October 13, 2009

Mr. Michael Thomas
Environmental, Safety, and Health Manager
Uranerz Energy Corporation
1701 East "E" Street
P.O. Box 50850
Casper, WY 82605-0850

SUBJECT: SUMMARY OF AUGUST 27, 2009 MEETING AND TELECONFERENCE - URANERZ ENERGY CORPORATION

Dear Mr. Thomas:

A summary of the meeting between U. S. Nuclear Regulatory Commission (NRC) staff and representatives of Uranerz Energy Corporation on August 27, 2009, is enclosed. Within 30 days, please either provide the information identified in the meeting summary or inform us of the date you expect to provide the information. At this point in the review process, NRC staff has presented the open issues to Uranerz regarding its Nichols Ranch facility Safety Evaluation Report. The staff is curtailing any further work on the SER until Uranerz responds, in writing, to the open issues.

If you have any questions regarding this letter or the enclosed meeting summary, please contact me at (301) 415-7777, or by email at ron.linton@nrc.gov.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice for Domestic Licensing Proceedings and Issuance of Orders," a copy of this letter will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html.

Sincerely,

/RA/

Ron C. Linton, Project Manager
Uranium Recovery Licensing Branch
Decommissioning and Uranium Recovery
Licensing Directorate
Division of Waste Management
and Environmental Protection
Office of Federal and State Materials
and Environmental Management Programs

Docket No.: 040-09067

Enclosure: Meeting Summary

cc: Meeting Attendees
G. Mooney (WDEQ)

Mr. Michael Thomas
Environmental, Safety, and Health Manager
Uranerz Energy Corporation
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MEETING REPORT

DATE: August 27, 2009

TIME: 10:00 a.m. – 4:00 p.m.

PLACE: U.S. Nuclear Regulatory Commission
Two White Flint North, Rockville, Maryland
Room T8C5c

PURPOSE: Meeting and Teleconference to Discuss Uranerz Energy Corporation's Source Material License Application and Open/Confirmatory Issues Related to NRC's License Review.

ATTENDEES: SEE ATTACHED ATTENDEE LIST

BACKGROUND:

The purpose of this meeting was for Uranerz Energy Corporation (Uranerz) and Nuclear Regulatory Commission (NRC) staff to discuss the Nichols Ranch *in-situ* recovery (ISR) facility license application and open/confirmatory issues related to NRC's license review.

The meeting and teleconference started at 10:00 a.m. Eastern time in T8C5c. An opening statement was presented by Ron Linton, NRC. Participants introduced themselves.

DISCUSSION:

The following issues were discussed in detail. The numerical headings are based on the outline to be used in the NRC staff's Safety Evaluation Report. The responses that are noted in the text in italics are short descriptions of discussions between Uranerz and NRC staff but do not capture the entirety of the conversations. Additionally, Uranerz staff did not review this meeting summary for accuracy or agreement prior to its publication. NRC staff expects Uranerz to address each open issue in writing.

2.2 – Meteorology

2.2.1 Uranerz has not provided sufficient information regarding the atmospheric stability of the site for the staff to evaluate its use of the Antelope station in lieu of site-specific data. A summary of the MILDOS methodology used to determine the atmospheric stability and the results contained in Addendum 7C should have been provided. **This is an open issue.**

2.2.2 Uranerz did not provide a summary of the MILDOS calculations and their effect on atmospheric dispersion of effluents and the resulting dose to the public, nor propose a source of mixing height data that is representative of the Nichols Ranch ISR Project site. **This is an open issue.**

Enclosure

2.2.3 Although the Antelope station and the proposed central processing plant at the Nichols Ranch Unit are located at similar elevations, Uranerz has not provided enough information describing the terrain of the Antelope station for the staff to evaluate if the terrain of the Antelope station is representative of the Nichols Ranch ISR Project terrain. **This is an open issue.**

2.2.4 The quantitative or qualitative criteria Uranerz used to conclude that the Pumpkin Buttes have little effect to the topography and the climate is not specified. Without specific information that supports these conclusions, the staff cannot determine if the meteorological data from Antelope is representative of the Nichols Ranch ISR Project site and cannot determine if the use of the Antelope station data is acceptable. **This is an open issue.**

2.2.5 Uranerz analyzed 20 years of wind data collected from the Antelope station (1987-2006), but did not compare the 20 years of data from Antelope to the longer term data collected from the Antelope station. Uranerz should demonstrate that the period of data used is representative of long-term meteorological conditions in the site vicinity. **This is an open issue.**

2.2.6 Uranerz did not provide any information on the maintenance, inspection, or service of the Antelope meteorological station. Meteorological calibration records are required to be maintained as part of the radiation safety records. The staff cannot determine the validity of the meteorological data collected by Uranerz during the time period from 1987 to 2006. Uranerz should provide records for the Antelope Station to establish the validity of the data. **This is an open issue.**

Uranerz Response: Uranerz will respond to the open issues related to meteorology.

2. 3 - Geology and Seismology

2.3.1 Uranerz provided the isopach of the B shale and the C shale which together act as the underlying confining layers to the ore zone at the Hank Unit in Exhibit D5-21. The vast majority of the borings were not deep enough to penetrate these shales, so the isopachs were defined by very few points along the ore body. NRC staff cannot interpret and determine the continuity and thickness of these underlying confining unit shales with so many non-detect points. **This is an open issue.**

2.3.2 At the Hank Unit, the C and B Sands are the underlying sands to the ore zone. These units were only shown on cross sections C-C', F-F', H-H' and J-J', which had borings deep enough to identify their presence. The "C sand" is thin and discontinuous, whereas the "B sand" appears thick and continuous. The majority of the borings were not deep enough to reach this sand on the isopach, so it was defined using very few points. Both of these sand units underlie the ore zone and one of these sands may be defined as the underlying aquifer for excursion monitoring purposes. NRC staff needs more thorough isopach maps for the C and B Sands (Exhibit D5-22) to assess the presence or absence of these sands across the license area to properly assess the ore zone underlying aquifer. **This is an open issue.**

NRC staff questioned if the C sand is a mapable aquifer and indicated Uranerz could either obtain the data to determine if this unit is the underlying aquifer or propose an alternative. Staff indicated obtaining this data may become a condition in the license.

Uranerz Response: The northern half of Hank C sand is aquifer, in the southern half would be B sand. Uranerz will review it and respond to the open issue.

2.4 – Hydrology

2.4.1 Uranerz recognized that the magnitude of the peak flows and velocities for the tributaries that cross the wellfields in the Nichols Ranch Unit license area may present an erosion risk to the site and damage wellfield infrastructure. Uranerz proposed to minimize damage from erosion and to wellfield infrastructure from peak flow events by avoiding well installation in the ephemeral drainages. Uranerz stated that if it is necessary to install such wells, appropriate erosion protection controls will be applied to minimize damage to the drainage. If wells are to be placed near a stream, appropriate well and well head protection will be utilized. Embankments, culverts, and drainage crossings will be protected using best management practices in accordance with Chapter 3 of Wyoming Department of Environmental Quality (WDEQ) Land Quality Division (LQD) Rules and Regulations. Uranerz should confirm that these practices will also be applied to any wells or infrastructure to be located in the 25-year flood plain of Cottonwood Creek shown in Figure 2-15a. The use of these practices should also be confirmed for Dry Willow Creek and for Willow Creek at the Hank Unit. **This is a confirmatory item.**

Uranerz Response: Uranerz will respond to the confirmatory item.

2.4.2 Uranerz estimated the peak velocities for the Hank Unit license area based on the 25-year peak flow rate and reported these values in Table D6-1 in Appendix D6 for all of the drainages except HDA7 and HDA8. Peak velocities for HDA7 and HDA8 should be determined. **This is an open issue.**

Uranerz Response: Uranerz will respond to the open issue.

2.4.3 The satellite facility at the Hank Unit is located in the middle of the license area and is not shown to be flooded by any drainage area. However, this facility could be subjected to sheet flow. Uranerz should identify engineering measures to protect this facility from sheet flow flooding. **This is a confirmatory item.**

Uranerz Response: Uranerz will respond to the confirmatory item.

2.4.4 Uranerz stated in a request for additional information (RAI) response that the Coal Bed Methane (CBM) operator at Hank Unit will not discharge any CBM water in the near future in the license area. The operator will pump it off site for reinjection into the Madison formation at a site 35 miles distant. Uranerz did not include this statement in the application or provide assurance that this or any additional CBM operator will continue this practice for the lifetime of the Hank Unit. Currently, the CBM operator possesses permits for CBM water basins within the Hank Unit. NRC staff requests a commitment in the application that Uranerz will notify NRC if CBM ponds or basins are installed in or within ¼ mile of the Hank Unit. **This is a confirmatory item**.

