

Directive 090

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Brine-Hosted Mineral Resource Development

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1 Introduction

1.1 Purpose of This Directive

This directive sets out the Alberta Energy Regulator (AER) requirements for developing **brine-hosted mineral resources**. The requirements apply to the entire life cycle of brine-hosted mineral development: initiation, construction, operation, and closure. This directive is made under the [Mineral Resource Development Act \(MRDA\)](#) and forms part of the [Brine-Hosted Mineral Resource Development Rules \(BMR\)](#).

Unless otherwise indicated, the word “mineral” (singular or plural) in this directive refers to brine-hosted mineral resources. It does not refer to minerals found in rock or extracted from the rock.

Many of the AER’s requirements for energy resource development (e.g., oil and gas) also apply to mineral resource development. Consequently, this directive refers to other AER directives with applicable requirements, particularly [Directive 056: Energy Development Applications and Schedules](#), which sets out specific licensing requirements for wells, facilities, and pipelines.

The AER is legally obligated to act in compliance with approved regional plans under the [Alberta Land Stewardship Act](#). To ensure this compliance, the AER requires applicants seeking approval for an activity within the boundary of an approved regional plan to meet the requirements set out in section 8.5 of [Directive 056](#).

In this directive, defined terms are set in **boldface** at first use, and the definitions are provided in appendix 1.

1.2 AER Requirements

In this directive, the term “must” indicates a requirement, while terms such as “should,” “recommends,” and “expects” indicate a recommended practice.

If a requirement applies at both the application stage and later in a development’s life cycle, the requirement may refer to both the applicant and the licensee.

Each AER requirement unique to this directive is numbered in this directive.

Information on compliance and enforcement can be found on the AER website.

2 Liability Requirements

2.1 Holistic Licensee Assessment

The AER will comprehensively assess the licensee throughout the life cycle of the mineral resource development, and the results will inform regulatory decisions regarding the licensee. This assessment uses a multifactor approach to assess the capabilities of licensees to meet their regulatory and liability obligations. This multifactor approach includes the factors outlined below and the factors listed in section 4.5 of *Directive 067: Eligibility Requirements for Acquiring and Holding Energy Licences and Approvals* for determining if a licensee poses an unreasonable risk. The AER may also consider additional information provided by the licensee throughout the life cycle, including applications, amendments, reports, and other submissions to the AER. This assessment is to ensure the responsible management by the licensee of their liability from their collective wells, facilities, pipelines, and sites.

Receipt of a mineral well, facility, or pipeline licence application or scheme approval application will trigger a holistic licensee assessment. The AER will consider the results of the assessment and any other factors deemed appropriate in making the decision to approve, approve with conditions, or deny an application.

The holistic assessment uses various factors to identify risks posed by a licensee:

- financial health
- estimated total magnitude of liability (active and inactive), including abandonment, remediation, and reclamation
- remaining lifespan of the mineral resource development and infrastructure and the extent to which existing operations may fund current and future liabilities
- management and maintenance of regulated infrastructure and sites, including compliance with operational requirements
- rate of closure activities and spending and pace of inactive liability growth
- compliance with administrative regulatory requirements, including the management of debts, fees, and levies
- any other factor the AER considers appropriate in the circumstances

The data that feeds into the assessment are drawn from numerous sources available to the AER, including the financial information submitted under *Directive 067*.

Financial information provided to the AER will be kept confidential for the period stated in section 102 of the *BMR*.

- 1) Licensees must provide complete and accurate information as required by the AER for the holistic assessment.

2.2 Licensee Management Program

The Licensee Management Program is how the AER will proactively monitor licensees to support the responsible management of mineral resource development. Under this program, the results from the holistic licensee assessment will be used to identify those licensees that are or are likely to be at risk of not meeting their regulatory and liability obligations throughout the development life cycle.

The AER may specifically engage and use appropriate regulatory tools or conduct compliance assurance activities with the licensee. This may involve providing education or recommendations to follow industry best practices and, where appropriate, initiating specific regulatory actions.

The AER encourages licensees to use available collaborative closure planning tools, such as the area-based closure approach, to help reduce their overall closure costs and work more efficiently to reduce liability on the landscape. Where special action is warranted, the AER may use appropriate regulatory tools or conduct other compliance assurance activities. Examples include changing licence eligibility under *Directive 067*, placing restrictions on licences and approvals, requiring security deposits in accordance with section 2.4 of this directive, or issuing orders.

- 2) Licensees must provide information to the AER as requested under the Licensee Management Program to ensure the responsible management of mineral resource development throughout the development life cycle.

2.3 Liability Assessment

- 3) An applicant or licensee must provide an estimate of the total liabilities associated with the mineral resource development, including the cost of providing care and custody and the cost to permanently end operations, which includes abandoning, remediating, and reclaiming the site.

The following factors relate to a liability assessment of a mineral resource development:

- a) geographic location
 - i) location within the province
 - ii) proximity to environmentally sensitive areas
 - iii) proximity to urban areas
- b) hydrogen sulphide (H₂S) and carbon dioxide (CO₂) content of produced fluids
- c) contamination management
- d) site-specific reclamation considerations

- e) wells
 - i) new or converted well
 - ii) depth and diameter of well
 - iii) cementing and completion details
 - iv) wellbore integrity
 - v) groundwater protection
 - vi) surface casing vent flow and gas migration
- f) facilities
 - i) type
 - ii) area and design capacity
 - iii) hazardous materials
- g) pipelines designated as problem sites
- h) other factors affecting cost to close infrastructure and sites

A site-specific liability assessment may be required for the mineral resource development to estimate the cost of suspension, abandonment, remediation, or reclamation of a particular site.

- 4) When directed by the AER, the licensee must conduct and submit a site-specific liability assessment in accordance with [*Directive 001: Requirements for Site-Specific Liability Assessments in Support of the ERCB's Liability Management Programs*](#) unless otherwise directed by the AER.

