



In-Situ Recovery Licensing Process

Daniel M. Gillen
Uranium Recovery Licensing Branch
U.S. Nuclear Regulatory Commission



The Issue

- Increased number and variety of ISR applications for new facilities, restarts, and expansions
- Need to establish procedures regarding separate licenses vs. amendment of existing licenses for variety of application scenarios



Background/Past Practice

- NRC process generally requiring separate licenses for individual fuel cycle facilities; Typically, new facility=new license
- Changes to facilities approved by amending licenses
 - New tailings cell at a conventional mill
 - New evaporation pond at an ISR
 - Process changes; monitoring changes
- Some proposed licensing actions raise question of amendment or new license

Related Definitions

- **Well Field** – An area within a mine unit from which source material is extracted by ISR operations, and which includes injection, production, and monitoring wells
- **Ion Exchange (IX) Plant** – A process building at an ISR Facility in which lixiviant from the production wells is run through ion exchange columns where resin beads selectively remove the uranium from the solution
- **Central Processing Plant (CPP)** – A process building at an ISR Facility in which the end product is yellowcake, produced as a slurry or a dried powder

Definitions (continued)

- **ISR Facility** – An operation that includes one or more well fields, and either an IX Plant or a CPP
 - **ISR/resin** - An operation with one or more well fields and only an IX Plant
 - **ISR/yellowcake** - An operation with one or more well fields and a CPP
- **ISR Satellite** – An ISR/resin that transports its loaded resin to a CPP operated by the same company/licensee; The ISR/resin is a “satellite” of the CPP.



Background/Past Practice (continued)

- Unique nature of ISR uranium operations
- Example-licensing ISR/resin satellite facilities
 - Historically, NRC amended the associated existing ISR/yellowcake license
 - Most cases, satellite facility near the existing licensed facility, thus considered an extension of existing operation
 - Case where proposed satellite remote from the licensed ISR/yellowcake has raised amendment vs. new license question



Other Scenarios

- NRC received inquiries from companies considering other ISR facilities deviating from typical ISR/yellowcake
 - Stand-alone ISR/resin facilities
 - CPPs without well fields
 - Additional CPP at satellite ISRs
- Other scenarios possible
 - Add second CPP
 - ?



Proposed Process – Primary-Site Amendments

- All additions or enhancements to a licensed uranium recovery facility at the primary site of the facility can be approved through an amendment to the license
 - Creation of multiple uranium recovery licenses at a single uranium recovery site not an efficient use of NRC resources
 - Allows amendment to the existing license for a request for an additional CPP at a facility that already has a CPP
 - Allows typical more minor amendments (add evaporation pond, modify process or monitoring program, etc) as in past



Proposed Process – Multiple-Site Amendments

- Certain facility additions not located at the primary licensed site can be approved through amendment
 - Need to show a **“strong connection”** to the primary facility
 - Facilities being of same type and ownership is not sufficient reason to meet strong connection requirement
 - Therefore, cannot use a single license (and single annual fee) to cover operationally or hydro-geologically separate facilities



Strong Connection

- Strong Connection requirement can be met in two ways
 - Operational Connection – Proposed addition of new ISR/resin facility that will ship resin to same entity's existing licensed CPP for further processing (satellite facility)
 - Hydro-Geologic Connection – Proposed addition of new ISR/resin facility and well fields having ore zone stratigraphy, hydro-geologic containment, and external influencing factors similar to the existing facility
- Meeting either of these conditions allows multiple ISR operations at separate locations under a single license
- Applies only to facilities totally in Non-Agreement States

Hydro-Geologic Connection

- Compare the degree of similarity or difference between the proposed new site/wellfield(s) and the site/wellfield(s) under the existing license using eight factors significant to well field performance characteristics
 - Natural system factors
 - Regional structural setting
 - Regional stratigraphy and hydrogeology
 - Ore zone stratigraphy and lithology
 - Confining unit stratigraphy, continuity, permeability
 - Faults and structures that could affect groundwater flow
 - Human disruptive factors
 - Impacts from uranium mining on hydrogeology
 - Impacts from other natural resources extraction (coal bed methane withdrawal) on hydrogeology
 - Impacts from abandoned drill holes
- For a “strong hydro-geologic connection,” none of the evaluation factors should be identified as different



Proposed Process – Separate Licenses

- If none of conditions allowing license amendments can be met, proposed action would require separate license
- Therefore, a separate license would be needed for:
 - Constructing an unattached ISR/resin facility whose loaded resin is taken to another company's facility with a CPP for processing
 - Constructing a stand-alone CPP without well fields that receives and processes resin from off-site ISRs
 - Creating a stand-alone facility by adding a CPP to a satellite ISR/resin



