching/transfer operations were removed in March 2016 under a RCRA closure activity.

C-733 is completely covered and partially equipped with side panels to prevent rain from falling on the pad; however, blowing precipitation can enter the facility. The dike wall prevents any run-on from outside. Spilled or leaked waste and accumulated precipitation must be removed from the sump or collection area in as timely a manner as necessary to prevent overflow of the collection system.

The maximum number of containers that can be stored at C-733 at one time is 700 55-gal drums. Wastes may be stored in containers that are under or above 55-gal in volume. All containers stored in C-733 are elevated to protect them from contact with standing liquids. All containers are stored on pallets or elevated platforms. Smaller containers may be stored on shelves or in flammable storage cabinets.

The means of secondary containment in the storage area at C-733 is a diked concrete pad, which is sloped to drain to a sump area. The sump dimensions are 6 feet by 5 feet by 16 feet. The maximum volume that could be contained inside the diked area is the dike volume (3,265 $ft^3$) plus the sump volume (480 $ft^3$) for a total of 3,745 $ft^3$ (28,000 gal)."

**34) C-720 Machine Shop(S) – stop, read information and exit to tour facility.**

"On our left is the C-720 Machine Shop. This facility is larger than five football fields and contains the fabrication and maintenance shops that supported plant operations. Shipping and receiving is also located at this facility. Almost every industrial craft was represented here, including painters, carpenters, sheet metal workers, plumbers, electricians, instrument and maintenance mechanics, machinists, laborers and heavy equipment operators. The crafts housed in this building had the capability to fabricate,

repair, maintain, and calibrate almost every piece of equipment essential to the operation of the plant. We will be walking through this facility today. Once again, please be alert to vehicle traffic and walking surfaces."

***Sheet Metal Shop/Weld Shop/Stores (Point these area out)***
"We are initially walking along the South Truck Alley. The high bay portion of the facility contains metal fabrication and machining equipment; overhead crane bays; climate controlled shop areas for precision work; electronic repair facilities; and paint spraying facilities.

The Sheet Metal shop is on your left, Stores, Shipping & Receiving to your right and the Weld Shop behind me on your left. Stores is located inside the Limited Area security zone with Shipping and Receiving outside of the zone to allow shipments and deliveries access to the loading docks and inspection areas from the Southside of the building. A security portal allows for movement to and from Shipping and Receiving."

***Machine Shop***
"There are 72 milling machines, both horizontal and vertical ranging in size from 9 inch by 36 inch table to a 20 foot table with a 72 inch vertical head travel. They are also equipped with nine tape controlled and computerized numerical controlled milling machines and 14 radial drills ranging from the small table and floor models up to a 24-inch diameter column and a 10-foot arm. Various equipment is also available for all types of grinding, shaping, forming and welding.

Directly overhead is the C-720 Mezzanine Office Area. This area, combined with the other office areas on the ground floor, provide offices for approximately 165 personnel. The mezzanine is accessible from two stairwells in this truck alley as well as a covered stairwell and walkway from the South side of the building."

***Quality Control/Metrology lab, compressor shop***
The QC & Metrology area, Machine shop and the Compressor shop are located at the East end of the building. The QC area to your right contains climate control facilities for precision measurements and inspections. A portion of the machine shop is on your left and the compressor shop is behind me. The compressor shop has equipment specially designed to repair and maintain the compressors used in the diffusion process. Almost all of the over 1,750 axial compressors were sent through this compressor shops for rebuilding during the uprating programs in the late 1970's."

"We will now exit C-720 and proceed to the North Truck Alley of the building. Once again, please be alert to vehicle traffic and walking surfaces."

***Seal Shop***
The Seal shop and storage area are located to your right. The seal shop contains the equipment required to build the seals that will be necessary to support the P&E pumps during ICT activities.

***Electrical and Instrument Shops***
Electrical and Instrument shop areas are located to your right. These shops include electrical motor facilities which include support equipment necessary to completely rebuild and test electrical motors, electrical protective equipment, and electrical insulating gloves. The majority of calibration of plant instrumentation takes place here currently.