The AER will continually assess the liability holistically to ensure the responsible management by the licensee of their ongoing liability from their collective wells, facilities, pipelines, and sites.

2.4 Security Deposits

The *BMR* gives the AER broad authority to require security deposits across the life cycle of the mineral resource development. This includes but is not limited to at the time of application and amendments for well and facility licences as well as licence transfers.

- 5) When directed by the AER, the licensee must provide a security deposit in the amount and by the due date specified by the AER. The AER will not issue a licence or scheme approval nor transfer a licence without confirmation that the licensee has posted the appropriate security deposit.

The AER will determine the need for a security deposit and the amount based on the AER's holistic assessment (see section 2.1), including whether the licensee poses an unreasonable risk (as outlined in section 4.5 of *Directive 067*), and any other factor the AER considers appropriate. The maximum amount of the security deposit that may be required is equal to the licensee's total liabilities, including the cost of providing care and custody and the cost to permanently end operations, which includes abandoning, remediating, and reclaiming the site.

A request for a refund of the security deposit collected under this directive will trigger a holistic assessment of the licensee. If the holistic assessment of the licensee indicates there is a risk and a security deposit is still required to offset the risk, the security deposit will not be refunded. If the assessment indicates more security is required than what the AER currently holds, the licensee could be required to provide additional security to mitigate the risk. If the holistic assessment indicates that the risk has been sufficiently reduced, a refund or partial refund of the security deposit may be warranted.

For more information on the processes that apply when a security deposit is required or can be refunded, refer to [Directive 068: ERCB Security Deposits](#).

3 Mineral Wells

See the *MRDA* for the definition of a (mineral) "well."

3.1 Technical Requirements

- 6) In addition to meeting the requirements of this directive, mineral wells must also meet the licensing requirements in *Directive 056*.
- 7) The licensee must manage their waste at wells, facilities, and pipelines in accordance with the requirements in [Directive 050: Drilling Waste Management](#) and [Directive 058: Oilfield Waste Management Requirements for the Upstream Petroleum Industry](#), including the handling of radioactive material.
- 8) The applicant must include an estimate of the liability as outlined in section 2.3 under separate cover with the application.

3.2 Drill-Cutting Samples

- 9) The licensee must take drill-cutting samples from a drilled mineral well. In the case of a multiwell pad, drill cuttings must be taken from the first well on the pad. The drill cuttings must be taken as follows:
 - a) The licensee must start sampling in accordance with the following applicable scenarios:
 - i) If there are no existing wells within a two-kilometre (km) radius of the new mineral well, sample from the base of the surface casing.
 - ii) If there is an existing well within a 2 km radius of the new mineral well, sample from the top of the deepest formation penetrated by the offset well.
 - iii) If there is an existing well within a 2 km radius that has been drilled deeper than the new mineral well, sample from 30 metres (m) above the target formation of the new mineral well.
 - b) The licensee must sample at 5 m intervals in the vertical section and at 20 m intervals in the horizontal section of the mineral well.
 - c) The licensee must sample to the total **measured depth** of the mineral well.

3.3 Subsurface Setbacks

- 10) The applicant must propose a minimum subsurface distance required to set back a mineral well or well network from the lease boundary to prevent adversely affecting adjacent subsurface operations authorized by the *Oil and Gas Conservation Act (OGCA)*, the *Oil Sands Conservation Act*, the *Coal Conservation Act*, or the *Geothermal Resource Development Act (GRDA)*.
- 11) Within 24 hours of applying for a mineral well licence, the applicant must email the following information to MineralApplications@aer.ca with the subject line “Supplementary Information: setback and technology”:
 - a) the proposed subsurface setback and supporting information on how this distance was determined
 - b) a brief description of the mineral technology to be used, its capabilities, and limitations

3.4 Well Types for Mineral Wells

Table 1 lists the designated well types for mineral well applications.

Table 1. Well types for mineral wells

Well type	Usage
Production	A well to extract groundwater from which minerals may be recovered.
Injection	A well to inject produced fluids into a formation after mineral removal.
Evaluation	A well to evaluate minerals found in groundwater under a brine-hosted metallic and industrial minerals licence.
Observation	A well to gather information to determine the performance of mineral resource recovery.

3.4.1 Inactive Wells

12) For an inactive mineral well, the licensee must meet the requirements of [Directive 013: Suspension Requirements for Wells](#). A mineral well is deemed inactive when no volumetric production or injection volumes have been reported for 12 consecutive months.

Under [Directive 013](#), inactive wells are classified as low, medium, and high risk. The AER classifies inactive mineral wells as medium risk for injection wells and low risk for production wells in table 1 of [Directive 13](#).

13) For inactive mineral observation wells, licensees must meet the requirements for a low-risk type 1 well as set out in table 1 of [Directive 013](#).

3.4.2 Well Closures

14) The licensee must meet the abandonment requirements in [Directive 020: Well Abandonment](#). Closure requirements also apply to all wells converted to mineral use.

Under section 137 of the *Environmental Protection and Enhancement Act (EPEA)*, a licensee must reclaim specified land. Land used or held for or in connection with mineral wells is included in the definition of “specified land” in the [Conservation and Reclamation Regulation](#) and is subject to the applicable standards, criteria, guidelines, and directives established under that regulation, which includes returning sites to equivalent land capability.

3.5 Commingling Production

15) A licensee wanting to commingle fluids from multiple formations in a wellbore must

- a) apply following the requirements in table 3.2 (reason 9) of [Directive 065](#)—the commingling of production involves an operations scenario not specifically detailed in [Directive 065](#), and
- b) indicate that the application is made under section 21(3) of the *BMR*.

- 16) The applicant must submit the application using the Electronic Application Submission process accessed through the Digital Data Submission (DDS) screen on our website www.aer.ca.

3.6 Conversion of Oil, Gas, or Geothermal Wells to Mineral Wells

A well licence issued under the *OGCA* or *GRDA* may be converted to a well licence issued under the *MRDA* for mineral resource development. However, not all wells are suitable for conversion. Consequently, if the AER finds the applied-for *OGCA* or *GRDA* well unsuitable for mineral resource development, the AER may not approve the application for conversion. The licensee of a converted well is responsible for that well.