Uranerz Response: Uranerz will respond to the open issue.

2.4.5 The "A sand" aquifer is the ore zone in the Nichols Ranch Unit license area. Uranerz used seven wells, MN-1, MN-2, MN-3, MN-4, MN-5, MN-6 and Nichols 1 to measure water levels in the "A sand." The reported water levels in MN-2 average approximately 4,592 feet, which is approximately 70 feet less than surrounding wells. Uranerz did not comment on the difference in water level between MN-2 and the other wells. In addition, Uranerz provided the potentiometric surface for the "A sand" in the license area using a water level of 4662 feet for well MN-2, which is not a value reported for this well. The potentiometric surface shows contours which do not reflect the measured potentiometric low at MN-2. NRC staff notes that these contours and the associated groundwater flow direction and gradient magnitude of 0.0033 ft/ft derived from these contours appears to be in error. **This is an open issue.**

Uranerz Response: The error in the measuring point in MN2 was corrected in the map, but not in the table. They will provide the correct information.

2.4.6 Uranerz did not provide a description of any underlying aquifers to the "1 sand" at the Nichols Ranch Unit. Uranerz did provide a deeper cross section in Exhibit D6-5 to show the relationship of the CBM production zone to the ore zone at the Nichols Ranch Unit. This figure shows that the next underlying aquifer would be located in the Fort Union sand, which appear to be separated from the "1 sand" by a significant shale layer. Because the "1 sand" appears to lack continuity, it is unclear if it is the only underlying aquifer for the Nichols Ranch Unit license area. **This is an open issue.**

Uranerz Response: Uranerz confirmed that the 1 sand will be the underlying aquifer. It's not a thick sand, but it can be used as the underlying aquifer. May be a spot or two that gets thin, overall it's continuous. The hydraulic head exhibited by the 1 sand will improve the likelihood that a sample can be collected.

2.4.7 Uranerz investigated the potential for the presence of artificial hydraulic connections between the deep coal seams that are producing methane and the ore zone in and around the Nichols Ranch Unit. It identified several exploratory borings and permitted wells that extended to depths sufficient to penetrate the coal seams. One exploratory boring, RAM-5, with a depth of 903 feet, was located in the permit area. Uranerz did not indicate it would investigate the condition of this boring at the Nichols Ranch Unit to assess if it could act as a conduit. **This is an open issue.**

Uranerz Response: It it's an old exploration boring and it should be investigated. They will address the open issue.

2.4.8 Uranerz reported the surficial aquifer in the Hank Unit license area is located in the "H sand." Uranerz provided a map of the depth to water to the "H sand" surficial aquifer. The water levels range from 50 -200 feet below ground surface (bgs) based on one well and hydrologic interpretation in Figure 2-21b of the application. Uranerz reported that alluvial wells in the Willow Creek drainage in the south of the license area are monitored by the Bureau of Land Management (BLM) and have been dry recently. NRC staff could not ascertain if a hydrologic connection exists between the "H sand" and the alluvium in the Dry Willow Creek drainage in the south and with the Willow Creek alluvium in the north of the license area. **This is an open issue.**

Uranerz Response: Uranerz added two additional H sand wells and modified the piezometric map which provides a much better definition of the H sand hydrogeology. They still say that there's no connection between H sand and alluvium. If it was high enough then it would discharge, but the head is not high enough. Uranerz will address the open issue.

2.4.9 Uranerz conducted three multi-well pumping tests at URZHF-5, URZHF-1 and SS1-F in the Hank Unit license area. The first test was conducted at pumping well URZHF-5 for four days and nineteen hours with two "F sand" observation wells and one underlying "B sand" and one overlying "G sand" monitoring well (MW). The transmissivity in the "F sand" could only be determined from the pumping well as 470 gpd/ft. The observation wells, which were located 500 and 1000 feet away, respectively, showed no response. Uranerz did not address the lack of response. NRC staff notes the aquifer is unconfined, so the drawdown from the well would have limited areal extent. **This is an open issue.**

NRC staff suggested the observation wells will likely need to be placed much closer in an unconfined aquifer to show a response and enable a value of specific yield to be determined for the unconfined aquifer.

Uranerz Response: Uranerz conducted a pumping test with a well closer to the pumping well. The Kv is 0.085, which is typical for the Powder River Basin sands. The observation well is 90 feet away from pumping well. Uranerz is proposing two more multi-well pumping tests to assess drawdowns and aquifer properties. Uranerz will address the open issue.

2.4.10 NRC staff finds there is substantial dewatering from low pumping rates in the Hank Unit "F Sand" unconfined aquifer. Uranerz should determine the limiting extraction rate which can be maintained in the "F sand" unconfined aquifer without causing excessive dewatering. **This is an open issue.**

NRC staff discussed the use of MODFLOW SURFACT for this determination. MODFLOW automatically resaturates cells and therefore doesn't work well for unsaturated flow.

Uranerz Response: Aquifer thickness is greater than 50 feet, however, the thickness of the saturation above the ore is approximately 50 feet. Uranerz indicated that analytical equations were rejected by WDEQ and WDEQ requested that modeling be completed with MODFLOW. Uranerz will address the open issue.

Section 2.5 – Background Surface and Groundwater Quality

2.5.1 Uranerz reported surface water quality for Ra-226 as zero for the Cottonwood Creek upstream measurements in 2008 and the Cottonwood Creek at Brown Ranch and Brown Water Pond in 1979. Uranerz reported values of zero for selenium in the overlying and ore zone sands at the Nichols Ranch Unit. Uranerz reported a value of zero for arsenic, cadmium, mercury and selenium in the ore zone sands. Uranerz reported a value of zero for selenium in the underlying sand at the Hank Unit. Zero values should be reported as non-detect, if appropriate. **This is an open issue.**

Uranerz will address the open issue.

2.5.2 Uranerz reported that CBM produced water will be discharged into impoundments that are designed to infiltrate this discharge into the surficial aquifer near the Nichols Ranch Unit license area. The possibility exists that groundwater quality in the surficial aquifer will be impacted by CBM water during the life of the Nichols Ranch Unit. Uranerz did not provide any discussion of this issue in the technical report. The ability to distinguish between CBM produced water infiltration to the surficial aquifer and impacts from surface spills, well/pipeline leaks, or excursions from ISR operations to the surficial aquifer has not been demonstrated. **This is an open issue.**

NRC staff suggested that Uranerz establish the pre-operational water quality of the "G sand," " F sand" and alluvial surficial aquifers in the Nichols Ranch Unit license area or provide a methodology for obtaining this information.

Uranerz Response: WDEQ requires that CBM operators of these impoundments must put in monitoring wells if they can produce 0.5 gpm for 24 hours from the receiving aquifer. The southern portion surficial aquifer is the F sand and the northern portion is the G sand. Uranerz took a sample when discharge was occurring and it is high bicarbonate and high sodium – very different from the typical groundwater. Uranerz is also collecting samples from surficial aquifer. Uranerz will address the open issue.

Section 2.6 – Background Radiological Characteristics

2.6.1 Uranerz did not collect air particulate samples as recommended in Regulatory Guide 4.14 because no uranium particles are expected to be generated in an ISR. Uranerz did not address the radon progeny particulates that are generated as radon decays. Emanation of radon and progeny undergoes diurnal and seasonal variations. Collecting the air particulate samples at the same location as the radon samples allows for evaluating the correlation between radon and its progeny. Therefore, pre-operational air particulate results may not accurately reflect site-specific conditions. **This is an open issue.**

Uranerz Response: Uranerz is in the process of collecting air particulate data – four stations at each site.

2.6.2 Uranerz did not describe the analytical methodology and the lower limit of detection used to quantify concentrations of radionuclides in soil and sediment samples. **This is an open issue.**

Uranerz Response: Uranerz will include the analytical method in the tables in the application.

2.6.3 Baseline surface water samples were not collected and analyzed for U, Ra-226, Pb-210, Th-230. **This is an open issue.**

Uranerz will address the open issue.

Section 3.1 – ISR Leaching Process and Equipment

3.1.1 NRC staff notes that screw and glue joints have experienced many failures in ISR operations. Uranerz did not describe how the casing would be joined in the well completions. **This is an open issue**.

