

Enhanced Oil Recovery Scheme New or Amend should contain the following:

Requirement for New Scheme Applications

Notification

- A map illustrating notifications to all well licensees, including abandoned wells, over the following area:
 - For amendments: all licensees of abandoned wells that penetrated the pool and licensees of wells completed in the pool, within the applied for approval area and the area within 800 meters of any proposed injection well;
 - For new schemes: all licensees of abandoned wells that penetrated the pool and licensees of wells completed in the pool, within the applied for approval area and the area within a quarter section of the applied for approval area.
- A statement as to whether the parties shown on the map referred to above have been notified about the application and, if so, include any statements of concern received.
- If the proposed injection fluid contains any H₂S, a statement indicating that notification of the scheme for emergency response plan (ERP) purposes has been made. See *Directive 071: Emergency Preparedness and Response Requirements for the Petroleum Industry*.
- Provide a review of all completed and abandoned wells within 800 meters of any proposed injection well in order to identify those that were not properly abandoned as per *Directive 020* and grandfathering provisions. If a hydraulic isolation risk to a completed or abandoned well is identified by a licensee then the applicant and the licensee have to come to an agreement on what needs to be done to mitigate this risk.

Description of Proposed Injection Well(s)

- Unique well identifier (surface and bottom, if different) of the proposed injection well, and general drilling, completion and activity history.
- Injection zone with zone top and base, perforations, depth of the production packer. Note that the packer is expected to be within 15 meters (TVD) above of the top of disposal perforations, unless technically justified;
- The base of the usable groundwater – It is available for locations across Alberta by using the Base of Groundwater Protection Query Tool on the AER's Systems & Tools on the AER website, www.aer.ca.
- Provide a statement on the H₂S content of the proposed disposal fluid and the details of an AER approved up-to-date Emergency Response Plan (ERP) that the applicant maintains in the area of the proposed operation. Clearly state the H₂S concentration and whether greater than or less than 100 parts per million (ppm);
- Proposed maximum wellhead injection pressure (MWHIP) – unless the default table MWHIP is requested, provide a detailed report of a step-rate injectivity test (SRT) or other acceptable test, including a test conducted in a technically justified location analogue, and conducted to determine the formation parting pressure including the followings (if available):
 - the wellbore schematics of the proposed disposal well or analogue well,

- the directional survey for the proposed well or analogue well,
- evidence that shows the time steps were of equal duration,
- qualitative evidence that pressures are moving toward stabilization at the end of each stage;
- the SRT data is presented in graphical and tabular form, and
- calculation of a MWHIP and a discussion on the appropriate safety factor to ensure fluid containment.

Discussion & Justification to Support Proposed ER Scheme

Geology, Reservoir History, Scheme Details and Performance

- Provide a geological interpretation of the reservoir rock and surrounding area;
- Provide a reservoir engineering review of fluid flow in the reservoir rock, pressure decline and the PVT characteristics of the reservoir fluid. Provide PVT characterization reports, if available, and the proposed PVT table for the ER scheme;
- Provide a statement on the fluid volumetric estimates of the pool and any discrepancies that may exist between the applicant's interpretation of the pool boundary and the AER pool boundary. A pool delineation application has to be submitted to resolve any such discrepancies, unless it is from the penetration data of a recently drilled well that is yet to be evaluated by the AER. Such discrepancies have to be resolved prior to the submission of an application for the establishment of a new ER scheme or the amendment of an existing scheme;
- Provide an analysis of the reservoir pressure decline trend;
- Provide the proposed scheme area and the reason for the selection;
- Provide a statement on the proposed injection fluid(s) and its suitability for the purpose of maximizing hydrocarbon recovery;
- Provide a statement on the availability of a fresh water diversion permit from Alberta Environment and Sustainable Resource Development (ESRD), or the pending application for the same, as this is required for the use of fresh water (Class IV fluid) as the injection fluid;
- Provide a statement as to the source, and sufficiency of the source, of the proposed injection fluid(s);
- Provide the list of wells that will be in the proposed scheme area;
- Provide a statement on the timing for the submission of *Directive 051* requirements for the proposed injection well(s) and the timing for the commencement of injection operations into the new ER scheme or a newly approved injection well. It is expected that injection operations will commence within three months of the approval of the *Directive 065* application. A request for the deviation from this timeline can be made with requisite justification.

Requirement for ER Scheme Amendment Applications

ER amendment applications are submitted to request the following changes;

- Revise assessed MWHIP,
- Add injection well location(s),
- Amend scheme approval area,
- Amend approval conditions,
- Terminate the scheme.

The minimum application requirements for each type of ER amendment application are as follows:

- Revise MWHIP
 - Notifications are not required,
 - Geological interpretation may be required for cases where injectivity tests from analogue locations are to be used,
 - PVT characterization submissions are not required, and
 - MWHIP requirements are as per above.

- Add injection well location(s)
 - Notifications are required as per guidelines stated above,
 - Provide a geological interpretation of the pool to place the proposed injection location(s) in the reservoir structure with to other wells in the area,
 - Provide a reservoir engineering analysis to show how the additional injection location(s) is likely to contribute to the objective of maximizing hydrocarbon recovery, and
 - PVT characterization submissions are not required.

- Amend scheme approval area
 - Notifications may be required depending on the location of the area to be added and possibly the new injection location(s) relative to other licensee wells in the pool,
 - Provide a statement on how the hydrocarbon content of the proposed additional area is likely to be swept by the existing or proposed producer/injector well configuration,
 - Provide an analysis of the expected enhancement of hydrocarbon recovery on account of the proposed area expansion, and
 - PVT characterization submissions are not required.

- Amend approval conditions
 - Notifications may be required if the changes requested involve the relaxation of voidage replacement conditions or the increase of injection rates,
 - Provide an analysis to justify the requested change on the basis of resource conservation, and
 - PVT characterization submissions are not required.

- Terminate the scheme
 - Notifications may be required if there are ongoing enhanced recovery operations in offset locations in the same pool by other operators and if there is an expectation that good production practice (GPP) within the scheme are to be terminated, and
 - Provide an analysis of the ultimate recovery achieved relative to the initial projections of ER recovery.