ERCBH2S Frequently Asked Questions.

Issue: Sweet pipeline tie-in to a sour gathering system
A company is tying a sweet pipeline into one containing H2S. Since the model assumes flow from either end of the pipeline until the ESD shuts, the company assumes that there will be a possibility of H2S flowing back into the sweet line, and that therefore there could be a release. The company has tried to model this sweet line and the sour one, assuming the model will account for the backflow and provide a small EPZ for the sweet line.

Answer:
ERCBH2S only has the capability of modeling gas that contains H2S. When a company enters 0% H2S into the model, it is forced to divide by zero, producing no answer. The key message is that the ERCB has never asked companies to account for backflow and calculate EPZs for sweet lines. The model is not built to handle that calculation. Therefore companies should assume 0 m EPZ on all sweet lines.

Issue: How do ESDs and check valves (CV) differ in the model?
A company indicates in its model that a pipeline has an ESD on one end of its line and a CV on the other end. Given that a CV immediately prevents backflow, the company assumed that any additional flow to the line between the time of a pipeline release and the time the ESD shut would only come from the end of the line where the ESD is located. However, when the company ran the model, a much larger EPZ than anticipated was predicted.

Answer:
ERCBH2S treats ESD valves and check valves the same for EPZ calculations. This means that the model assumes there could be backflow into a line, when in reality there would not be. The model was written this way for simplicity. If there is enough concern from industry, we may recommend that the model be changed.

Issue: Large EPZs on very short lines
In some instances a line that is only 5 or 10 m in length can have EPZs several kilometres in diameter.

Answer:
There are three main things to look for here:

- whether the company has used mitigation or not,
- what the pressure rate of change on the ESDs is, and
- what the upstream and downstream line properties are.

The model assumes infinite flow from both upstream and downstream of a pipeline. Therefore a short line with no mitigation or a very low pressure rate of change (10%) will have continual flow into it from both upstream and downstream. To mitigate this, the applicant must increase its pressure rate of change to ensure that the ESDs close sooner.

Issue: What does the ESD valve low pressure trigger mean?

Answer:
The low pressure trigger is the pressure set point where the ESDs on a pipeline close. The model asks companies to enter this value as a pressure value (kPa), but it is commonly discussed in terms of percentages. A low pressure trigger of 10% means that the pipeline has to depressure to 10% of its total operating MOP before the ESDs will close. Essentially, the pipeline must be empty before the ESDs close. This means the associated EPZ will be very large, almost equal to a case using no mitigation. A low pressure trigger of 90% is generally unreasonable, as daily fluctuations in pipeline pressure would cause the ESDs to close. Many companies choose to use a low pressure trigger somewhere in the range of 50%.

Issue: Lines with differing lengths having very similar EPZs
All other input being equal, why do lines with differing lengths have virtually the same EPZ?

Answer:
The first thing to do is check whether the company has modeled the lines using mitigation or not. If they have not (which will most likely be the case in these scenarios), the model assumes that the line will flow for 12 hours before the ESDs shut. If they have chosen “With Mitigation” but have a very low “low pressure trigger” (say, 10%), this is virtually the same as having no mitigation at all. The model assumes that the sections upstream and downstream of the ESD are infinite and will supply as much gas as needed until the pressure drops to the set point or the valves are closed manually. By selecting “With Mitigation” and entering values above the default, the EPZ becomes more sensitive to the line length.

Issue: The .csv file will not import into the model
After importing, the model provides a message that states “Batch import successful! 0 records imported.”

Answer:
First, open the .csv file to make sure it looks correct and is the proper version (v1.19). The company may not have exported it correctly on its end. Instructions on how to export model runs are found in the User Guide.

If the .csv looks correct, the company may have accidentally saved it as an Excel file. Once a model run is exported, changes cannot be made to it. If you open the .csv, change something (or not), and then press “Save,” Excel will automatically change it to Excel format. Even though the suffix is still .csv, it is actually now an Excel file. The only way to make changes to a .csv file is to import it back into the model, make changes on the input page, and then reexport it.

Issue: MOP input values
Should the MOP values be for a sustained rate or should they include very short duration high pressure anomalies?

Answer:
The intent of the program is to calculate EPZs based on normal operating conditions, not anomalous or maintenance conditions. Therefore, all values entered should be reflective of normal operating conditions.

Issue: Companies want to use values lower than the default in the model
There are cases where companies want to use values that are lower than the default. Specifically, they would like to use lower than 10% for the low pressure trigger.