Converted wells must meet the requirements of the *BMR, Directive 056*, and this directive. Figure 1 is a process flow diagram showing the steps required to convert an oil, gas, or geothermal well licence to a mineral well licence.

- 17) If the applicant is the current licensee of the *OGCA* or *GRDA* well, they must apply to convert the well licence through an amendment application submitted via the designated information submission system.
- 18) If the applicant is not the current licensee of the *OGCA* or *GRDA* well, they must first apply to transfer the well licence in accordance with section 6 and email the following information to MineralApplications@aer.ca with the subject line “Well licence transfer for mineral conversion”:
 - a) the transfer application number with names of the transferor and the transferee
 - b) the well licence number and unique well identifier (UWI)
 - c) proposed mineral resource well type
 - d) proposed modifications to the well
 - e) confirmation of surface agreement
 - f) confirmation technical requirements can be met in accordance with *Directive 056*
 - g) confirmation of subsurface rights

The AER will review the licence transfer application and make its decision on the transfer application. Approval of the transfer application does not guarantee AER approval of the conversion application for the subject well.

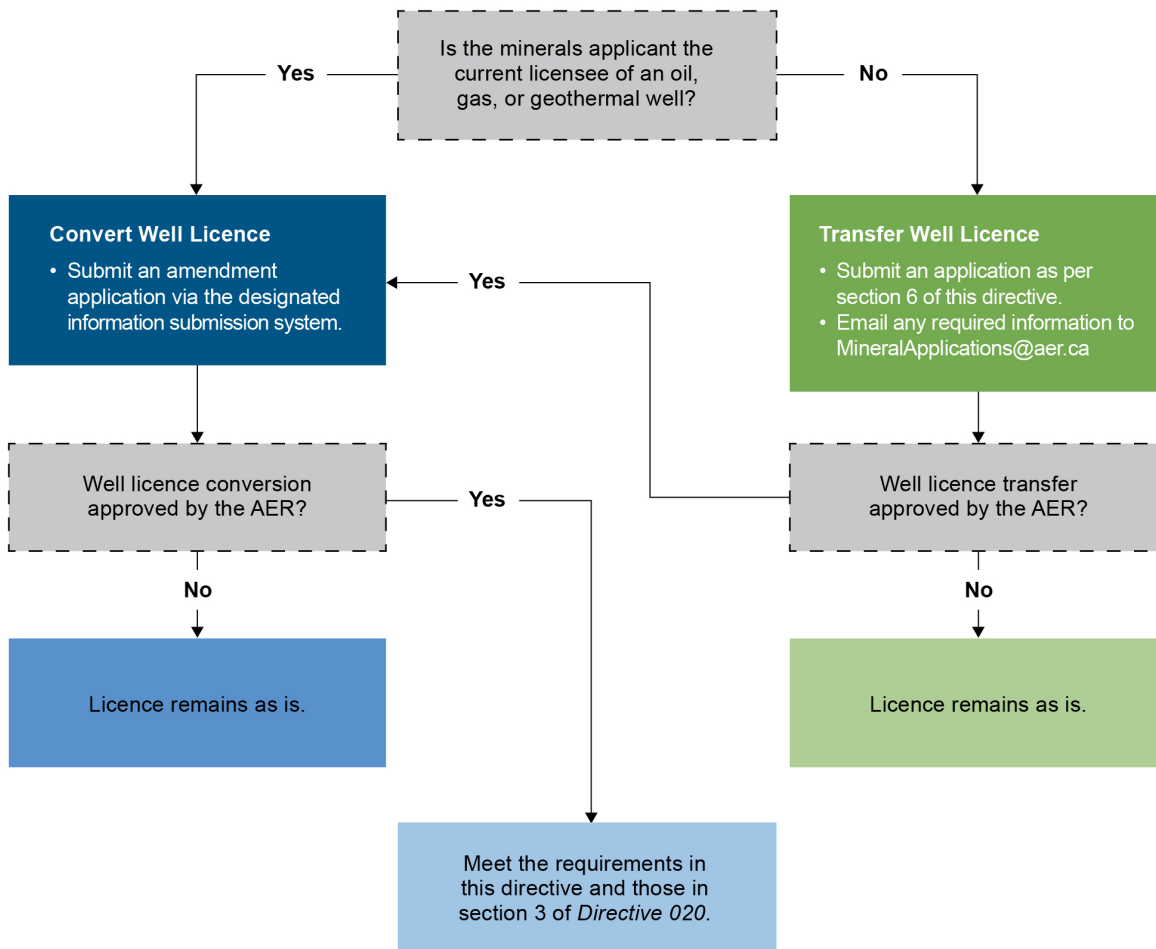


Figure 1. Conversion of an oil, gas, or geothermal well licence to a mineral well licence

19) Upon approval of the licence transfer, the new licensee must apply to convert the well licence through an amendment application submitted via the designated information submission system.

To reduce information duplication, applicants may refer the AER to information already in the AER’s possession by identifying the specific information relevant to the conversion application.

20) Zonal abandonment of converted wells must meet the requirements in this directive and the requirements in section 3 of *Directive 020*.

The AER will review the information in the amendment application and, upon approval, will designate the well as a well under the *MRDA*.

4 Mineral Facilities

See the *MRDA* for the definition of a (mineral) “facility.”

