

ALBERTA ENERGY AND UTILITIES BOARD

Calgary Alberta

APPLICATION BY CRESTAR ENERGY INC. FOR PERMITS TO INCREASE THE HYDROGEN SULPHIDE CONCENTRATION OF AN EXISTING PIPELINE AND CONSTRUCT SOUR NATURAL GAS PIPELINES IN THE VULCAN AREA

**Examiner Report 97-2
Application No. 1002908**

1 INTRODUCTION

1.1 Application

Pursuant to Part 4 of the Pipeline Act, Crestar Energy Inc. (Crestar) applied to the Alberta Energy and Utilities Board (EUB) for approval to change the substance authorized to be carried in approximately 24 kilometres (km) of existing 168.3-millimetre (mm) outside diameter pipeline. The pipeline would transport sour natural gas containing up to 18 moles of hydrogen sulphide per kilomole of natural gas (1.8 per cent H₂S). The pipeline (referred to by Crestar as the Kirkcaldy pipeline) would be a Level 1 facility as defined in the EUB's Interim Directive ID 81-3, "Minimum Distance Requirements Separating New Sour Gas Facilities from Residential and Other Developments ID 81-3." The pipeline is currently licensed to transport natural gas containing up to 5 moles of H₂S per kilomole of natural gas (0.5 per cent H₂S) from wells in the surrounding area to Crestar's Vulcan gas plant located in the South-east quarter of Section 24, Township 15, Range 22, West of the 4th Meridian (SE $\frac{1}{4}$ of 24-15-22 W4M).

In addition to the above substance change, Crestar applied for a permit to construct five sour natural gas pipelines totalling 51.4 km in length with a maximum 168.3 mm outside diameter. The pipelines would transport sour natural gas containing up to 1.8 per cent H₂S from wells located in Legal Subdivision (LSD) 8-33-13-26 W4M, LSD 15-33-13-26 W4M, LSD 6-27-13-26 W4M, and LSD 11-19-12-25 W4M to a tie-in point located at LSD 16-16-16-24 W4M. The gas and liquids would then be transported through the Kirkcaldy pipeline to the Crestar Vulcan gas plant. The new pipelines would be Level 2 facilities as defined in ID 81-3.

1.2 Interventions

Interventions to the application were filed by D. and R. Stretch, W. and H. Roebuck (the Roebucks), and P. Adams.

1.3 Hearing

A public hearing to consider the application was held in Vulcan, Alberta on 19 February 1997 before Board-appointed examiners W. J. Schnitzler, P.Eng., T. J. Pesta, P.Eng., and J. R. Creasey, P.Biol.

Those who appeared at the hearing are listed in the following table.

THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations Used in Report)

Crestar Energy Inc. (Crestar)
N. G. Sauder

D. and R. Stretch
W. and H. Roebuck

D. Stretch

G. Mueller

Alberta Energy and Utilities Board staff
D. Garvin
K. Wills

Witnesses

S. Hindle, P.Eng.
M. Cubrilo, P.Eng.
P. Marlatt
B. Nagy
D. G. Black, C.E.T.
D. G. Zeback, P.Eng.

D. Stretch
W. Roebuck P.Adams

P. Adams

G. Mueller

1.4 Preliminary Matters

At the commencement of the hearing, Crestar informed the examiners that concerns had been expressed by some landowners about information contained in a landowner list filed in support of the application. Crestar stated it had prepared a substitute list which only included landowner names, legal land descriptions, and telephone numbers.

Mr. Stretch and Mr. Adams objected to their names being included on Crestar's land list. Both interveners stressed that detailed information was given to Crestar in confidence for emergency planning purposes and that the information could be misused as a result of being publicly available during the course of the hearing notice period. Mr. Mueller expressed a similar concern and requested that unlisted numbers not be released as part of the list.

The examiners accept the concerns expressed by the interveners regarding confidential information exchanged between a company and an individual and the examiners recognize Crestar's attempt to address the concerns prior to the hearing. The EUB requires a listing of names of landowners and legal land descriptions to confirm that all landowners have been made aware of the application. The examiners requested the applicant to prepare a further revised list of landowners within 0.5 km of the applied-for pipelines and include only the names of the landowners and legal land descriptions¹. The examiners will recommend to the Board that it

¹ Subsequent to the hearing, Crestar provided a revised list.

request EUB staff to review and adjust, as necessary, requirements for landowner lists to minimize the opportunities for unintentional distribution of confidential information.