Uranerz Response: Joints are O-ring locking system not screw and glue. Uranerz will address the open issue.

3.1.2 Uranerz stated that during wellfield operations, injection pressures at the wellheads would not exceed 90 percent of the mechanical integrity test (MIT) pressure. Uranerz, however, did not provide the MIT pressure value or a fracture gradient for the Nichols Ranch Unit or the Hank Unit. NRC staff cannot evaluate if the fracture gradient will be exceeded. **This is an open issue.**

Uranerz Response: Uranerz will address the open issue.

3.1.3 Uranerz stated that injection wells may be equipped with downhole spargers with oxygen being metered through individual rotometers or an oxygen manifold will be installed. Uranerz did not describe downhole spargers to enable NRC staff to evaluate their operation. **This is an open issue.**

Uranerz Response: Uranerz will address the open issue.

3.1.4 Uranerz provided a plant material balance in Figure 3-6 and a typical plant water balance in Figure 3-7. The figures show that all liquid waste will be sent to two deep disposal wells during production and restoration operations. No storage or evaporation ponds will be constructed for disposal. Uranerz also provided predictions of waste volumes to be sent to each disposal well for each unit for the production, production and restoration, and restoration only phases. These calculations showed that with a capacity of 100 gpm for each disposal well, restoration and production operations would bring each unit close to the maximum with little extra capacity (e.g. 1 gpm available). In RAIs to Uranerz, NRC staff questioned this lack of sufficient extra capacity in each disposal well, especially if a disposal well became inoperable. Uranerz stated that if either disposal well becomes inoperable, each unit will have a surge capacity to maintain the water balance. At Nichols Ranch Unit this surge capacity will come from four large tanks with a capacity of 17,000 gallons each. At a rate of 42 gpm this will provide 24 hours of capacity. At Hank Unit, there will be six large tanks with a capacity of 17,000 gallons each. At a fill rate of 77 gpm, this will allow for 22 hours of capacity. To manage surge capacity, Uranerz stated it could rent large capacity bladder tanks for more capacity; it could haul solution over to the other unit; or it could reduce production flow rates to minimize waste tank fill rate. Uranerz has not demonstrated an adequate plan or methodology to maintain wellfield bleed rates, given the possibility that either or both disposal wells may become inoperable or have reduced capacity for more than 22 or 24 hours. **This is an open issue**.

Uranerz Response: Uranerz did analysis of how long it would take to repair a deep disposal well and indicated a likely scenario would be they could be operable in 7 days. Common down time would be 3 to 5 days for a deep disposal well.

NRC and Uranerz staff discussed the possibility of a commitment by Uranerz to installing and maintaining two deep disposal wells during operations and a methodology for handling the loss of one deep disposal well during operations. NRC staff indicated the primary concern is that Uranerz needs to demonstrate the ability to handle the water in case of an emergency and to maintain well field control at all times.

3.1.5 NRC staff reviewed the "reversal of gradient analysis" for the "F sand" unconfined aquifer for the Hank Unit. The simulations only use extraction wells at low bleed rates to represent consumptive use. The simulations do not account for the fact that during operation the extraction wells will create dewatered cones and the injection wells will create groundwater mounds that will affect the gradient reversals calculated by Uranerz. NRC staff suggests Uranerz could revise the simulations and include extraction and injection wells operating at true rates to show that the gradient reversal will still be adequate. **This is an open issue**.

Uranerz Response: Questioned whether or not the bleed rate was adequate.

NRC staff indicated the concern that the flow system in an unconfined system is very different from a confined system and this has not been adequately analyzed.

3.1.6 The gradient reversal simulations at the Hank Unit "F sand" only report the difference in head between two nodes and not the actual drawdown in the aquifer. It is possible that when true extraction rates (3% bleed) are applied over the unconfined aquifer in this area it may create excessive dewatering at the extraction wells. Consequently, this dewatering may become prohibitive if the entire side of a well field is converted to extraction only to capture an excursion. Uranerz has not demonstrated that these rates can be maintained. **This is an open issue**.

Uranerz Response: Uranerz will address the open issue.

3.1.7 Uranerz concluded the simulations provide evidence that Uranerz can maintain a cone of depression for expected production and restoration operations in the unconfined "F sand" aquifer. However, as noted above, substantial dewatering can occur at extraction wells in an unconfined aquifer as the water is produced by actual dewatering of the sediments. In the results from Uranerz' multi-well pumping test at URHZF-5, Uranerz reported a drawdown of about 40 feet after a 5 day pumping test at 4 gpm. If the saturated thickness above the ore zone averages 50 feet as reported by Uranerz, this drawdown would reduce the available drawdown to 10 feet of head at the extraction well. If more wells are operating, such as in the case of capturing an excursion, the dewatering will be even more severe. Lowering the water level near the well can also impact submersible pump performance, as such pumps require a certain head to operate efficiently. NRC staff, therefore, notes dewatering of wells in the unconfined aquifer will limit the flexibility in the extraction rates which can be used at Hank Unit. These limits may pose a problem if an excursion of lixiviant from a wellfield occurs. Uranerz needs to demonstrate an excursion capture stategy at the Hank Unit which will not cause excessive dewatering. **This is an open issue**.

Uranerz Response: Uranerz will address the open issue.

3.1.8 Uranerz stated that the groundwater simulation showed that the gradient reversal would reach the monitoring well ring which is located 500 feet away with wells 500 feet apart in

the Hank Unit. NRC staff notes that this simulation only demonstrates that the gradient would reach the monitoring well ring. It does not demonstrate that the monitoring wells would detect an excursion. In addition, in an unconfined aquifer like the "F sand" a monitoring well sample only intercepts a small amount of water near the well because it is delivered to the well by draining the sediments. It is, therefore, possible that an excursion could slip in between the monitoring wells. Uranerz needs to demonstrate how the monitoring well ring will intercept an excursion to support the 500 foot spacing. **This is an open issue.**

Uranerz Response: That would take a long time to demonstrate.

3.1.9 NRC staff notes that the steep drawdown and limited areal extent of drawdown created by pumping in the unconfined "F sand" aquifer will require an unique pumping test strategy to ensure the wellfield is in communication with the monitoring well ring. Therefore it may take many pumping tests perhaps operating simultaneously to demonstrate hydraulic communication between the monitor ring and production zone in each of the wellfields. These tests will need to be conducted when the wellfields are installed as part of the hydrologic data collection for each wellfield. In a response to an NRC RAI, Uranerz indicated that it would take at least three pumping tests to establish communication with observation wells 1000 feet distant. NRC staff notes that an almost five day multi-well pumping test conducted by Uranerz at URZHF-5 at 4 gpm in the Hank Unit did not create a response at observation wells located 500 and 1000 feet distant. Therefore, it is likely that pumping wells and observation wells will probably need to be much closer in the "F sand" to demonstrate communication. Uranerz has not provided a pumping test strategy which will show this communication. **This is an open issue**.

Uranerz Response: Uranerz is proposing to use 4 - 5 F sand wells at the same to pump to define the continuity of the drawdown of the monitoring well ring and also the ability to confine the fluids.

3.1.10 Based on the unconfined nature of the "F sand," NRC is concerned that dissolved oxygen or hydrogen peroxide in lixiviant at Hank Unit could lead to a free gas phase which can create "gas lock." This could reduce conductivity and affect the flow system in the "F sand" aquifer such that excursions would increase and contact within the ore zone during restoration could be impacted. The presence of a free oxygen gas phase could also damage wells, piping and pumps and interfere with instrumentation such as flow and pressure measurements. Uranerz did not address the potential for the "gas lock" problem at the Hank Unit and how it would identify, monitor, and correct this problem. Uranerz needs to address this issue with respect to dissolved oxygen use. **This is an open issue.**

Uranerz Response: Uranerz will not use hydrogen peroxide at the Hank Unit.

NRC staff noted, however, they did not discuss or describe how they would prevent, identify or correct the problem of free phase gas dissolving out of either use of dissolved oxygen or hydrogen peroxide at the Hank Unit.

3.1.11 Uranerz did not explain the duration of restoration for the production areas, which ranged from one year to five years. In particular, if restoration is going to take longer than 2 years, an explanation and alternate schedule should be provided. **This an open issue**.

Uranerz Response: Uranerz will address this open issue.