4.1 Technical Requirements

- 21) In addition to meeting the requirements of this directive, mineral facilities must also meet the requirements found in the following directives:
- a) [*Directive 038: Noise Control*](#)
 - b) [*Directive 055: Storage Requirements for the Upstream Petroleum Industry*](#)
 - c) [*Directive 056*](#), licensing requirements in section 5 except for the sulphur recovery requirements in section 5.6
 - d) [*Directive 058: Oilfield Waste Management Requirements for the Upstream Petroleum Industry*](#)
 - e) [*Directive 060: Upstream Petroleum Industry Flaring, Incinerating, and Venting*](#)
- 22) The applicant must include an estimate of the liability as outlined in section 2.3 under separate cover with the application.
- 23) The applicant must apply for *EPEA* approval for a mineral facility designed to process 5000 cubic metres per day or more of water that contains minerals.
- Also, an environmental impact assessment may be required.
- 24) Before submitting an application for approval under *EPEA*, the applicant must seek direction from the AER via email at MineralApplications@aer.ca.

4.2 Inactive Facilities

A mineral facility is deemed inactive under the following conditions:

- No volumetric activity has been reported for 12 consecutive months. The facility inactive date is 12 months from the date of the last reported volumetric activity.
- Where the facility requires *EPEA* approval, it is deemed inactive when no volumetric activity has been reported for six consecutive months. The facility inactive date is six months from the date of the last reported volumetric activity.
- New facilities become inactive 24 months after the licence issue date if it has not reported any volumetric activity.

25) A licensee of an inactive mineral facility must

- a) suspend the facility,
- b) abandon the facility, or
- c) reactivate the facility.

The AER expects the licensee to prepare a suspension or closure plan for the facility and begin suspension or closure activities immediately after shutting in the facility.

26) To suspend an inactive mineral facility, the licensee must prepare a suspension plan that includes the following:

- a) details of suspension activities, including
 - i) identification of hazardous materials and measures to be taken to control them
 - ii) how facility equipment will be isolated, de-energized, purged, and cleaned
- b) timelines for suspension activities, including the completion date of suspension
- c) ongoing monitoring and maintenance activities

27) The licensee must update the suspension plan as required to ensure it reflects ongoing activities.

28) The licensee must provide the suspension plan to the AER within 30 days of receiving a request from the AER.

29) The licensee must complete all suspension activities no later than one year after the facility inactive date.

30) The licensee must report the facility suspension date and any other suspension activity information requested by the AER within 30 days of the suspension date through the designated information submission system.

The facility suspension date is the date all suspension activities have been completed.

31) A licensee of a suspended facility must either abandon or reactivate the facility.

32) Reactivation of an inactive facility that has not been suspended must occur within 12 months of the facility inactive date.

33) To reactivate a facility, the licensee must be able to safely reactivate the facility to meet its licensed purpose.

34) The licensee must report the reactivation date and any reactivation activity information requested by the AER within 30 days of the reactivation date through the designated information submission system.

The reactivation date of an inactive or suspended facility is the date of first reported commercial mineral resource production after the facility inactive date.

4.3 Facility Closure

Facility closure activities include abandonment, remediation, reclamation, and applying for a reclamation certificate.

- 35) To close an inactive mineral facility, the licensee must prepare a closure plan that includes the following:
- a) details of abandonment activities, including
 - i) identification of hazardous materials and measures to be taken to control them
 - ii) how facility equipment will be isolated, de-energized, purged, and cleaned
 - iii) how all aboveground equipment and infrastructure will be dismantled and removed
 - iv) how the facility site will be maintained in a safe and secure manner
 - b) details of ongoing site monitoring and maintenance activities, including vegetation control and site security
 - c) details of environmental site assessment, remediation, and reclamation activities
 - d) timelines, including proposed completion dates for abandonment, environmental site assessment, remediation, and surface land reclamation activities
- 36) The licensee must update the closure plan as required to reflect ongoing activities.
- 37) The licensee must provide the closure plan to the AER within 30 days of receiving a request.
- 38) The licensee must report the facility abandonment date and any other abandonment activity information requested by the AER within 30 days of the abandonment date through the designated information submission system.

The facility abandonment date is the date all abandonment activities have been completed.

Under section 137 of *EPEA*, a licensee must reclaim specified land. Land used or held for or in connection with mineral facilities is included in the definition of “specified land” in the *Conservation and Reclamation Regulation* and is subject to the applicable standards, criteria, guidelines, and directives established under that regulation, which includes returning sites to equivalent land capability. Mineral facilities with *EPEA* approvals may have additional requirements.

5 Pipelines Transporting Minerals

For the definition of “pipeline,” refer to the [Pipeline Act](#) and [Pipeline Rules](#).

5.1 General

- 39) Applicants must apply for a pipeline licence under the *Pipeline Act*, *Pipeline Rules*, and in accordance with section 6 of *Directive 056*.
- 40) The applicant must include an estimate of the liability as outlined in section 2.3 of this directive under separate cover with the application.
- 41) Applicants and licensees must meet the technical requirements in the *Pipeline Act*, *Pipeline Rules*, and section 6.6 of *Directive 056* and meet the design specifications in accordance with the CSA Group (CSA) standard [CSA Z662: Oil and Gas Pipeline Systems](#).

5.2 Pipeline Closure

Pipeline closure activities include abandonment, remediation, and reclamation.

Under section 137 of *EPEA*, a licensee must reclaim specified land. Land used or held for or in connection with pipelines transporting minerals is included in the definition of “specified land” in the *Conservation and Reclamation Regulation* and is subject to the applicable standards, criteria, guidelines, and directives established under that regulation, which includes returning sites to equivalent land capability. Pipelines with *EPEA* approvals used for transporting minerals may have additional closure requirements.

6 Application for Transfer of Well, Facility, or Pipeline Licences

Agreements for the sale and purchase of AER-licensed wells, facilities, and pipelines do not result in a transfer of the associated licences until a licence transfer application has been submitted and approved by the AER.

AER licences with a licence status of Issued, Amended, Discontinued, Suspended, Abandoned, RecCertified, or RecExempt are eligible for transfer. Licences with a licence status of Cancelled or Re-Entered are not eligible for transfer.

The AER will not accept a licence transfer application unless both the transferor and transferee have AER identification codes that permit the holding of all the licence types included within the licence transfer application. For information about agent appointments, identification code requirements, and other eligibility requirements, refer to *Directive 067*.