2 ISSUES

The examiners consider the issues respecting the application to be:

- the need for the pipelines,
- suitability of the existing pipeline for the proposed service,
- public safety, and
- public consultation.

3 NEED FOR THE PIPELINES

3.1 Views of the Applicant

Crestar submitted that the proposed pipelines and the relicensing of the existing Kirkcaldy pipeline are required to tie in production from four existing natural gas wells in the Claresholm area. The production from these wells would be transported by the new pipelines to a tie-in point at LSD 16-16-16-24 W4M, where gas production would enter the Kirkcaldy pipeline for transportation to Crestar's Vulcan gas plant located in the SE ¼ of 24-15-22 W4M. Crestar stated that it evaluated building a new pipeline directly to its Vulcan gas plant, but discounted this option because the Kirkcaldy pipeline has existing capacity and an additional 14 km of new pipeline would be required. Crestar acknowledged that it had not conducted a detailed economic evaluation of building a pipeline directly to the Vulcan gas plant, but estimated an additional cost of approximately 2 million dollars over the current application.

Crestar stated that there are no sour gas processing facilities in the Claresholm area at this time. Crestar considered processing the sweet gas at the existing Ranger facility in the area and not producing the sour gas well, but this was not its preference. Crestar added that the Vulcan gas plant is currently operating at 40 per cent of capacity so it was not necessary to conduct a detailed study of constructing a clearly less economic new gas plant in the Claresholm area.

3.2 Views of the Interveners

Mr. Stretch stated that he could understand the use of the Kirkcaldy pipeline to deplete the existing gas field that it presently serves but could not see any reason for transporting new gas from the Stavely (Claresholm) area. Mr. Stretch expressed a concern that if Crestar obtained an approval, it would find additional sour gas fields in the future and request that higher levels of H₂S be transported in the pipeline. Mr. Stretch suggested it would be better to develop facilities near the sour gas well(s) to remove the H₂S.

Although the Roebucks and Mr. Adams did not directly question the need for the pipelines, they had indicated that Mr. Stretch would represent their views with regard to this issue.

3.3 Views of the Examiners

The examiners are satisfied that there is a need to produce the reserves from the subject wells and that the applied-for pipelines are needed to transport the gas to the Crestar Vulcan gas plant.

The use of an existing pipeline system minimizes costs as well as social and environmental impacts. Therefore, the examiners believe that, providing it is technically suitable and safe, the use of an existing pipeline system is preferable to the construction of a new pipeline. Although Crestar did not provide details, the examiners are satisfied that Crestar had considered other pipeline and processing alternatives before determining its preferred method of handling the gas.

4 SUITABILITY OF THE EXISTING PIPELINE FOR THE PROPOSED SERVICE

4.1 Views of the Applicant

Crestar first described how it had studied the suitability of the existing pipeline for carrying additional sour natural gas. Crestar stated the existing Kirkcaldy pipeline currently transports natural gas containing H₂S and is licensed for a maximum operating pressure (MOP) of 9650 kilopascals (kPa) and an H₂S content of 0.5 per cent H₂S. Crestar stated that to verify the integrity of the pipeline it had completed a pressure test, to a pressure of 1.4 times the proposed maximum operating pressure, and conducted a survey using an in-line inspection tool to evaluate pipe corrosion. Crestar acknowledged that when conducting the pressure test in the fall of 1996, the pipeline failed at a pressure of 11000 kPa. This failure was described by Crestar as being the result of a crack along the seam produced during the manufacture of the pipe. An independent metallurgical analysis concluded that the seam had not been heat treated after welding. Crestar suggested that the heat treating of the seam on this joint of pipe had either been interrupted or missed. Crestar stated that it believed this was an anomaly restricted to this particular joint of pipe and undertook to provide to the examiners and hearing participants the metallurgical analysis and the results of subsequent materials testing².

Crestar also described a second failure on the Kirkcaldy pipeline which occurred in January 1997 in the SW¹/₄ of 14-16-24 W4M near the Stretch residence. The failure mechanism has not yet been determined, as weather conditions and topographical features restricted access to the failed section. Crestar installed a new pipeline around the area of the failure. Crestar stated that following removal of the failed section of pipe, the failure mechanism will be compared with that of the pressure test failure to see if there is a correlation. Based on the preliminary results of the in-line inspection tool, Crestar stated that it would have probably identified this section of pipe for replacement even if the failure had not occurred. Crestar also identified one other section for replacement which shows fairly continuous corrosion pitting, with wall loss estimated to be approximately 30 per cent and stated other sections may need to be replaced once the survey has been fully evaluated.