Section 3.2 - Recovery Plant, Satellite Facility, and Well Fields

3.2.1 Uranerz has included a list of chemicals that may be used in the uranium recovery process. These include hydrochloric acid, hydrogen, peroxide, sodium chloride, sodium hydroxide, sodium hypochlorite, ammonia, oxygen, carbon dioxide, sodium carbonate, and sodium bicarbonate. Hazardous chemicals that have the potential to impact radiological safety, are ammonia, hydrogen peroxide, and hydrochloric acid, and would be stored outside and segregated from areas where licensed materials are processed and stored. Uranerz indicates that for these hazardous chemicals, it will comply with the Environmental Protection Agency's risk management program regulations. The chemicals proposed for use are similar to those discussed in NUREG-6733, Chapter 4, Consequence Analyses. NUREG-6733, Table 1, presents a list of chemicals and pertinent regulation for the chemical used at ISR facilities (NRC, 2001). Uranerz has not listed the specific regulations that would apply to chemicals used. (NUREG – 3.2.3 (6). **This is a confirmatory item.**

Uranerz Response: Uranerz will address this confirmatory issue.

Section 3.3 - Instrumentation and Control

3.3.1 Uranerz has provided information in the application on proposed instrumentation, but at this point has not provided specific details of the final selected equipment. NRC staff notes that final selected control equipment may have to be reviewed and inspected prior to facility operation to ensure compliance with 10 CFR 40.32(c). **This is a confirmatory item.**

Uranerz Response: Uranerz will address this confirmatory issue.

Section 4.1 – Gaseous and Airborne Particulates

4.1.1 Uranerz has not provided information regarding how it plans to meet the requirement in 10 CFR 40.65 for reporting the quantity of each of the principal radionuclides released to unrestricted areas in gaseous effluents. 10 CFR 40, Appendix A, Criterion 8 states that milling operations must be conducted so that all airborne effluent releases are reduced to levels as low as is reasonably achievable (ALARA). The primary means of accomplishing this is by emission controls. Uranerz stated that the ventilation system will exhaust air from within the plant to outside the building but has not demonstrated how the gaseous effluents will be monitored and meet 10 CFR 40, Appendix A, Criterion 8. **This is an open issue.**

Uranerz Response: Uranerz discussed a diagram of the vacuum dryer system. Air comes in and goes into a baghouse and particulates drop. Uranerz discussed that the regulation does not require monitoring at a point of release, but requires a

documentation of effluents. Uranerz proposed a series of grab samples for monitoring. Section 5 of the application discusses the monitoring and locations of particulate samplers and one would be in the dryer room. Uranerz will address this open issue.

4.1.2 Uranerz stated that the principal particulate radiological effluent is uranium and daughters released from the drying and packaging of yellowcake. Uranerz did not discuss radon progeny in potential effluent discharges containing particulates. While radon is a gas, its progeny are particulates that have not been discussed by Uranerz in the application. Uranerz should discuss particulates derived from radon progeny and how they will be sampled or accounted for in its effluent discharges. **This is an open issue.**

4.1.3 Uranerz stated that during routine operations, the air pressure differential gauges for other emission control equipment is observed and documented at least once per shift during dryer operations. 10 CFR 40, Appendix A, Criterion 8 states that checks must be made and logged hourly of all parameters (e.g., differential pressures and scrubber water flow rates) that determine the efficiency of yellowcake stack emission control equipment operations. The Uranerz procedure does not appear to meet 10 CFR 40, Appendix A, Criterion 8. **This is an open issue.**

4.1.4 Uranerz does not plan to collect effluent or grab samples to validate that the vacuum dryer and ventilation systems prevent buildup of radon in buildings or prevent the release of airborne particulates. Uranerz should justify the lack of sampling and explain how it intends to demonstrate compliance with 10 CFR 20.1101(d), 10 CFR 20.1301, and 10 CFR 20.1302. **This is an open issue.**

Uranerz will address the open issues related to Gaseous and Airborne Particulates.

Section 4.2 – Liquids and Solids

4.2.1 Uranerz has not demonstrated that the deep well liquid waste disposal method and facilities proposed are adequate to handle production and restoration efforts. See earlier discussion. **This is an open issue.**

Uranerz will address this open issue.

4.2.2 Uranerz will need to demonstrate UIC approval from WDEQ of the deep well injection wells and plans prior to operations. **This is an open issue.**

Uranerz will address this open issue.

4.2.3 The plants at both units will have a concrete foundation with concrete curbed side walls. The height of the concrete sides would be such that the curbed foundation would contain the volume of the largest tank in the unit. Based on a recent accident at another ISR facility, the plans to contain only the volume of the largest tank may not be sufficient. **This is an open issue.**

Uranerz Response: Uranerz requested guidance on how many tanks it needs to consider. It usually uses 110% of the largest tank.

NRC staff stated that there are other engineering issues that could be considered and proposed to contain larger spills.

4.2.4 Uranerz has committed to notifying NRC within 7 days if any disposal agreement is terminated, and submitting within 90 days of agreement termination, a new agreement for NRC approval. Prior to operation, Uranerz will need to provide the details of a waste disposal agreement for 11e.(2) byproduct material disposal at an NRC or Agreement State licensed facility. **This is a confirmatory item.**

Uranerz will address this confirmatory item.

4.2.5 In the application, it was unclear if Uranerz will temporarily store contaminated 11e.(2) solid waste. If there are temporary waste sites, Uranerz needs to discuss what controls will be required. **This is a confirmatory item.**

NRC staff asked Uranerz if it has a location outside of the fenced plant area for storage of equipment or waste such as a lay down area. If so, will there be restrictions?

Uranerz Response: All storage of equipment, including wastes, would be in the fenced in area. In the wellfields outside the plant areas there would be some temporary storage of well equipment, such as casing.

Section 5.7.1 - Effluent Control Techniques

5.7.1.1 The staff cannot determine if the ventilation process is adequate to ensure that radon daughter concentrations in the facility are maintained below 25% of the derived air concentration (DAC) from 10 CFR 20, and if controls will ensure all airborne releases are ALARA consistent with 10 CFR 40, Appendix A, Criterion 8. **This is an open issue.**

5.7.1.2 The staff cannot determine if the operational monitoring program required in 10 CFR 40, Appendix A, Criterion 7 includes sampling that effectively evaluates the performance of control systems, procedures and environmental impacts of operations. In addition, Uranerz must identify if the areas affected by effluent controls are restricted or unrestricted areas to ensure compliance with 10 CFR 20.1101. **This is an open issue.**

Uranerz Response: Both issues in this section were discussed earlier and they will address these open issues.

Section 5.7.2 - External Radiation Exposure Monitoring Program

5.7.2.1 Uranerz stated that survey instrumentation will cover a range of 0.010 mrem/hr to 5 mrem/hr. However, Uranerz has not discussed whether it will have sufficient instrumentation to measure gamma dose rates in excess of 5 mrem per hour. 10 CFR 20.1501(a)(2)(i) states that the licensee shall make or cause to be made surveys that are reasonable under the circumstances to evaluate the magnitude and extent of radiation levels. Uranerz has not shown that it will have sufficient instrumentation to evaluate the magnitude and extent of radiation levels. **This is an open issue.**

Uranerz will address this open issue.

5.7.2.2 Regulatory Guide 8.30 recommends that, in addition to gamma surveys, beta surveys of specific operations that involve direct handling of large quantities of aged yellowcake be performed to ensure that extremity and skin exposures are not unduly high. Uranerz did not discuss beta surveys nor provide information on the lower limits of detection on the beta and gamma radiation survey instruments. Uranerz did not indicate in the application that beta surveys will be performed and if the monitoring equipment has a lower limit of detection that allows measurement of 10% of the applicable limits. **This is an open issue.**

Uranerz indicated it will have beta equipment at the site and will address this open issue.

5.7.2.3 Uranerz has not discussed records and reporting requirements associated with the external radiation exposure monitoring program. Uranerz should provide a description of how its external radiation exposure monitoring program will meet the requirements of 10 CFR 20, Subpart L, which specifies record keeping requirements and 10 CFR 20, Subpart M, which defines reporting requirements. **This is an open issue.**

Uranerz will address this open issue.

The following item was not discussed in the meeting with Uranerz, but provides additional information on ALARA requirements in Section 5.7.2.

5.7.2.4 Uranerz described the ALARA policy and management's commitment to ALARA in Section 5.1.1. However, Uranerz does not describe how emission controls will be implemented on ventilation systems to ensure airborne effluent releases of radon and radon progeny from the liquid phases of the ISR processes will be reduced to ALARA.