The AER will process licence transfer applications as they are received.

A licence transfer application will trigger a holistic licensee assessment (see section 2.1) of both the transferor and transferee. This assessment will include reviewing abandoned, reclaimed, and

reclamation-exempt sites to ensure they are held by a responsible party that can address, manage, and monitor current conditions or future issues related to public safety or the environment should they arise.

The AER will consider the entire application package of licences to be transferred and may reject a licence transfer application that does not include licences that have received reclamation certification or that are abandoned and classified as “reclamation exempt.” The AER will consider the results of this assessment and any other factors determined appropriate in making the decision to approve, approve with conditions, or deny a licence transfer application. The AER may require a site-specific liability assessment to be completed to support the holistic assessment.

For licences that have a public lands disposition that need to be assigned or transferred, if either party has arrears in respect of any debt to the Crown or taxes owing to a municipality, the AER will reject the public lands application for assignment or transfer of the disposition as outlined in section 153 of the *Public Lands Administration Regulation*.

It is the transferor’s responsibility to ensure that all information relevant to the licences included in a transfer application is updated in AER systems before the application is submitted.

- 42) An applicant must apply for a licence transfer and submit the numbers of all the licences proposed for transfer through the designated information submission system.
- 43) The application must include the **business associate** (BA) code and contact information (including both an email address and phone number) for both the transferor and transferee.

A licence transfer application can be submitted by the transferor, the transferee, or an authorized agent or consultant acting on behalf of either party. The party initiating the submission is responsible for notifying the other party that the application has been submitted; the application must be accepted by both parties before it can be processed.

- 44) Before a licence transfer application will be accepted by the AER, both parties must make the declarations outlined in appendix 2.
- 45) The applicant must provide the following current information about the working interest participants involved in the licence transfer:
 - a) full legal name of each working interest participant, which cannot be a partnership
 - b) contact information for each working interest participant, including an email address and telephone number
 - c) the percentages of working interest (totalling 100 per cent) for every well and facility included in the application

- 46) The applicant must include an estimate of the liability as outlined in section 2.3 under separate cover with the application.
- 47) For licence transfer applications that include problem sites (see appendix 6 of [Directive 006: Licensee Liability Rating \(LLR\) Program](#)), any site-specific liability assessments submitted must have been completed within the previous three years, unless otherwise directed by the AER, and must be accompanied by an evaluation of cost changes that have occurred since the assessments were completed.
- 48) If one or both parties wish to withdraw a transfer application, they must submit a written request to the AER. Upon receipt of the request, the AER will process the application as withdrawn and will notify the licensees.
- 49) Licensees must provide information to the AER as requested for the transfer application.

The holistic assessment of a licensee is used to determine whether security deposits are required from the transferor or transferee and the amount of security deposit in accordance with section 2.4. To offset any potential increase in risk that may arise from a licence transfer, a transferor or transferee may be required, as a condition of approval, to provide a security deposit to the AER.

The AER does not provide a preliminary determination of expected security deposit requirements. They cannot be determined until the licence transfer application has been received and reviewed.

If a required security deposit is not received by the due date identified by the AER, the licence transfer application will be closed, and the transferor will remain the licensee of record.

The AER will convey its decision regarding a licence transfer application to both the transferor and the transferee. If a transferor or transferee is represented by an agent or uses the services of a consultant, the AER will also provide notice of its decision to the agent or consultant.

The licensee of record (transferor) remains responsible to comply with all applicable regulatory requirements for any well, facility, or pipeline in a licence transfer application until the AER approves the transfer. On approval of a licence transfer application, the new licensee of record (transferee) becomes responsible for any well, facility, or pipeline in the application as of the effective date of the transfer.

7 Mineral Schemes

See the *MRDA* for the definition of a (mineral) “scheme.”

- 50) Before any subsurface injection or storage activity for produced fluids may proceed, scheme approval is required. Applications for these approvals must meet the requirements in this section and the application requirements in [Directive 065: Resources Applications for Oil and Gas Reservoirs](#).

- 51) The applicant for a scheme approval must also meet the requirements set out in the following directives relating to subsurface approvals:
- a) section 4.1 and section 5 of *Directive 040: Pressure and Deliverability Testing Oil and Gas Wells*, as may be required by the AER to address concerns about overpressurization
 - b) *Directive 051: Injection and Disposal Wells – Well Classifications, Completions, Logging, and Testing Requirements* for injection wells meeting the requirements for class II produced water or brine equivalent
 - c) *Directive 071: Emergency Preparedness and Response*, including developing and maintaining an appropriate emergency response plan for the applicant’s mineral operations
- 52) Unless otherwise approved by the AER, produced fluids must be reinjected into the formation of origin.
- 53) Applicants proposing to reinject produced fluids into a formation other than the formation of origin must provide technical evidence in the application to demonstrate that
- a) the original formation is unsuitable for injection, and
 - b) the proposed formation can support injection.

7.1 Produced Fluids Injection Scheme with no Enhanced Recovery

- 54) Where produced fluids will be reinjected and not used for enhanced recovery, applicants must
- a) provide technical information demonstrating there is no enhanced recovery potential;
 - b) submit an injection scheme application using the requirements set out in section 4 of *Directive 065*;
 - c) submit a risk assessment in accordance with section 8 of this directive; and
 - d) notify parties identified for “disposal except waste disposal (class I) and acid gas disposal (4.1)” in table 3 of *Directive 065*, using a notification area that extends to the greater of
 - i) a 1.6 km radius from the injection well, or
 - ii) the maximum calculated area of the injection fluid, calculated as the cylindrical radius of influence from the injection well and considering
 - injection rates,
 - total injection period,
 - net porosity thickness,
 - injection well completion,

- boundaries such as reef edges, and
- an injection fluid formation volume factor of 1.0 for incompressible fluids.

55) The applicant must submit the scheme application for produced fluids injection via the DDS system using “ER” (enhanced recovery) as the scheme type and use “brackish injection” as the [Petrinex](#) well status.