Crestar stated that while the new pipeline would meet current Canadian Standards Association (CSA) standards for sour service, the CSA standards respecting metallurgy, quality control and exterior pipe coating material have changed since the existing Kirkcaldy pipeline was installed. To compensate for these differences, Crestar proposed to lower the maximum operating pressure of the Kirkcaldy pipeline to 7850 kPa and install additional emergency shut-down (ESD) valves on the pipeline. Crestar said the pressure will be regulated at the point of tie-in from the new

²Subsequent to the hearing, Crestar completed this undertaking.

pipe into the existing Kirkcaldy pipeline to ensure that the operating pressure of the Kirkcaldy pipeline is not exceeded.

Crestar stated that recent inspections show no internal corrosion and there is no history of internal corrosion on the Kirkcaldy pipeline. Crestar stated it has made provisions to install facilities on the pipeline system, if it is deemed necessary, to remove liquids and would consider the use of corrosion inhibitors for the sections of the pipeline leading to the dehydration facility proposed at LSD 6-27-13-26 W4M. Under normal operating conditions no free liquids are anticipated in the pipeline downstream of the dehydration facility, but Crestar acknowledged that there could be some free liquids under upset conditions.

Crestar stated that soil conditions along the Kirkcaldy pipeline are typical of those in the southern Alberta flat range and would not result in any unusual external corrosion of the pipeline system.

Crestar depicted the amount of H₂S that would be carried in the pipeline as very low. Under normal operation 10 per cent of the volume would be produced from the one gas well which has been found to contain 1.8 per cent H₂S. The sour natural gas would be diluted to approximately 0.18 per cent H₂S upstream of the Kirkcaldy pipeline as a result of being mixed with gas from the sweet wells. Crestar commented that operating the sour gas well by itself would not be feasible as the gas pressure would not be sufficient for the proper operation of the gas compression equipment at the Vulcan gas plant.

Crestar proposed that to ensure future integrity of the pipeline, it would re-run the in-line inspection tool at set intervals and would conduct inspections by walking or driving the pipeline right-of-way at least once per year.

4.2 Views of the Interveners

The interveners believe that the existing Kirkcaldy pipeline is not suitable for the transportation of sour natural gas because of its age (approximately 30 years old), it has a tape wrap external coating rather than extruded polyethylene coating, it traverses areas of corrosive soils and construction practices and standards today are different than in the past. The interveners stated that a recent newspaper article identified pipelines with tape wrap coatings to be more susceptible to failures and that this appears to be the conclusion of a number of pipeline professionals. Mr. Adams suggested that the article indicates that the age and the effects of stress and corrosion are a concern of all pipelines. The interveners expressed concern with the 30 per cent pipe wall loss found in a section of the pipeline by Crestar's inspection and they extrapolated from this fact that in another 20 years half of the wall of the pipe will be lost. The interveners argued that Crestar had not completed the evaluation of its in-line inspection tool survey and suggested that the strengths and weaknesses of the pipeline were not yet known. Mr. Stretch was not satisfied that Crestar would be able to identify all areas of corrosion pitting in the pipeline.

Mr. Adams stated he was concerned with the integrity of Crestar's pipeline. He cited the effects of stress, corrosion, and expansion/contraction of the pipe over the life of the pipeline. Mr. Adams indicated his concerns about safety, centred around the age of the Kirkcaldy pipeline. The recent leak on Mr. Stretch's land and a recent newspaper article regarding pipeline failures by the TransCanada Pipelines system added to his concerns about safety.

4.3 Views of the Examiners

The examiners are satisfied that the proposed new pipelines would meet the sour gas requirements and note that this was not an issue with the interveners. However, the integrity of the existing Kirkcaldy pipeline was the primary focus of the hearing. Subsequent to the conclusion of the hearing, Crestar distributed to the participants and the examiners a metallurgical analysis of the 1996 pressure test failure and results of additional hardness testing.