Answer:
The defaults in the model are there as safety measures; therefore, even if a company enters a lower value, the model will default to the higher number. If the company feels that the default is unreasonable, it can send feedback to Directive71@ercb.ca, and ERCB staff will look at it for future model revisions.

In the case of wanting a low pressure trigger less than 10%, this number is already so low that it means the line will be virtually depressured before the ESDs close. If the company would like to use a lower value, it should choose "No Mitigation" instead.

Issue: Gas lift wells

Answer:
Gas lift wells must be entered into the model using the release rate and H2S when the lift is operating.

Issue: Wells that are "suspended" but do not meet the requirements of Directive 013.

Answer:
As these wells have not been suspended in accordance with Directive 013, companies must use the last available flow rate and gas analysis to calculate an EPZ.

Issue: CO2 modeling

Answer:
The model does have an input for CO2, however, it is meant to create an EPZ for hazards associated with H2S only. Currently CO2 hazards fall within the Corporate ERP requirements of Directive 071. If a company wishes to create a site specific plan to deal with CO2 hazards, it will have to do its own modeling to determine an EPZ. This modeling may be requested for review when the accompanying ERP is submitted for review.

Issue: Setback designation on summary page
Why does the setback level sometimes indicate N/A?

Answer:
Setbacks only apply to sour gas pipelines with greater than 1% H2S, not natural gas pipelines. For model runs less that 1%, N/A appears.

Issue: Different EPZ sizes for drilling and completions
Applicants run the model for both drilling and completions and get different results. Which .csv should be submitted with the ERP? Which EPZ should be used for the ERP?

Answer:
The csv's for both operations need to be submitted.

Issue: The EPZ on the Directive 056 application is for production. Does that mean the ERP should be based on that EPZ?
Directive 056 requires that companies input the EPZ for the largest of (a) drilling, (b) completions/servicing, or (c) producing/suspended in the Schedule 4.3 application. In some cases, the largest EPZ will be associated with production.

Answer:
Directive 056 requires consultation/notification to be based on the largest zone. Directive 071 requires consultation to be on the largest EPZ for the operations that the ERP addresses. Therefore, the ERCB does not expect a company's drilling/completions plan to be based on a production EPZ. The applicant will have to provide an explanation of why the EPZ in the application does not match that in the ERP.

Issue: What is the largest EPZ that the model will calculate?

Answer:
The largest EPZ the model will calculate is 30 km. Companies can change their operating procedures to try to reduce this value. Using mitigation, especially in populated areas, is strongly recommended. In remote areas, companies will have to do an analysis of whether the benefits of a reduced planning zone outweigh the costs of additional mitigation.

Issue: What release rate/release volume from the model should be used for the Directive 056 application?
There are several different release rates/release volumes in the model. Which one is the correct one to use for the licence application?

Answer:
The Land Use Setback and OLD EPZ H2S Release Rate or Volume at Licensed Conditions in column DV on the batch sheets is the number that should be used.

Issue: Expected maximum liquid flow rate of pipeline fluid
The expected maximum liquid flow rate influences the EPZ size for the GLR<1000 model, and companies are concerned that it may be difficult to derive this value for a complex system.

Answer:
The operator should have this information available based on production accounting. For example, if well A is assigned flow A and well B assigned flow B, then the pipeline that is joined to each well is modeled with flows A and B respectively. At the tie-in of the two lines, the flow would just be A + B.

To be conservative, one could use the total cumulative flow rate at the discharge of the gathering system for each pipeline segment in the system. For example:

Well 1 is producing 10 m3/d of oil, 5 m3/d of water, and 50 m3/d of gas
Well 2 is producing 20 m3/d of oil, 10 m3/d of water, and 50 m3/d of gas

Flow 1 = 15 m3/d
Flow 2 = 30 m3/d
Flow 3 (combined 2 & 3) = 45 m3/d

So the GLR inputs are:

Well 1 GLR = 50/15
Well 2 GLR = 50/30
Combined GLR = (50 + 50)/(15 + 30) = 100/45

Issue: Pipelines with larger H2S concentrations giving EPZs smaller than pipelines with smaller H2S concentrations.
All other things being equal, why would a pipeline with 60% H2S give a smaller EPZ than one with 20% H2S?