Table of ISR licensing action scenarios and corresponding process requirements

ISR-RELATED APPLICATION	LICENSING PROCESS	ENVIRON PROCESS
New applicant or existing licensee proposes a new ISR/yellowcake	License	Complex EA*
New applicant proposes a new ISR/resin, resin shipped to separate business entity's CPP	License	Complex EA*
Existing ISR/resin licensee proposes an additional ISR/resin w/ no strong connection	License	Complex EA*
Existing ISR/resin licensee proposes an additional ISR/resin close by with strong hydro/geo connection	Amendment	EA
Existing Licensee proposes satellite, i.e., remote ISR/resin w/ resin shipped to its licensed existing CPP (strong business connection)	Amendment	EA
New applicant or existing licensee proposes a stand-alone CPP at new site	License	Complex EA*
Existing licensee proposes a CPP at its ISR/resin	Amendment	EA
Existing ISR/yellowcake licensee proposes a CPP at its existing satellite ISR/resin	License	Complex EA*
Existing licensee proposes an additional CPP at its existing ISR/yellowcake	Amendment	EA
Existing licensee proposes restart of a facility in standby or decommissioning	Amendment	EA
Existing ISR licensee proposes additions, modifications, or enhancements to its licensed facility	Amendment	EA

•New licenses would require complex EAs that are tiered off of the GEIS issued in draft (7/28/08); If EA doesn't result in FONSI, an EIS would be required



Fee Issues

- Recognize potential for fee inequities
- Will consider potential changes to fee categories based on potential application expectations



Summary

- Number and variety of ISR applications = need for position on approach to licensing actions
- Additions or enhancements to a licensed uranium recovery facility at the primary site of the facility approved through a license amendment
- “Strong connection” facility additions not located at the primary licensed site approved through amendment
- Strong connection = operational or hydro-geologic
- If neither of conditions allowing license amendments met, proposed action requires separate license



Path Forward

- Issue RIS on licensing process before the NRC/NMA Workshop
- Address any fee structure proposals during the annual fee rule process; draft fee rule for comment Feb 2009; 30 day comment period



ISR Activities and Issues

Bill von Till

Chief, Uranium Recovery Licensing Branch
Division of Waste Management and Environmental
Protection

U.S. Nuclear Regulatory Commission



Discussion Items

- Activity Status
 - Applications
 - Guidance
 - MILDOS code
- Industry Issues



Application Status

- Recent ISR Applications
 - Christensen Ranch (Cogema) – Restart application; Review completed September 2008
 - North Trend (Crow Butte Resources) – Expansion application accepted for detailed review; RAIs sent to applicant; awaiting responses
 - Moore Ranch (Uranium One) – New license application accepted for detailed review; reviewing applicant responses to RAIs
 - Lost Creek (UR-Energy) – New license application accepted for detailed review; RAIs sent to applicant; awaiting responses
 - Nichols Ranch (Uranerz) – New license application accepted for detailed review; RAIs sent to applicant; awaiting responses
 - Antelope and JAB – (Uranium One) – New license application acceptance review in progress

Expected Uranium Recovery Facility Applications / Restarts / Expansions					
Company	Site	Design type	Estimated Application Date	State	Letter of Intent
Fiscal 2007 Applications					
Cogema	Christensen Ranch	ISL - Restart	Rec. 4/07, Comp. 9/08	WY	None
Cameco (Crow Butte Resources, Inc.)	North Trend	ISL - Expansion	Received June 2007	NE	None
Cameco (Crow Butte Resources, Inc.)	Plant Upgrade	ISL - Expansion	Rec. 10/06, Comp. 12/07	NE	None
Fiscal 2008 Applications					
Lost Creek ISR, LLC	Lost Creek	ISL - New	Resubmitted Mar 2008	WY	05/23/07
Uranerz Energy Corp.	Hank and Nichols	ISL - New	Received December 2007	WY	06/21/07
Uranium One (Energy Metals Corporation)	Moore Ranch	ISL - New	Received October 2007	WY	05/31/07
Uranium One (Energy Metals Corporation)	Jab and Antelope	ISL - New	Received September 2008	WY	05/31/07
Fiscal 2009 Applications					
Powertech Uranium Corporation	Dewey Burdock	ISL - New	Dec-08	SD	01/26/07
Lost Creek ISR, LLC	Lost Creek	ISL - Expansion	Jan-09	WY	03/21/08
UR-Energy Corp.	Lost Soldier	ISL - New	Jan-09	WY	03/20/08
Uranium One (Energy Metals Corporation)	Ludeman	ISL - New	Mar-09	WY	03/20/08
Cameco (Power Resources, Inc.)	Smith Ranch/Highland CPP	ISL - Expansion	May-09	WY	03/20/08
Cameco (Crow Butte Resources, Inc.)	Three Crow	ISL - Expansion	Jun-09	NE	03/20/08
Uranium Energy Corporation	Grants Ridge	Heap Leach - New	Jul-09	NM	02/22/08
Uranium One (Energy Metals)	Allemand-Ross	ISL - New	Sep-09	WY	03/20/08
Fiscal 2010 Applications					
Neutron Energy	Marquez	Conv. - New	Dec-09	NM	03/25/08
Kennecott Uranium Co.	Sweetwater	Resin Elution - Expansion	Jan-10	WY	03/20/08
Rio Grande Resources	Mt. Taylor	Conv. - New	Jan-10	NM	03/21/08
Uranium King Corporation	Apex Mill	Conv. - New	Jun-10	NV	09/27/08
Strathmore Minerals Corporation	Roca Honda	Conv. - New	Sep-10	NM	04/23/07
Fiscal 2011 Applications					
Concentric	Yavapai County	Conv. - New	Oct-10	AZ	03/20/08
Wildhorse Energy	West Alkali Creek	ISL - New	Dec-10	WY	03/20/08
Strathmore Minerals Corporation	Reno Creek	ISL - New	Mar-11	WY	03/21/08
Wildhorse Energy	Sweetwater	ISL and Conv. - New	May-11	WY	-
Cameco (Crow Butte Resources, Inc.)	Marsland	ISL - Expansion	Jul-11	NE	03/20/08
Strathmore Minerals Corporation	Sky	ISL - New	Sep-11	WY	05/11/07
Fiscal 2012 Applications					
Strathmore Minerals Corporation	Gas Hills	Conv. - New	Oct-11	WY	03/21/2008
Cameco (Power Resources, Inc.)	Ruby Ranch	ISL-Expansion	Oct-11	WY	03/20/08
5 year projected total reviews = 28					
Total New Uranium Recovery Applications = 20					
Total Restart/Expansion Uranium Recovery Applications = 8					