7.2 Enhanced Recovery Scheme

56) Where produced fluids will be reinjected to increase or maintain subsurface pressure, displace minerals to production wells, or alter formation fluids so that mineral brine flow and mineral recovery are improved, applicants must

- submit an enhanced recovery scheme application in accordance with section 2 of *Directive 065*,
- submit a risk assessment in accordance with section 8 of this directive, and
- notify parties identified for “EOR scheme (amendment)” and “EOR scheme (new)” in table 1 of *Directive 065*, using a notification area extending a 1.6 km radius from the injection well.

57) The applicant must submit the application for an enhanced recovery scheme via the DDS system using “ER” (enhanced recovery) as the scheme type and use “water injection” as the [Petrinex](#) well status.

The following sections of *Directive 065* do not apply to a scheme approval for enhanced recovery:

- section 2.1.1.3, “Other Issues – A) Allowable Administration”
- section 2.1.2.2, “Scheme Expectations – D) Operations,” disregard:
Where feasible and appropriate, the ER scheme should be operated at a reservoir pressure close to the bubble point pressure or dew point pressure.
- section 2.1.3.3, “Forms and Attachments Required For ER Scheme Applications – A) Summary of Required Application Documents,” disregard the attachment requesting the pressure-volume-temperature (PVT) data

7.3 Concurrent Production Scheme

Concurrent production involves producing mineral resources and hydrocarbons or geothermal resources or both at the same time from the same well.

58) Where mineral resources are produced concurrently with other energy resources, the applicant must

- a) immediately notify the AER at ResourceCompliance@aer.ca and
 - b) submit an application for a concurrent production scheme via the DDS system using “CCP” (concurrent production) as the scheme type.
- 59) An application for a concurrent production scheme must include the following:
- a) evidence of the right to produce minerals and hydrocarbons or geothermal
 - b) confirmation of compliance with the notification requirements in section 2.4 of *Directive 065*
 - c) the applicant’s plans to conserve both mineral and hydrocarbon resources
 - d) evidence that the most restrictive well buffer zone is being proposed in the application for the resources being produced (see *Directive 065*)
 - e) any other information requested by the AER

In addition to a scheme application for concurrent production, the AER may direct the applicant to amend the authorized purpose of any well or facility licences.

7.4 Experimental Schemes

7.4.1 Qualifying Criteria

- 60) An experimental scheme (project) must meet the following criteria:
- a) The purpose is to test untried and unproven surface or subsurface technology or apply proven technology to a new situation for minerals recovery, extraction, or processing.
 - b) The time required to complete the project is no longer than necessary to test the technology.
 - c) The scale of the project is no larger than necessary to test the technology.

The AER expects that the project, given the technical uncertainties, would not immediately be economically viable.

- 61) The applicant must provide the following information to demonstrate how the proposed project meets the criteria in requirement 60:
- a) a description of the technology, including
 - i) information on why it is considered unproven, which includes use in a new situation
 - ii) the objectives of the project (i.e., what new information will be obtained about the technology)
 - b) a rationale for the project duration

- c) a rationale for the project size

Applicants may seek process guidance from the AER before submitting their application by emailing MineralApplications@aer.ca.

7.4.2 Confidential Information

One of the purposes of the *MRDA* is “to provide for the timely and useful collection, appraisal and dissemination of information relating to mineral resources in Alberta.” Consequently, the AER’s approach to determining confidentiality for experimental projects balances

- the operator’s need for a reasonable opportunity to benefit from the test before others and
- the public interest in the timely and effective access to information by others that may accelerate the commercial deployment of technological advances.

Applications for experimental schemes will be on the public record. Basic well data, project location, and geological information are not confidential. The AER will only consider information directly indicative of a project’s performance (e.g., production and injection data [quantities and hours] and progress reports) as confidential.

The AER will determine the appropriate period of confidentiality on an application-by-application basis, considering the time the applicant will need to determine if the technology is successful and allow a reasonable opportunity for the applicant to benefit from the information obtained. However, in accordance with the *BMR*, the AER will make the confidential information and data available to the public one year from the expiry date of the experimental scheme approval, or the AER may reduce or extend the one-year confidentiality period as it considers appropriate.

7.4.3 Application for Experimental Scheme Approval

62) The application for an experimental scheme approval must include the following:

- a) the information requested in requirement 61
- b) a risk assessment in accordance with section 8
- c) identification of the information the applicant would like kept confidential and the reasons why it should be considered confidential
- d) the requested period of confidentiality and justification for the requested period, particularly if it differs from the typical one year given

63) Applicants must submit applications for an experimental scheme approval via email to MineralApplications@aer.ca.

7.4.4 Summary Report

- 64) Information about the performance of an approved experimental scheme must be submitted to the AER in progress reports, which will be held confidential for the scheme's approved confidentiality period (see section 7.4.2). When the confidentiality period ends, the progress reports will become public.

7.5 Approval Transfer for Change of Approval Holder

- 65) Applicants must apply for approval transfers following the requirements in section 5 of *Directive 065* and the Transfer of Approval form in Appendix D of *Directive 065*.

8 Risk Assessment for Scheme Approval

- 66) Where required as part of a scheme application (see requirements 54, 56, and 62), applicants must assess the risks related to the following hazards and demonstrate appropriate mitigation:

- a) breach of underground formation
- b) failure of well integrity
- c) surface deformation (e.g., ground subsidence and heave)
- d) induced seismicity in accordance with section 8.1
- e) any other hazards specific to the project

The level of detail in a risk assessment should be proportionate to the risk and appropriate to the nature of the hazard.

- 67) In addition to developing an emergency response plan in accordance with *Directive 071*, for each hazard that may pose significant risks to public safety or the environment, the applicant must develop and implement a mitigation, monitoring, and response plan to further reduce risks to levels as low as reasonably possible.

The AER may impose additional periodic technical reporting requirements on a scheme approval as necessary to further mitigate any perceived risks.