5.7.2.5 Uranerz does not describe how the operational effluent and environmental monitoring programs will include sampling that will detect possible long-term effects and evaluate performance of control systems, procedures, and environmental impacts of operations as required by 10 CFR 40, Appendix A, Criterion 7 and 8.

Section 5.7.3 - Airborne Radiation Monitoring Program

5.7.3.1 Uranerz indicated that measurement of airborne uranium will be performed by gross alpha counting of the air filters for uranium air particulates. Uranerz has not provided justification that the air filters will contain only uranium or explained how it will evaluate a mixture of radionuclides including uranium and its progeny, Th-234 and Pa-234. Gross alpha counting of the air filters will not be able to differentiate specific radionuclides. Thus, Uranerz may not be able to accurately determine if the action level for uranium or its progeny has been reached by relying on gross alpha counting of the air filters. **This is an open issue.**

Uranerz will address this open issue.

Section 5.7.4 - Exposure Calculations

5.7.4.1 The staff commented in the RAI that it could not determine how Uranerz derived the basis for the "D" solubility class for natural uranium. In the response to the RAI, Uranerz cites a journal article by Metzger et al. (1997) to support its use of "D" solubility class and

states the revised Chapter 5 cites Regulatory Guide 8.30 as a reference for the basis. Uranerz' response and revision does not demonstrate that calculations will comply with 10 CFR 20.

Regulatory Guide 8.30 does not provide specific guidance on which inhalation class should be applied to uranium recovery operations, other than to consider yellowcake "soluble" if dried at low temperatures. This terminology does not comport with the current regulatory basis of 10 CFR 20, Appendix B, which uses a three-tiered system of inhalation classes; D, W, and Y. Furthermore, the regulations do not specifically address the carbonate and peroxide forms of uranium that are relevant to the ISR operations. Additionally, Metzger et al. concludes that the airborne concentrations of uranium in the wet process and drum loading area where uranyl peroxide is the primary chemical form of uranium will be considered 97% class D and 3% Class W.

10 CFR 20.1204c(3) states that when specific information on the physical and biochemical properties of the radionuclides is known, the licensee may assess the contribution of fractional intakes of Class D, W, or Y compounds from 10 CFR 20, Appendix B to the committed effective dose equivalent. 10 CFR 20.1204(e) states that if the concentration of each radionuclide in a mixture are known, the fraction of the DAC used in calculating DAC-hours must be either: (1) the sum of the ratios of the concentration to the appropriate DAC value, or (2) the ratio of the total concentration to the most restrictive DAC value for any radionuclide in the mixture. However, Uranerz does not know the concentration or the chemical components of the uranium compounds in the ISR process. Uranerz has not demonstrated how exposures will be calculated. **This is an open issue.**

Uranerz responded that in standard industry practice the uranium DAC is limiting. Uranerz will address this open issue.

5.7.4.2 Uranerz did not account for the possibility of other radionuclides that may be present in air. According to 10 CFR 20.1204(f), if the identity of each radionuclide in a mixture is known, but the concentration of one or more of the radionuclides in the mixture is not known, the DAC for the mixture must be the most restrictive DAC of any radionuclide in the mixture. Uranerz needs to identify all radionuclides and concentrations that may exist in air and determine the dose from this mixture. **This is an open issue.**

Uranerz will address this open issue.

5.7.4.3 10 CFR 20.1201(e) states that in addition to the annual dose limits, the licensee shall limit the soluble uranium intake by an individual to 10 milligrams per week in consideration of chemical toxicity. Uranerz has not described in this section how it will monitor and keep records of this requirement. **This is an open issue.**

Uranerz will address this open issue.

5.7.4.4 Uranerz states that any employee may request a written report of their exposure history at any time. These reports will be provided within 30 days of the request and will provide the information as discussed in 10 CFR 19.13. Uranerz does not identify any reporting requirements of reports to individuals exceeding dose limits as defined in 10 CFR 20.2005. **This is an open issue.**

Uranerz will address this open issue.

Section 5.7.5 - Bioassay Program

5.7.5.1 Uranerz has not demonstrated the technical basis for selecting the "D" solubility class for airborne uranium. NRC staff cannot determine if the proper classification and DAC is being used to show compliance with 10 CFR 20, Subpart C. **This is an open issue.**

Uranerz Response: Already discussed. Uranerz will address this open issue.

5.7.5.2 In addition to the dose limit, Uranerz is also required to limit the soluble uranium intake by an individual to 10 milligrams (mg) in a week in consideration of chemical toxicity. This requirement is defined in 10 CFR 20.1201(e). Uranerz did not discuss how it will limit the soluble uranium intake by an individual to 10 mg per week. **This is an open issue.**

Uranerz will address this open issue.

5.7.5.3 Uranerz needs to provide a technical basis for how the uptake will be converted to a dose as assigned to the individual in accordance with 10 CFR 20, Subpart C. **This is an open issue.**

Uranerz will address this open issue.

5.7.5.4 Uranerz does not indicate that it will obtain prior dose histories for all employees in accordance with 10 CFR 20.2104(a)(2) and (c). The prior dose history may be an NRC Form 4 (or equivalent) signed by the individual monitored, or a written statement that includes the names of all facilities that monitored the individual for occupational exposure to radiation during the current (or previous) year and an estimate of the dose received. **This is an open issue.**

Uranerz will address this open issue.

Section 5.7.6 - Contamination Control Program

5.7.6.1 Uranerz does not address conducting surface contamination surveys of unrestricted or clean areas of the facility. Frequent contamination surveys of work areas, restrooms, lunchrooms, hallways, etc., are needed to ensure contamination is controlled properly and that employees are following procedures and not transferring radioactivity in unrestricted areas. The staff cannot determine if surveys of unrestricted areas will be conducted. **This is an open issue.**

Uranerz Response: This was an oversight, but it will be addressed. Uranerz will address this open issue.

5.7.6.2 Surveys of controlled areas will be conducted monthly. Uranerz stated that the action level for surface contamination in these areas will be 1000 dpm/100 cm^2. This represents the contamination limits for natural uranium and progeny for equipment to be released for unrestricted use as defined in Table 2 of Regulatory Guide 8.30. However, the removable contamination limit for Ra-226 is 20 dpm/100 cm^2 according to Enclosure 2 to Policy and Guidance Directive 83-23. Uranerz has not demonstrated that it can

account for and detect Ra-226 as well as other naturally occurring daughter products that may be present as a result of the uranium recovery operations, such as Th-230. The staff cannot determine that Uranerz proposed program will be consistent with Enclosure 2 to Policy and Guidance Directive 83-23 nor that it will meet the requirements in 10 CFR 20 Subpart F. **This is an open issue.**

Uranerz Response: Uranerz will make a commitment to justify it and address this open issue.

Section 5.7.7 - Airborne Effluent and Environmental Monitoring Program

5.7.7.1 Regulatory Guide 8.37 states, "When practicable, releases of airborne radioactive effluents should be from monitored release points (e.g., monitored stacks, discharges, vents) to ensure that the magnitude of such effluents is known with a sufficient degree of confidence to estimate public exposure." Uranerz has not discussed how the effluent control techniques will ensure that the magnitude of such effluents is known with a sufficient degree of confidence to estimate public exposure. **This is an open issue.**

This issue was previously discussed and Uranerz will address this open issue.

5.7.7.2 Uranerz has not discussed how it will control the area between the points of release and the radon sampling stations to limit its access to members of the public and has not discussed how it will determine that doses to members of public in that area are in compliance with 10 CFR 20 Subpart D. **This is an open issue.**

Uranerz will address this open issue.

Section 5.7.8 - Ground and Surface Water Monitoring Programs

5.7.8.1 During baseline water quality monitoring, Uranerz stated the wells will be sampled for all of the water quality parameters in WDEQ Guideline 8 including uranium. If certain analytes are not detected in the first two samples, these elements may not be tested in the remaining samples. NRC staff notes there are several separate tables of analytes in WDEQ Guideline 8. Uranerz needs to reference the specific tables in Guideline 8 or provide the table of analytes to be evaluated in the application for NRC staff to determine if they are sufficient. **This is an open issue**.

Uranerz Response: Uranerz will address this open issue.

5.7.8.2 Uranerz did not provide the location of the screens in the production zone monitoring wells or the production zone ring monitoring wells that will be used for baseline water quality in either license area. Uranerz did not provide the location of the screens in the overlying and underlying monitoring wells in either license area. NRC staff needs this information to evaluate if the sampling will be representative. **This is an open issue.**

Uranerz Response: The monitoring well screens will cover the interval of the ore zone and it will use 20 feet screens. Uranerz will address this open issue.