Guidance Updating

- Most Uranium Recovery Program guidance documents in revision or planned for revision
- **Phase 2, completion by 12-09:**
 - Regulatory Guide 3.5, Rev. 1, Standard Format and Content of License Applications for Uranium Mills, November 1977.
 - Regulatory Guide 3.8, Rev. 2, Preparation of Environmental Reports for Uranium Mills, October 1982.
 - Regulatory Guide 3.46, Standard Format and Content of License Applications, Including Environmental Reports, for In Situ Solution Mining, June 1982.
 - Regulatory Guide 3.51, Calculational Models for Estimating Radiation Doses to Man from Airborne Radioactive Materials resulting from Uranium Milling Operations, March 1982.
 - Regulatory Guide 3.56, Regulatory Guidance for Designing, Testing, Operating, and Maintaining Emission Control Devices at Uranium Mills, May 1986.
 - Regulatory Guide 3.59, Methods for Estimating Radioactive and Toxic Airborne Source Terms for Uranium Milling Operations, March 1987.
 - Regulatory Guide 3.64, Calculation of Radon Flux Attenuation by Earthen Uranium Mill Tailings Covers, June 1989.
 - Regulatory Guide 4.14, Revision 1, Radiological Effluent and Environmental Monitoring at Uranium Mills, April 1980.



Guidance Updating (continued)

- Phase 3, completion by 12-10:
 - Regulatory Guide 3.63, Onsite Meteorological Measurement Program for Uranium Recovery Facilities; Data Acquisition and Reporting, March 1988.
 - Regulatory Guide 8.11, Applications of Bioassay for Uranium, June 1974.
 - Regulatory Guide 8.22, Revision 1, Bioassay at Uranium Mills, August 1988.
- Completed
 - **RG 3.11, Design, Construction, and Inspection of Embankment Retention Systems at Uranium Recovery Facilities (Rev 3 completed and on Web)**



MILDOS Code

- NRC has just authorized release of MILDOS-AREA version 3.06 for use by licensees and regulatory agencies
- Calculates dose to individuals and general population within an 80k radius
- Argonne National Lab upgraded the code to:
 - Allow compatibility with new PC operating systems
 - Incorporate ISR technology
- Link to download - www.ead.anl.gov/mildos



Issues for Discussion (from industry)

- Requirements for estimation of doses to the public – 10CFR 40.65, 20.1302
- Use of Performance-Based license conditions for new licensees
- BLM/NRC coordination status



Issue: Requirements for estimation of doses to the public – 10CFR 40.65, 20.1302

- Twofold issue
 - Licensees need to measure “principle radionuclides released to unrestricted areas” as required by 10 CFR 40.65.
 - Licensees need to demonstrate compliance with 10 CFR 20.1301/1302 regarding dose limits for individual members of the public.
- Current industry practice is to measure radionuclides using their environmental monitoring program (site boundary)
- Staff reviews of applications have requested information on monitoring to determine the magnitude of effluents released (stacks, etc.)



Issue: Performance Based Licenses

- Will continue use of Performance-Based License/SERP approach
- Some operational aspects due to site-specific circumstances and potential impacts beyond the original analysis may not be appropriate for the SERP process
- Historic use of SERP process for hydrogeological tests for new wellfields/mine units has been site-specific
- Most recent ISR license (HRI) includes a condition requiring submittal of restoration demonstration
- Staff reviews of new applications have requested commitments to submit all wellfield hydrologic packages to NRC for review and approval before extraction begins



Issue: NRC/BLM Coordination

- Issue is duplication of effort in Environmental Assessments
- Industry request in recent briefings: Chairman open dialogue with Secretary of the Interior and BLM Headquarters on this issue, and NRC Staff assist with this effort
- UR program has increased its coordination and interaction with States and other Federal Agencies
- NRC and BLM (HQ and WY) have had several meetings and are working on an MOU on environmental roles and process
- BLM stated an agreed need for the MOU at 12/11/08 Commission meeting
- BLM reviewing NRC draft MOU – goal to review by February



Other Industry Discussion Issues?