***C-720-C Facility***
"The facility we are standing in is the C-720-C facility. This 28,000 $ft^2$ building was added during the Cascade Uprating Program in the 1970s to support converter assembly. The laundry will relocate to this area and support the plant with pick-up and distribution to plant personnel and offsite shipment and receipt."

"We will now exit the facility and make our way over to the other end of the facility. Once again, please be alert to vehicle traffic and walking surfaces."

***Prefabricated Decontamination Structure***
"The Portable Prefabricated Decontamination Structures in front of you was procured to support decontamination activities at the Paducah plant. The structure is a 20 foot long x 16 foot wide x 16 foot high, clear-span interior; with a 20 foot x 8 foot roof opening consisting of two 20 foot x 4 foot hinged-leaf roof sections. It includes roll-up and personnel doors as well as an adjoining air-lock. A similar structure, without the roof opening, is located in the C-335 building. These structures will be used to tear down, segment, and decontaminate larger loose fissile material removed from the process building."

"We will now exit the facility and board the bus."

**35) C-720 SWMU 211A (P) – Pause and point out**

"On your right is Solid Waste Management Unit 211A, which is one of two potential TCE source areas near the C-720 Maintenance and Storage Building. The other potential source area, SWMU 211B, is south of the C-720 Building and is upgradient to SWMU 211A. DOE is currently working with regulators to evaluate results from soil testing performed in 2012 and 2015. The results indicate that dense non-aqueous phase liquid or DNAPL may be present at SWMU 211B and the Conceptual Site Model for this site may be invalid. Further discussions are warranted among the FFA parties with regard to the TCE source located upgradient of SWMU 211A, the possibility that anaerobic degradation is affecting this source, and on the timing of the SWMU 211A remedial action."

**36) C-409 Stabilization Building (S) – Stop and go into facility at South side roll up door.**

"The C-409 building was constructed in the early 1970s for converter testing, conditioning and disassembly. The C-409 facility provided three main functions during the Process Equipment Modification program. The first function was to measure the

amount of A to B flow by measuring the Slope Factor which was an indicator of the type and amount of flow through the barrier and any defects in the assembly of the converter. If the Slope Factor was above limits, the converter was sent back to C-720 for further evaluation and repair. In C-720 the tubes were checked and any excessive leaking tubes were plugged at both ends of the tube. Once the repairs were made, the converter was sent back to C-409 for Slope Factor testing again.

After the converter passed the testing, the second function of the building was initiated. The converter was placed in one of the six conditioning stands and heated in the presence of fluorine to remove any residual oil and moisture and to build up a protective metal fluoride film to prevent $UF_6$ reaction with the metal once it was placed in the cascade. Once the conditioning process was completed the converter was sent back to the slope factor test stand to assure no damage was done to the converter during the conditioning.

The third function of the facility was to cut the heads off the converters being removed from the cascade and to wash the tube bundle, the cooler and exposed inner parts of the converter to allow maintenance to further tear down the tube bundle in C-400. The wash solutions were pumped back to C-400 for disposal. This operation was performed in the southeast section of the building.

Once the uprating program was completed the facility was used for laboratory field testing on various projects and a high assay uranium recovery process was installed along the south wall of the building. There are also office areas still being utilized in the building. The C-409 facility is a Hazard Category 2 facility with criticality accident alarm system still operable within the facility.

The building still contains contaminated areas due to the converter disassembly and washing operation during the uprating program."

**Read the following as bus proceeds to Post 15.**

"This concludes the Day 2 tour of the inside of the facility. We will now be returning to the parking area. Just a reminder that any questions need to be in written form and submitted in accordance with guidance previously provided. Please hand the attendant at the bus door your checklist request for the Bidders' Choice Tour to take place tomorrow at 7:30 am. We thank-you for your interest in the Paducah Plant Deactivation and Remediation Project."