5.7.8.3 NRC staff agrees with the strategy of consulting with regulators concerning placement of monitoring wells in areas where the sands are thin or absent to be acceptable in

either license area, but asks that Uranerz provide some mechanism for this approach. **This is a confirmatory item.**

Uranerz Response: Uranerz will address this confirmatory item.

5.7.8.4 Uranerz stated that the overlying and underlying aquifer wells will be sampled four times prior to wellfield operation, with a minimum of two weeks between samples. In the first and second sampling, the wells will be sampled for all of the water quality parameters provided in Table 5-1 of the application. The third and fourth samplings will be tested for parameters of chloride, total alkalinity and conductivity. NUREG-1569 Section 5.7.8.3 (1) states that at least four independent sets of samples should be collected, with adequate time between sets to represet any pre-operational temporal variations. Uranerz did not provide a technical basis for limiting the list of constituents to these three parameters in the third and fourth sampling events. **This is an open issue.**

Uranerz Response: Its experience has been that the first samples is to get a flavor of the water quality, then take the last two and do the excursion parameters.

NRC stated that these samples are needed to understand the baseline of overlying and underlying aquifers.

5.7.8.5 Uranerz did not propose monitoring well locations to establish baseline water quality in the surficial aquifers at either the Nichols Ranch Unit or the Hank Unit. NRC staff notes the surficial aquifer water quality may be impacted by spills, piping and casing leaks that routinely occur at ISR operations and potentially artificial connections between the surficial aquifer and other aquifers. Additionally, CBM produced water is and will continue to be discharged to surface impoundments which are designed to infiltrate into the surficial aquifer near the Nichols Ranch Unit and potentially the Hank Unit. This infiltration may impact the surficial aquifer water quality within the Nichols Ranch permit boundary over the lifetime of the operations and be mistaken as an impact from ISR operations. NRC staff is concerned that the lack of characterization of baseline water quality in the surficial aquifers of each license area before operations will hinder the ability of Uranerz to assess impacts to the surficial aquifer from ISR or CBM operations. **This is an open issue**.

This issue was previously discussed in another section.

5.7.8.6 The pumping test strategy to assess communication in the “F sand” unconfined aquifer at the Hank Unit is not sufficient. Uranerz needs to demonstrate that the monitoring well ring can detect an excursion. **This is an open issue.**

This issue was previously discussed in another section.

5.7.8.7 Uranerz indicated it will implement corrective actions once an excursion is verified. Corrective actions may include the suspension of lixiviant injection that will remain suspended until a declining trend in UCLs is established. Uranerz also stated that when a significant declining trend is established, normal injection and extraction operations will resume. The declining trend will be maintained until all excursion indicators are returned to values less than UCLs. NRC staff is unsure what Uranerz means by a “significant declining trend” to indicate an excursion has been corrected. **This is an open issue.**

Uranerz will address this open issue.

5.7.8.8 NRC staff is concerned that increased pumping of the unconfined aquifer at Hank Unit without injection to capture an excursion could lead to excessive dewatering which may interfere with excursion capture. **This is an open issue.**

Uranerz Response: Already discussed this issue.

5.7.8.9 Uranerz did not state that it will update its surety for cleanup of excursions which remain for more than 60 days as discussed in NUREG-1569. **This is an open issue.**

Uranerz Response: Uranerz will address this open issue.

5.7.8.10 In addition to wellfield monitoring, Uranerz stated that any private wells within one kilometer of the Nichols Ranch and Hank Units wellfield area boundaries will be sampled on a quarterly basis for natural uranium and radium-226. Uranerz did not identify these wells in the technical report. **This is an open issue**.

Uranerz Response: Uranerz has them on maps, but it needs to identify them.

5.7.8.11 Uranerz did not propose any surface water monitoring for either license area during operations. NRC staff notes that Cottonwood Creek in the license area is the receiving water body for almost all of the ephemeral drainages from the Nichols Ranch Unit. In addition, the surficial alluvial aquifer in the southern portion of the Nichols Ranch Unit discharges to Cottonwood Creek. At the Hank Unit, the Dry Willow Creek in the southern portion of the license area receives almost all the ephemeral drainage from the Hank Unit permit area. In addition, the surficial alluvium near Dry Willow Creek is sometimes saturated and thus hydraulically connected to the creek. There is a possibilty that Cottonwood Creek at Nichols Ranch Unit or Dry Willow Creek at the Hank Unit may, at some point during the life of the ISR, be impacted by ISR operations. Without surface water monitoring during operations, any impacts to these drainages will not be detected. **This is an open issue**

Uranerz will address this open issue.

Section 5.7.9 - Quality Assurance

5.7.9.1 Uranerz did not provide a comprehensive plan describing the Quality Assurance/Quality Control (QA/QC) procedures for all radiological, effluent and environmental monitoring which is in accordance with Regulatory Guide 4.14, “Radiological Effluent and Environmental Monitoring at Uranium Mills, Revision 1” and Regulatory Guide 4.15, “Quality Assurance for Radiological Monitoring Programs (Normal Operations)-Effluent Streams and the Environment” as noted in NUREG-1569 Section 5.7.9.3 (1). NRC staff requests that Uranerz provide a comprehensive plan addressing both radiological and non-radiological QA/QC in detail for review in the application or include a statement which commits it to submit this QA Plan to NRC for review and approval before operations will begin. **This is an open issue.**

Uranerz Response: Not totally clear what is needed. There are commitments in Section 5.7.9. of the application.

NRC indicated that Uranerz can provide a QA plan prior to licensing or it could become a condition of the license. Staff stated that Uranerz should ensure laboratory QA/QC procedures are addressed, both onsite and/or offsite laboratories. NRC does not have a standard format and content, but there is guidance in Regulatory Guides 4.14 and 4.15.

The following items in Section 5.7.9, Quality Assurance, were not discussed in detail during the meeting due to constraints in time. These items are included, as they have been noted as open issues by NRC staff reviewers.

5.7.9.2 Uranerz needs to clarify the QA organization and how these individuals are organizationally integrated with the Radiation Safety Officer. Uranerz needs to identify who has ultimate authority for the QA Program at the site. NRC staff cannot determine if the described QA-related organization and responsibilities are consistent with Regulatory Guide 4.15. **This is an open issue.**

5.7.9.3 Uranerz stated that personnel and training will be consistent with Regulatory Guide 4.15. However, Uranerz did not provide sufficient detail as to how the recommendations in Regulatory Guide 4.15 will be implemented. **This is an open issue.**

5.7.9.4 The measurement system was not described in sufficient detail to allow NRC staff to determine if the measurement system is consistent with Regulatory Guide 4.15. **This is an open issue.**

5.7.9.5 Uranerz did not provide field quality objectives for field and analytical methods that are industry standards and laboratory quality objectives that will include precision, bias, accuracy, representativeness, comparability, and sensitivity. **This is an open issue.**

5.7.9.6 Uranerz did not state that it will use a sampling process design that defines the sample locations and sampling frequency and determine the types of analyses that will be conducted on the samples collected from these locations. **This is an open issue.**

5.7.9.7 Uranerz did not state that it will ensure that field measurements and sample collections will follow procedures attached to nationally recognized consensus standards, such as EPA methods, ASTM, or instrument manufacturer recommended procedures. **This is an open issue.**

5.7.9.8 Uranerz did not state that it will include preparation and decontamination requirements for sampling equipment. **This is an open issue.**

5.7.9.9 Uranerz did not state that it will ensure laboratory requirements for subcontractor and site-owned laboratories will have a QA/QC program. **This is an open issue.**

5.7.9.10 Uranerz has not provided any information or discussed the routine QC checks for acceptable performances, such as background checks, reference checks, and the use of control charts to track trends. **This is an open issue.**

5.7.9.11 NRC staff cannot determine how data acquired through non-direct measurements will be incorporated into the QA/QC program including, for example, record keeping and verification and validation. **This is an open issue.**

5.7.9.12 Uranerz did not discuss verification and validation in the license application. **This is an open issue.**

5.7.9.13 Uranerz did not describe an assessment, audit, and surveillance program that will be implemented at the Nichols Ranch ISR Project facility. Although Uranerz stated that the QA program will be audited by qualified personnel, the application did not describe the qualifications of the auditors and it did not indicate that assessments, audits, and surveillances will be implemented for facility operations. **This is an open issue.**

5.7.9.14 Uranerz has not discussed or demonstrated a corrective action program at the site that integrates components of the QA program. **This is an open issue.**

Section 6.1 – Plans and Schedules for Groundwater Quality Restoration

6.1.2 Restoration Standards

6.1.2.1 Uranerz stated in the application the restored groundwater quality of the production areas will be consistent with the standards presented in NUREG-1569. NRC staff notes that these primary and secondary restoration standards are inconsistent with the restoration standards in 10 CFR Part 40, Appendix A, Criterion 5B(5). NRC has notified licensees and applicants in Regulatory Information Summary, RIS 09-05, dated April 29, 2009, that the restoration standards listed in NUREG-1569, Section 6.1.3 (4) are not consistent with those listed in 10 CFR Part 40, Appendix A. Uranerz must commit to achieve restoration standards in Appendix A, Criterion 5B(5). **This is an open issue.**

Uranerz will address this open issue.