8.1 Induced Seismicity

- 68) At a minimum, a risk assessment must assess the presence of **critically stressed faults** within a 3 km radius of the proposed mineral well to determine the potential for induced seismicity. This task can be done by identifying and documenting known earthquakes around the proposed wellbore and any faults using publicly available data (e.g., Alberta Geological Survey, Earthquake Canada).

- 69) If induced seismicity is identified as a risk by the applicant, licensee, or the AER, or if a seismic event is induced or triggered by the mineral well operations, the applicant or licensee (whichever is applicable) must do the following:
- a) Develop a mitigation, monitoring, and response plan that defines the thresholds of the “traffic light” protocol described in requirement 71 used to eliminate or reduce the magnitude of seismic events, including actions for following the traffic light protocol.
The plan should be prepared by a qualified professional licensed to practice in Alberta and reviewed by the AER.
 - b) Implement the mitigation, monitoring, and response plan before starting drilling operations for a new well or before injection operations start for a converted well.
 - c) Install the following seismic monitoring equipment:
 - i) a seismometer network capable of detecting a seismic event of 2.0 local magnitude (M_L) within 10 km of the mineral well
 - ii) accelerometers at strategic locations near residences, communities, and any critical infrastructure within a 10 km radius from the mineral well or as directed by the AER
- 70) Seismic wave form monitoring data generated or collected as required by this directive must be submitted to
- a) the AER in real time¹ and
 - b) the Incorporated Research Institutions for Seismology no later than one year after the data are collected (data will be public).
- 71) The licensee must follow the traffic light protocol described below in response to a seismic event that occurs within 10 km of a mineral well:
- a) Green light: If the seismic event is less than the low threshold magnitude agreed on between the AER and the licensee, the licensee need not take any action.
 - b) Yellow light: If the seismic event is equal to or greater than the low threshold and less than a high threshold magnitude agreed on between the AER and the licensee, then the licensee must
 - i) immediately report the event to the Energy and Environmental Emergency 24-Hour Response Line (1-800-222-6514) and

¹ See the AER’s [Open File Report 2019-09: The Scientific Induced Seismicity Monitoring Network \(SCISMN\)](#) for details on how to provide seismic information to the AER.

- ii) implement its mitigation, monitoring, and response plan to eliminate or reduce the magnitude of future seismic events.
 - c) Red light: If the seismic event is equal to or greater than the high threshold magnitude, then the licensee must immediately
 - i) review any operations underway and, if injecting fluids, reduce the rate of injection or pump fluids out from the well and, if hydraulically fracturing, suspend hydraulic fracturing at the subject well;
 - ii) return the well to a safe state; and
 - iii) immediately report the event to the Energy and Environmental Emergency 24-Hour Response Line (1-800-222-6514).
- 72) For the subject well under a “red light” event, the licensee must receive written consent from the AER to resume affected operations.
- 73) Before resuming affected operations of the subject well under a “red light” event, the licensee must implement a revised mitigation, monitoring, and response plan agreed on between the AER and the licensee.
- 74) The licensee must retain a copy of its mitigation, monitoring, and response plan on site during mineral operations and submit the plan to the AER on request.
- 75) As operational data is acquired over the life of the development, the licensee must adjust the seismic magnitude thresholds in the traffic light protocol as necessary. The AER must agree on any adjustments to the protocol.

9 Data Filing, Measurement, and Reporting Requirements

9.1 Well Data Requirements

- 76) Licensees must meet the requirements in [Directive 059: Well Drilling and Completion Data Filing Requirements](#) and [Directive 080: Well Logging](#).
- 77) A core report is required under section 89 of the *BMR*. The licensee must submit the core report via the designated information submission system, and any **core images** submitted must be compressed and of high quality.
- 78) If drillstem tests are conducted, licensees must meet the requirements in section 4.5 of *Directive 040*.
- 79) Within 90 days of drilling completion, the licensee must, upon request, submit to the AER an analysis of the chemical composition and physical properties of the mineral brine from all wells. The analysis must include

- a) a routine water analysis that includes major ions, total dissolved solids, pH, H₂S, resistivity, conductivity, density and
- b) a trace element analysis for barium, boron, bromine, iodine, lithium, manganese, silicon, strontium, titanium, uranium, vanadium, and zinc. Include the results for any other trace elements analyzed.

80) Mineral brine samples must be taken at the wellhead and be representative of the formation mineral brine.

81) When requested by the AER, licensees must submit a PDF copy of the certified laboratory analysis report via the designated information submission system.

9.2 Confidentiality and Release of Well Data

In addition to the items listed in section 103 of the *BMR*, the AER will also hold sample drill cuttings and core preserved by the AER as confidential for one year from the finished drilling date.

Only under exceptional circumstances will the AER consider extending the period of confidentiality.

82) The applicant must apply for an extension at least 30 business days before the expiry date of the confidentiality period. Submit the extension request to GeoConfTeam@aer.ca.

The following information is not confidential and is public domain on receipt of the applicant's submission:

- the surface and bottomhole locations, elevation, current depth, drilling status, and casing and cementing data
- the monthly totals of each type of fluid injected into injection wells and produced from production wells
- any information submitted about hydraulic fracturing fluids used in mineral operations

9.3 Measurement Requirements

83) Licensees must meet the water measurement requirements in the following sections of [*Directive 017: Measurement Requirements for Oil and Gas Operations*](#):

- a) section 1.2, "Applicability and Use of Uncertainties"
- b) section 1.3, "Maximum Uncertainty of Monthly Volume"
- c) section 1.4, "Single Point Measurement Uncertainty"
- d) section 1.5, "Confidence Level"