The examiners believe that even though the pipeline has operated with natural gas containing H₂S since its installation and a satisfactory pressure test to 1.4 times the proposed maximum operating pressure was recently completed, there remains significant uncertainty about the integrity of the Kirkcaldy pipeline as indicated by the following observations:

- the pipeline failed during pressure testing,
- the metallurgical analysis determined that the failed pipe seam was not heat-treated resulting in weld heat-affected zone hardness significantly above the maximum allowed for sour service,
- the exact mechanism of the crack which led to the pressure test failure was not clearly identified but the metallurgical report identifies a possibility that as a result of failure of the outer surface wrap, soil induced stress corrosion cracking initiated on the outer surface of the pipe and propagated through the hard weld heat-affected zone,
- hardness testing on three other pipe joints indicated high hardness values, mostly above the maximum permissible for sour service; the metallurgical report concluded that it appeared that other joints in the line had unacceptably high hardness in the weld region,
- subsequent to the pressure test, a leak occurred on the existing Kirkcaldy pipeline; the exact cause for this leak was not determined prior to the hearing since conditions were not suitable for the failed pipe to be removed and analyzed, and
- Crestar has completed an in-line pipe inspection and suggested that, based on preliminary information, there were areas with corrosion in excess of 30 per cent pipe wall loss, however final analysis was not completed at the time of the hearing.

The examiners believe that there remain several unanswered questions regarding pipe integrity :

- What was the cause of the second leak?
- Was the cause similar to that for the failure during pressure testing?
- What is the condition of the tape wrap coating?
- Is the high weld hardness representative of the Kirkcaldy pipeline?
- Could there be stress corrosion cracking present elsewhere on the Kirkcaldy pipeline?
- How would Crestar respond to the above questions and satisfy the Board that the integrity of the Kirkcaldy pipeline would be suitable to transport sour natural gas?

The examiners are not satisfied that Crestar completed a thorough evaluation of the integrity of the Kirkcaldy pipeline to carry sour natural gas. The examiners believe that the applicant should have completed such evaluations to demonstrate that the pipeline would be suitable for the proposed service prior to applying to the EUB for approval.

5 PUBLIC SAFETY

5.1 Views of the Applicant

Crestar stated that it has taken steps and plans to take further steps to meet the safety concerns of the landowners and the requirements of the EUB. Crestar said that it had completed a pressure test and in-line pipeline survey of the Kirkcaldy pipeline, planned to install ESD valves, and would be lowering the existing maximum operating pressure to address safety concerns. Crestar also planned to have in place a specific emergency response plan (ERP) before placing the pipelines in service, and intended to update the ERP annually. Crestar personnel would conduct a simulated emergency response exercise each year.

Crestar was concerned with the request from a number of residents for H₂S monitors and breathing apparatus. Crestar stated it felt that providing members of the public with monitors and breathing apparatus would detract from public safety rather than enhance it.

In describing the properties of the sour natural gas that would be transported in the pipelines, Crestar stated that the gas is mostly methane with small amounts of H₂S. Crestar indicated the H₂S would not separate from the methane and that this type of gas mixture would, in the event of a release, dissipate very quickly as it moves away from the pipeline. Crestar added that a characteristic of this natural gas mixture is that it is not heavier than air, so it would not be expected to settle in low-lying areas.

Crestar indicated that the installation of ESD valves would reduce the volume of H₂S that could be released as a result of a pipeline failure. The resulting release volume would classify the Kirkcaldy pipeline as a Level 1 facility based on ID 81-3. Crestar stated the ESD valves have been designed to withstand extreme weather conditions and would be subjected to a 3-month test/maintenance schedule conducted by Crestar personnel. Crestar stressed that, although the ESD valves could be by-passed, it is against Crestar's operating policy to do so.

5.2 Views of the Interveners

Mr. Stretch argued that the Kirkcaldy pipeline is not safe to operate in sour natural gas service and expressed concerns about the potential danger H₂S gas presents to rural residents.

Mr. Stretch stated that Crestar's ERP failed to deal with evacuation of residents and whether or not cattle would be moved. Mr. Stretch expressed a concern that a recent failure on his property took too long to be confirmed and located by Crestar.

Mr. Stretch acknowledged that Crestar had attempted to alleviate some of his safety concerns by planning to install ESD valves and changing the Kirkcaldy pipeline to a Level 1 facility, but questioned Crestar's ability to follow through with its intended 3-month test/maintenance schedule. Mr. Stretch stated that he would like to see a third party monitor the testing/maintenance of the ESD valves. Mr. Stretch suggested that his safety concerns would not be alleviated if the one sour gas well, containing 1.8 per cent H₂S, was not produced as he would continue to have concerns with operating the pipeline at the existing MOP. Mr. Stretch stated a reduction in the MOP should be a condition should the EUB decide to approve the application.