6.1.3 Restoration Methods

6.1.3.1 Uranerz has agreed, in Section 6.1.3.3 of the application, to develop a comprehensive safety plan and implement it prior to using any reductant. In addition, Uranerz has also stated it may consider using a biological reduction method to achieve groundwater restoration. If Uranerz chooses to use a reduction method to achieve groundwater restoration targets, it should submit a detailed plan to NRC. Uranerz should commit to sending this plan to NRC for review and approval prior to reductant use. **This is a confirmatory item.**

Uranerz will address this confirmatory item..

6.1.4 Effectiveness of Groundwater Restoration Methods

6.1.4.1 In Section 6.2.8 of the application, Uranerz discusses the Bison Basin commercial facility and restoration. NRC staff is aware that this was a licensed facility but is unfamiliar with the details of this project. Uranerz should consider expanding its discussion of groundwater restoration and approval for this site for use as an analog. **This is a confirmatory item.**

Uranerz Response: Bison Basin had a pilot project and did restoration. It received a license and operated the first wellfield for approximately one year. When uranium prices dropped, it ceased operations. The project was abandoned and the state cashed

in the bond. Duke power stayed involved until decommissioning plan was finished and restored the site. This occurred in the 1982 timeframe. Restoration was completed in approximately 1986. Uranerz did not indicate it would make changes or update the application as many of the files are very old and not readily accessible.

6.1.4.2 Uranerz stated in Section 6.1.3.5 of the application that the restoration methods proposed for the Nichols Ranch Project have been successfully implemented at nearby ISR sites (within 56 km ((35 mi)) with similar hydrological characteristics as the Powder River Basin. The ISR sites identified included the Bison Basin ISR located in the Great Divide Basin of Wyoming, the COGEMA Christensen Ranch and Irigaray ISRs, Smith Ranch/Highlands ISR, Collins Draw Research and Development (R&D) Facility, Ruth R&D Facility, and the Reno Creek R&D Facility. Apart from the "similar formation" argument, Uranerz did not provide any additional details of how these sites are analogs for the proposed Nichols Ranch Project ISR. **This is an open issue.**

Uranerz Response: When the old Uranerz company licensed North Butte, Ruth was used as an analog and approved by NRC. It had previously provided hydrogeologic analog information and geologic correlations. Hank and Nichols are between North Butte and Ruth, and Christensen Ranch which is only 6 miles away. Uranerz may have trouble finding information because it may be old and unavailable.

NRC staff indicated that Uranerz should compare and discuss the hydrologic and geologic properties and note the similarities or differences between formations and not just rely on the comment that they are similar formations.

6.1.4.3 NRC staff notes there is very little field information available on the success of traditional restoration methods in the unconfined aquifer setting. The Reno Creek facility was operated by Rocky Mountain Energy Corporation in a location approximately 32 km (20 mi) to the east of the Nichols Ranch ISR Project. A portion of the project, known as Pattern 2, was located in an unconfined aquifer. Restoration of Pattern 2 demonstrated that all groundwater constituents, except uranium, were restored to levels below or within baseline ranges at the end of groundwater restoration. NRC staff notes that the Reno Creek operation was a demonstration project, which was subjected to only 10 weeks of injection and only 1 month of groundwater sweep for restoration. The reduced restoration operation may not represent the conditions that will exist at the Hank Unit after production. Apart from the unconfined aquifer similarity, Uranerz did not provide any additional discussion about why the Reno Creek R&D facility should be considered as an appropriate analog for the Hank Unit site. **This is an open issue.**

Uranerz Response: Hobson site in Texas may have done some restoration in an unconfined aquifer on a commercial scale. Uranerz will address this open issue.

6.1.4.4 Uranerz has not provided any additional information or discussion related to restoration issues that are specific to unconfined aquifers. These include: (i) an examination of dewatering/mounding characteristics of the aquifer through field testing and/or groundwater modeling to ensure operations can be maintained; (ii) the provision of a strategy that will ensure that restoration fluids will contact all parts of the ore zone in the unconfined aquifer; and (iii) evaluation of conductivity impairment in the ore zone due to "gas lock" from the evolution of dissolved oxygen in the lixiviant under low hydrostatic head conditions (see SER Section 3.1). **This is an open issue.**

Uranerz Response: Already discussed previously and Uranerz will address this open issue.

6.1.5 Pore Volume Estimates

6.1.5.1 Uranerz presented the method used to determine pore volume and the results for pore volume estimates in Section 6.2.8 of the application. Uranerz estimated the pore volume as the product of affected ore zone area, average well completed thickness, flare factor, and porosity. In an unconfined aquifer like the Hank Unit, there is significant dewatering and mounding, which creates vertical flow throughout the ore zone. It is therefore necessary to reconsider the definition of the thickness of the aquifer which should be used to determine the pore volume in an unconfined aquifer. **This is an open issue.**

Uranerz Response: Open interval will be about 10 feet. Uranerz would use that open interval plus the flare; however, it plans on doing some simulations. Uranerz will address this open issue.

6.1.5.2 Uranerz stated that the estimated number of pore volumes needed to restore the partial operating Production Area 1 in the first year at the site is seven. Uranerz cited several examples of nearby ISR facilities (Cogema, Bison Basin, and Reno Creek), where the pore volumes ranged from 6 to 18.4, as the basis for estimating seven pore volumes. However, Uranerz did not clearly explain (i) the relevancy of the analog sites to the Nichols Ranch Project and (ii) why seven pore volumes was an appropriate estimate for restoring the operating Production Area 1 in the first year of operation. **This is an open issue.**

Uranerz Response: Uranerz questioned how this would tie in to the other applicants because there seems to be a common value used. It indicated there might be some confusion with the 1-year interval used to estimate the surety bond calculation.

NRC staff indicated that other applicants did a thorough analog analysis to come up with a number to provide a technical basis. Staff indicated that Uranerz will also need to estimate the total number of pore volumes for restoration, not just those for the first year of operations.

6.1.5.3 Using a flare factor of 1.45 was based on Cogema's Irigaray/Christensen Ranch sites that used an overall flare factor of 1.44. Uranerz stated that Irigaray/Christensen Ranch sites are adjacent to the proposed site and operate in very similar formations and deposits. Uranerz provided no technical basis beyond the similar formation argument for the use of this flare factor. The use of this flare value for the unconfined aquifer conditions at the Hank Unit, however, has not been established. **This is an open issue**.

Uranerz will address this open issue.

6.1.6 Restoration Monitoring

6.1.6.1 Uranerz stated in Section 6.1.3.4 of the application that the monitoring wells (MR-Wells), overlying aquifer wells (MO-Wells), and underlying aquifer wells (MU-Wells) sampling frequencies will be changed from once every 2 weeks to once every 60 days during restoration. Uranerz stated in Section 6.1.3.4 that production wells (MP-wells) will be

monitored on a “frequent basis” to assess the progress and efficacy of restoration and to optimize the operation. Uranerz did not clearly state the frequency of monitoring or define “frequent basis” for the production wells (MP-wells). **This is an open issue.**

Uranerz will address this open issue.

6.1.6.2 The NRC staff checked the sufficiency of the 60-day sampling frequency for overlying and underlying monitoring wells. Uranerz estimated that if the groundwater moves at 0.00007 m/s (22 ft/year), the distance traveled in 60 days is 1.1 m (3.6 ft). NRC staff checked the calculation based on information given in Section 2.7.2.3 of the application (hydraulic gradient 0.003 ft/ft, effective porosity of 0.05, average hydraulic conductivity 0.000001 m/s ((0.5 ft/day)) and it appears to be correct. However, the monitoring well ring (MR wells) will be subjected to a different gradient because of operations in the ore zone, therefore Uranerz has not justified the 60-day period for MR wells based on this calculation. **This is an open issue.**

Uranerz will address this open issue.