- e) section 1.6, “Determination of Uncertainties”
 - f) section 1.7.3, “Injection/Disposal Systems” (for total water)
 - g) section 1.8.3, “Injection Systems” (only the row for total water)
 - h) section 1.9, “Measurement Schematics”
 - i) section 2, “Calibration and Proving”
 - j) section 3.2, “Metering Difference” (for injection/disposal systems)
 - k) section 5.1, “Site-Specific Examples”
 - l) section 5.2, “Site-Specific Approval Applications”
 - m) section 15.1, “Base Requirements for Water Measurement, Volume Calculation, Production Data Verification, and Audit Trail”
 - n) section 15.2.4, “Water Injection and Disposal Facility”
- 84) In accordance with section 15.2.2 of *Directive 017*, mineral brine must be continuously measured before commingling with water or fluids from other sources.
- 85) If produced fluids contain incidental hydrocarbons (i.e., gas, condensate, or oil), licensees must
- a) immediately notify the AER at ResourceCompliance@aer.ca on the first occurrence of detecting incidental hydrocarbons in produced fluids and
 - b) meet the hydrocarbon-related measurement requirements in *Directive 017*.
- 86) The mineral licensee must have the corresponding hydrocarbon rights, either by purchase or through agreement, before any hydrocarbons or other energy resources may be produced.

9.4 Reporting Requirements

- 87) Licensees must meet the reporting requirements in *Directive 007: Volumetric and Infrastructure Requirements*. Refer to *Manual 011: How to Submit Volumetric Data to the AER* for information on how to submit volumetric data.
- 88) Licensees must report any incidentally produced hydrocarbons in accordance with *Directive 007*.
- 89) By June 30 of each year, the licensee must compile the following data for the previous calendar year and email it to MineralApplications@aer.ca upon request:
- a) for surface deformation, if applicable,
 - i) a summary of the results from implementing the mitigation, monitoring, and response plan, including measurements of any surface deformation

- ii) a description of activities taken to mitigate any surface deformation
- b) all mineral observation well data

9.4.1 Well Status Codes for Petrinex Reporting

90) Licensees must use the well status codes in table 2 for reporting volumetric data to Petrinex for mineral wells.

Contact Production Accounting at PA.Help@aer.ca when the Petrinex codes identified in table 2 do not permit reporting (e.g., reporting activities associated with temporary approvals).

Table 2. Well status codes for Petrinex reporting

Well type	Well status codes			
	Fluid	Mode	Type	Structure
Mineral production	Water	N/A	Source	N/A
Mineral injection	Water	N/A	Injection (INJ)	N/A

Note: N/A = not applicable

9.4.2 Facility Subtypes for Petrinex Reporting

91) Licensees must use the facility subtype and product codes in table 3 to report volumetric data to Petrinex.

Contact Production Accounting at PA.Help@aer.ca when the Petrinex codes identified in table 3 do not permit reporting (e.g., reporting activities associated with temporary approvals).

Table 3. Facility subtype and product codes for Petrinex reporting

Well types	Facility subtype	Subtype code	Linked well types	Activity code	Product codes
Mineral production	Water source battery*	902	Water source	Production (PROD)	BRKWTR, OIL, GAS
Mineral injection	Disposal	503	Water injection	Injection (INJ)	BRKWTR

Note: * Although a “water source battery” facility subtype does not require a *Directive 056* facility licence for Petrinex reporting, a *Directive 056* facility licence is required for mineral facilities, and this facility subtype must be used for minerals reporting.

Appendix 1 Definitions

brine-hosted mineral resource	As defined in the <i>Brine-Hosted Mineral Resource Development Rules (BMR)</i> .
business associate (BA) code	The <i>BMR</i> requires that a person (which includes a corporation) hold a subsisting identification code (BA code) in order to apply to the AER for a licence or approval under the rules.
core image	A core image is any photography of a core, including white light, ultraviolet light, hyperspectral image analysis, etc.
critically stressed fault	A fault that requires a small stress perturbation to slip and generate seismic events. For this directive, a critically stressed fault is a fault within approximately ± 15 degrees of the maximum horizontal stress orientation for the geothermal well. Fluid injection subsurface can trigger seismicity in critically stressed faults. (Most induced seismicity events in Alberta have been found to be directly related to strike-slip faults.)
measured depth mineral brine	The total depth of the wellbore along its actual course and not vertical depth. As defined in the <i>BMR</i> .

Appendix 2 Transfer Application Declaration

In submitting this application as transferor or transferee, you hereby declare the following:

- Your use of the confidential identification code and password for submission of this application has been duly authorized by your company (transferor/transferee), and the confidential identification code and password used are equivalent to and have the same binding effect as a signature executed by a duly authorized representative of the transferor/transferee company.
- You have the authority to make these (and the following if transferee) statements and thereby bind your company.
- The information in the application is complete and accurate.

In submitting this application as transferee, you declare that the transferee

- holds valid surface access rights for all wells, facilities, and pipelines included in this application;
- holds valid mineral rights for all licensed producing and inactive wells included in this application;
- has the right to produce, inject, or dispose of fluids for all licensed active and inactive wells included in this application;
- is a working interest participant in all wells and facilities included in this application; and
- will ensure that all applicable AER signage requirements are met as required, including erecting or changing signs to accurately reflect the new licensee name and contact, and accepts and assumes the responsibilities and obligations of a licensee as provided for in law, including the *Oil and Gas Conservation Act*, *Oil and Gas Conservation Rules*, *Pipeline Act*, *Pipeline Rules*, *Geothermal Resource Development Act*, *Geothermal Resource Development Rules*, *Mineral Resource Development Act*, *Brine-Hosted Mineral Resource Development Rules*, and AER directives and requirements.

For pipeline licence transfers only:

- The transferor hereby confirms that it has collected and retained all records required under the *Pipeline Rules* and *Canadian Standard Association Z662: Oil and Gas Pipeline Systems*. The transferor confirms that it has provided these records to the transferee by the effective date of the licence transfer.
- The transferee hereby confirms that it has received all records required to be collected and retained under the *Pipeline Rules* and *Canadian Standard Association Z662: Oil and Gas Pipeline Systems* from the transferor. The transferee is responsible for producing these records on request by the AER. Failure to do so constitutes a noncompliance of AER requirements.