Answer:
The reason for these centres around buoyancy. Basically, the more H2S in a mixture, the denser it is and the less buoyant. Therefore, the gas would have the tendency to spread out over an area rather than disperse horizontally. In very basic terms, an EPZ calculated with 55% H2S would result in a plume more circular, where as an EPZ calculated with 20% H2S it would be longer and skinny.

Issue: New pipeline tying into an existing system. Is recalculation of the system required

Answer:
When the directive was released, the ERCB stated that for well supplements or pipeline tie-in, the new operation has to be modeled and that EPZ adopted. The existing pipelines don't have to be modeled and the ERP does not have to be rewritten. Therefore, the ERCB does not require that the entire system be recalculated unless there is a significant change to the H2S or release volume. However, should a company choose to remodel the entire system (the ERCB always

encourages being proactive), then it would have to complete its notification in accordance with the directive.

Issue: Offset well gas analysis.
Must a company use the ERCBH2S model for a well without offset gas analysis and no H_2S potential during drilling or completions, yet that is predicted to contain H_2S once on production? If yes, what is acceptable for use as a gas analysis, given these circumstances?

Answer:
The EPZ is based on the largest release potential from the drilling, completions, or production cases. For this well the need for a site-specific production ERP would be based on the producing release rate and ERCBH2S calculation. Given that the EPZ is not strongly dependent on the gas analysis (driven largely by H_2S content); it is permissible to use a best guess gas analysis until confirmation of composition is achieved during production.

Issue: PIPELINES - EPZ SIZES, FAILURE SIZES, AND VALVE SETTINGS
Why is my pipeline EPZ different using ERCBH2S than it was using the nomograph?

Answer:
ERCBH2S has undergone a rigorous development process over several years. Changes in the EPZ size are driven by a better understanding of sour gas dispersion, as well as more appropriate assumptions and methodology. Full details of this can be found in Volume 1: Technical Reference Document.

Primarily the changes are driven by the volume and duration of the release. This, in turn, is mainly impacted by the presence, type, setting, and subsequent behaviour of pipeline ESD valves. Many of these parameters can be controlled by the user to reflect the actual operating conditions or allow the users to investigate changes that would result in a more appropriately sized EPZ. This process, called hazard mitigation, reflects a lower risk of operation and is encouraged by the ERCB.

Former Method

1. **H_2S Release Volume**. A pipeline H_2S release volume was considered to be only the H_2S volume between closed ESD valves.

2. **Valve Closure**. The ESD valves were assumed to already be in a closed position.

3. **Pipeline Failure Scenario**. The failure scenario assumed a guillotine failure, with both halves of the pipeline completely releasing all the H_2S to atmosphere.

4. **These simplifying assumptions resulted in the smallest volume of gas being released over the shortest duration**.

ERCBH2S Method

1. **H_2S Release Volume**. A pipeline H_2S release volume is based on the H_2S between closed valves (as before) PLUS additional H_2S that can flow to the release site (from both upstream and downstream) UNTIL valve closure occurs.

2. **Valve Closure**. ESD valve closure is based on the slowest valve setting of any valve responsible for controlling the flow of material to the pipeline being modeled. Back-flow check valves are assumed to operate perfectly and immediately.

3. **Pipeline Failure Scenario**. ERCBH2S examines 11 different failure sizes (one of which is a guillotine failure) under 54 different meteorological conditions, for a total of 594 case studies or "iterations." For each failure size, ERCBH2S determines how long it will take for valve closure to be activated, depending upon the valve settings entered by the user. The calculated EPZ is based on whatever combination of meteorological conditions and pipeline failure size produces the largest zone.

Issue: SURFACE-CONTROLLED SUBSURFACE SAFETY VALVES (SCSSSV)
Some wells have subsurface safety valves that are not "surface controlled." Can these still be selected under "Source Mitigation"?

Answer:
No. These valves cannot be maintained reliably unless they are surface-controlled.

Issue: SCSSSV is selected for the well, but the minimum time under "Time from release until stop flow or ignition" still shows 15 minutes. Why?

Answer: The phase of well operation selected must be producing/injection in order to receive a "time credit" for the valve. Otherwise, the valve may not be in place

Issue: What is the ERCB expecting licensees to use as the effective maximum H_2S concentration in calculating EPZs for operating wells and pipelines? Understanding that it should reflect a value that will never be exceeded, should this be the gas analysis value times some kind of safety factor?

Answer:
The expected maximum can equal the licensed value for pipelines. Licensees that choose to use a lower value must ensure that it is a representative value that will not be exceeded during operations.