Mr. Stretch stated that Crestar did not adequately describe the composition of the gas to be transported in the pipelines nor how to deal with the gas if there is a problem. Mr. Stretch added

that he has not received any written information on what to do in the event of a sour gas release, and he said that his requests made to Crestar for formal H₂S training or H₂S monitors have been refused. Therefore, Mr. Stretch suggested that Crestar should re-route the pipeline further from existing dwellings.

The Roebucks stated they share the same views on public safety of the pipeline as Mr. Stretch.

Mr. Adams indicated that Crestar has no site-specific ERP in place and stated that if the Board were to approve Crestar's application, a third party should inspect the ESD valves for proper functioning. Mr. Adams suggested that if he was not to be supplied with H₂S monitors, then respiration devices should be supplied.

Mr. Mueller stated he was concerned about the safety of his family should the pipeline rupture and result in H₂S entering his house.

5.3 Views of the Examiners

The examiners are satisfied that a detailed ERP for the pipelines would be required and it would have to be developed with input from the affected parties and finalized prior to placing the pipelines in sour natural gas operation. The examiners believe that the issuance of breathing apparatus and H₂S monitoring equipment to landowners and occupants would not enhance public safety.

The examiners are satisfied that if the gas mixture were to escape from the Kirkcaldy pipeline, it would be diluted quickly due to its favourable dispersion characteristics. The H₂S component would not separate from the mixture and would be dispersed along with the mixture rather than separate and accumulate in low-lying areas.

The examiners believe that if the integrity of the existing pipeline is determined to be sufficient, plans can be developed for safe operation. Ensuring safety requires that the company and the public adjacent to the facility understand the nature of the risks and safety measures designed to mitigate risks. The company and the public must work together to ensure safety measures are effective.

The examiners are satisfied that the new pipelines can be operated safely. However, the examiners cannot determine whether the same is true for the Kirkcaldy pipeline until more information is available regarding its integrity.

6 PUBLIC CONSULTATION

6.1 Views of the Applicant

Crestar stated that it had published a notice in the local newspaper respecting an open house for the entire project. However, the notice showed only a map of the new pipeline and did not include the existing Kirkcaldy pipeline. Crestar stated that at the time of the notice (18 July 1996) it had not anticipated any major concerns relating to the existing pipeline since it was already carrying gas containing H₂S.

Crestar stated that it attempted to address the concerns of the interveners by meeting with them and by modifying the Kirkcaldy pipeline to a Level 1 facility from its original plans for a Level 2 facility. Crestar also added that the MOP would be reduced.

Crestar stated that all of the landowners except Mr. Adams and the Roebucks had provided consent to the construction of the pipelines and the re-licensing of the Kirkcaldy pipeline.

6.2 Views of the Intervenors

Mr. Stretch indicated that the original notification letter from Crestar referred to licensing the pipeline as Level 3 and he had not received an update showing a reduction to Level 2 or Level 1.

Mr. Adams stated that other than information gathered at the meeting at the Stretch's residence and contact through land negotiations, he has received very little information on the development. Mr. Adams added that he assumed that after the meeting at the Stretch's residence, Crestar would supply him with additional information. Mr. Adams also stated that he was not made aware of an open house by Crestar.

6.3 Views of the Examiners

The examiners believe that early and complete disclosure of a project involving sour natural gas is necessary to ensure that all potentially affected parties understand the project and that the applicant understands and considers the concerns of the community. Subsequent discussions with concerned individuals and resolution of their concerns are integral parts of the application process.

The examiners acknowledge that Crestar held an open house for the public to obtain feedback on the project, however, as stated by the interveners, the newspaper notice was not detailed enough for individuals residing near the Kirkcaldy pipeline to determine if they may be potentially affected. Nevertheless, the examiners find that through individual contact with potentially affected parties, Crestar met the EUB public notification requirements, and expect that the applicant would continue dialogue, as necessary, with all landowners and residents affected by this project.

7 RECOMMENDATIONS

The examiners are not satisfied that Crestar has completed and presented sufficient evaluation of the integrity of the existing Kirkcaldy pipeline for the transportation of sour natural gas. Therefore the examiners recommend that Crestar's Application No. 1002908 be denied.

DATED at Calgary, Alberta, on 4 June 1997.

ALBERTA ENERGY AND UTILITIES BOARD

W. J. Schnitzler, P.Eng.

T. J. Pesta, P.Eng.

J. R. Creasey, P.Biol.