6.1.7 Restoration Wastewater Disposal

6.1.7.1 Proposals for disposal of liquid waste from process water by injection in deep wells must meet the regulatory provisions in 10 CFR 20.2002 and demonstrate that doses are ALARA and within the dose limits in 10 CFR 20.1301. Uranerz has not provided a description of the waste, the conditions of waste disposal, the location of potentially affected facilities, and an analysis and procedures to ensure that doses are ALARA and within the dose limits of 10 CFR 20.1301. **This is an open issue.**

Uranerz will address this open issue

6.1.7.2 In its response to NRC’s RAI, Uranerz estimated the waste water flow to be sent to the deep disposal well during restoration will be 50 gpm for the Nichols Ranch Unit and at least 22 gpm for the Hank Unit. These estimates do not match the flow rates given in Section 3.2.6 of the application, which are 90 gpm for both units during restoration. Uranerz needs to confirm which values are correct. **This is a confirmatory item.**

Uranerz Response: Already discussed in previous section and Uranerz will address this open issue.

6.1.7.3 The remaining deep disposal well capacity balance for both units is 8 gpm. If a deep disposal well becomes inoperable or loses capacity, Uranerz has stated it will use four large tanks with a capacity of over 17,000 gallons each at Nichols Ranch, and six large tanks with a capacity of over 17,000 gallons each at Hanks Unit for surge capacity. The surge capacity is only 24 hours for the former and 22 hours for the latter. Uranerz needs to demonstrate a clear contingency plan for restoration fluid disposal and safety margin in case of deep disposal well malfunction so that hydraulic control of the well field can be maintained. **This is an open issue.**

Uranerz Response: Already discussed in previous section and Uranerz will address this open issue.

6.1.8 Restoration Stability Monitoring

6.1.8.1 Uranerz proposed, in Section 6.1.4, to use averages of target parameter concentrations to demonstrate restoration is complete. However, Uranerz did not address or provide a methodology how to evaluate areas with higher concentrations (i.e., "hot spots") if they occur in a set of data used to show restoration is complete. These "hot spots" can act as point sources of contamination and may require specific attention if they remain. **This is an open issue.**

Uranerz Response: From an operational standpoint, we see these hotspots so we can adjust the flows to address these areas. They understand the question will address this open issue.

6.1.8.2 The monitoring duration should be extended to 4 sampling events on a quarter-year basis rather than 3 events spaced two months apart (6 months). **This is an open issue.**

Uranerz will address this open issue.

6.1.10 Restoration Schedule

6.1.10.1 A preliminary wellfield restoration schedule was provided in Table 7-5 of the application. Uranerz reported it will take approximately three years to restore Nichols Ranch Area #1, one year to restore Nichols Ranch Area #2, five years to restore Hank Area #1, and one year to restore Hank Area #2. For wellfield restoration schedules expected to take longer than two years, justification is required as per 10 CFR 40.42. **This is an open issue.**

Uranerz will address this open issue.

Section 6.2 - Plans and Schedules - Reclaiming Disturbed Lands

6.2.1 Prior to operation, Uranerz will need to provide the details of a waste disposal agreement for 11e.(2) See Section 4.2 for discussion of this open issue. **This is an open issue.**

This issue has been previously discussed and Uranerz will address.

Section 6.3 – Process for Removing and Disposing of Structures and Equipment

6.3.1 Prior to operation, Uranerz will need to provide the details of a waste disposal agreement for 11e.(2) See Section 4.2 for discussion of this open issue. **This is an open issue.**

This issue has been previously discussed and Uranerz will address.

Section 6.4 - Post Reclamation and Decommissioning Radiation Surveys

Uranerz committed to develop cleanup criteria for uranium in soil based on the radium benchmark dose approach of 10 CFR Part 40, Appendix A, Criterion 6(6). Uranerz also

stated that the cleanup criteria for Th-230 in soil will be that concentration which, when combined with the residual concentration of Ra-226, will satisfy the radium cleanup standard. Uranerz has not described the survey methodology to be used in the decommissioning plan nor has provided assurance that the survey method for verification of soil cleanup is designed to provide 95% assurance that the soil units meet the cleanup guidelines. Because the surety agreement requires quantification of the costs of reclamation and decommissioning, a description of the survey methodology is needed to comply with 10 CFR 40, Appendix A, Criterion 9. **This is an open issue.**

Uranerz will address this issue.

Section 6.5 – Financial Assurance

Uranerz has established a financial assurance cost estimate that will need to be updated based on the requirements in 10 CFR Part 40, Appendix A, Criterion 9, prior to operations. Updates will need to incorporate other requirements such as updated pore volumes estimates and flare factors. **This is a confirmatory item.**

Uranerz will address this confirmatory item.

Section 7.0 – Accidents

7.0.1 The plants at both units will have a concrete foundation with concrete curbed side walls. The height of the concrete sides would be such that the curbed foundation would contain the volume of the largest tank in the unit. Uranerz has not discussed contingency plans for a failure of a larger spill related to multiple tank failure or an in plant pipe or joint failure releasing a volume larger than the largest tank. **This is an open issue.**

This issue has been raised in a previous section and Uranerz will address this issue.

7.0.2 The Effects of Accident in Section 7.5 does not mention reporting requirement of accidents. Uranerz accident response program and reporting must be consistent with 20.2202 and 20.2203 and NUREG -1569, 7.5.3 (4). **This is an open issue.**

Uranerz will address this issue.

The following open issues were not discussed during the meeting but are included as open/confirmatory issues that need to be addressed by Uranerz.

7.0.3 Uranerz states in Section 7.5 of the application that if the amount and/or concentration of the process fluid lost in a pipeline failure constitutes an environmental concern, the affected area would have the contaminated soil surveyed and removed for disposal according to NRC and State regulations. Uranerz has not defined how large a spill, at what concentration, or combination of both factors, would constitute an environmental concern. **This is an open issue.**

7.0.4 Section 7.5 in the application discusses the risk of fire and dispersal of yellowcake due to a propane explosion. It is not clear in Section 7.5 of the application where propane

will be stored and if it will be away from the dried yellowcake containment building to minimize the risk of yellowcake dispersal. **This is a confirmatory item.**

7.0.5 Uranerz discussed the possibility of fire and explosion from propane and oxygen. Uranerz did not discuss coordination or training of local fire departments and ambulance on responding to a fire or injury at its facility. Uranerz should commit to contacting and training local responders to the hazards at the facility. **This is a confirmatory item.**

PUBLIC DISCUSSION:

A question was asked if the specific issues raised by NRC staff to Uranerz staff would be available to the public.

NRC staff indicated that the meeting summary would contain the details of the issues discussed.

A question was asked if the NRC should have accepted the application based on the number of outstanding issues.

NRC staff indicated that most of the issues could not have been determined in the acceptance review, but were a result of detailed review of the application.

ACTION ITEMS:

NRC will provide a detailed meeting summary of the issues discussed.

The meeting and teleconference ended at approximately 4:00 p.m. eastern time.

ATTACHMENTS: Attendee List
Meeting Agenda

MEETING ATTENDEES

Topic: Discuss Uranerz Energy Corporation's Nichols Ranch ISR Project License Application and open issues related to the draft Safety Evaluation Report.

Date: August 27, 2009

NAME	AFFILIATION	PHONE NUMBER	E-MAIL
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* Attended by telephone			

Attachment 1

MEETING AGENDA
Uranerz Energy Corp.
August 27, 2009

MEETING PURPOSE: Meeting and Teleconference to Discuss Uranerz Energy Corporation's Source Material License Application and Open/Confirmatory Issues Related to NRC's License Review.

MEETING PROCESS:

Time	Topic	Lead
10:00 a.m.	Introductions	All
	Discussion of Hydrology Issues	All
12:00 noon	Lunch (on your own)	
1:00 p.m.	Continuation of Hydrology Issues (if needed)	All
	Discussion of Health Physics Issues	All
3:00 p.m.	Discussion of Additional Issues	All
	Summary of Action Items	Moderator
	Public Comment/Questions	Moderator
4:00 p.m.	Adjourn	

Attachment 2