Refer to the ERCBH2S User Guide for additional information on this input parameter.

The ERCB at anytime may audit production facilities to ensure compliance with Directive 071 requirements. Findings that support out-of-specification parameters may result in enforcement action, in accordance with Directive 019.

Issue: For existing wells, should the highest H_2S from any formation capable of flowing to surface (based on a search of data from the area--i.e., using third-party data suppliers) be used, or should individual well data be used?

Answer:
When using the models for a production scenario, use the highest value from that particular well's production data.

When using the model for drilling and completions scenarios, the data are unknown and therefore the highest value from your search area would be used.

It should be noted that the ERCB Geology and Reserves Group has an established presubmission procedure that is required for critical sour wells. Noncritical wells do not require a presubmission but are still subject to audit by EPA and the Geology and Reserves Group, and they may be subject to post approval enforcement action.

Issue: How are ERCBH2S results submitted to the ERCB?

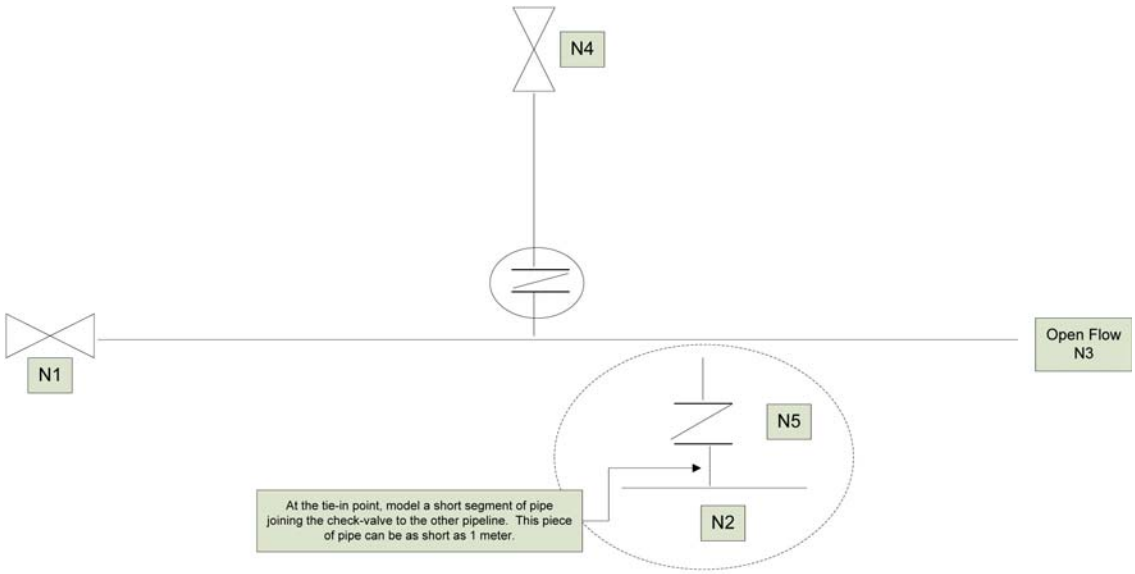
Answer:
Create a “Batch Export” file, as described in the ERCBH2S User Guide, and send it as an e-mail attachment.

Issue: CHOKE VALVES AS SOURCE MITIGATION
Does the model consider choke valves that restrict the flow from the gas well? Some wells are equipped with choke valves or flow restrictors to regulate flow and decrease the likelihood of forming hydrates. How would this scenario be entered on the Input page?

Answer:
It depends on whether the valve is inside the well's tubing or not. If it is outside the well's tubing, it is considered too vulnerable to be considered as source mitigation for the well. If it is inside the tubing, the “choked” flow rate may be used for determining the H_2S release rate for the well.

Issue: In modeling a gathering system where two pipelines tie in together and then leave the tie-in point as one pipeline, how is it described using segments and nodes if only one of the pipelines has a check valve at the tie-in point?

Answer:
At the tie-in point described, there must be two nodes – one for the check valve and one for the actual joining of the two segments, which will represent an open flow condition because they aren’t both connected to the check valve. To join the two nodes, model a short segment of pipe connecting the check valve node to the tie-in node. This extra little piece of pipeline can be as short at 1 m. By creating two unique nodes at the tie-in location and connecting



N1	→	N2	ESD to --
N2	→	N3	-- to --
N4	→	N5	ESD to CV
N5	→	N2	CV to --

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