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## **Orphan Wells Dilemma in Canada**

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An orphan well is an oil and gas well or related facility that has no responsible or financially-able party to manage its abandonment and reclamation responsibilities [1], therefore becoming the responsibility of the Orphan Well Association (OWA). Orphan wells and facilities continue to proliferate because of multiple complex economic and environmental factors and pinpointing one root cause is a challenge, with few solutions in place. The remedy must consider a balance between economy and environment.

Leaving oil and gas wells exposed to the environment without proper abandonment or suspension is a serious environmental issue. Leaks can negatively impact human health, affect soil and groundwater quality and release methane to the atmosphere. The presence of an orphan well may also depreciate land value and increase the safety risk to third-party stakeholders, such as regulatory inspectors and firefighters.

The orphan wells inventory is increasing in North America due to continuous bankruptcies since the 2014 oil and gas price downturn. In 2019, bankruptcy filings in the US increased significantly [2] and more than 10 bankruptcies occurred for producers in Canada [3]. Going forward, the number of insolvencies and related orphan wells may increase as a result of different industry challenges including the most recent downturn in oil price.

Several economic, financial, regulatory, environmental and legal factors need to be reassessed to enable oil and gas operators to finance their projects. It is important to note that, with reasonable reforms and collaboration between stakeholders, insolvency rates can decline. Also, additional capital is needed to increase pipeline egress capacity, create demand for natural gas in domestic and global markets and facilitate reasonable incentives for junior companies to meet their environmental obligation and encourage them to diversify their business.

A cost-benefit analysis of monetary outlay associated with inspections, incidents and catastrophic events, medical treatments, litigations, land value, etc. and benefits related to rectifying orphan well issues could demonstrate the value proposition of the latter. This article identifies various challenges and potential solutions to address the issue in Canada.

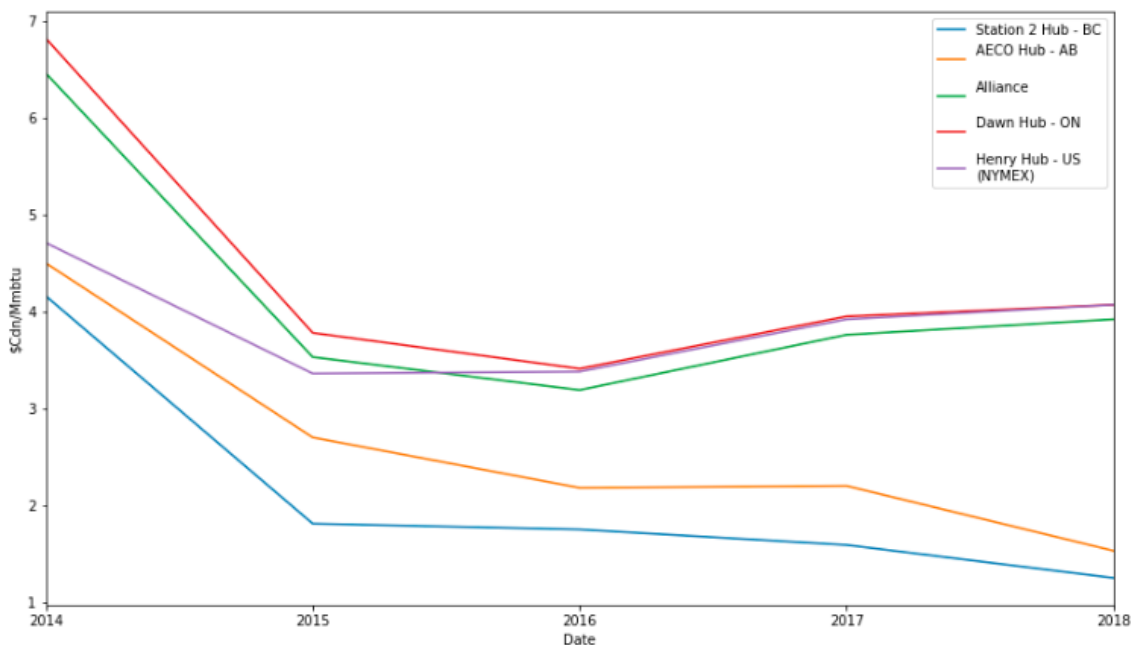
### **Market Challenges**

Oil and gas technology improvements, such as enhanced oil recovery and other factors including deep-water developments and the shale revolution have led to increased global production and field lifespan over the last few decades. Increased production flooded the market with oil and gas, affecting commodity prices and changing the long-term nature of the Exploration & Production (E&P) business from a high-risk-high-return investment to high-risk-low-return.

Abundance of supply in the oil and gas market has increased the level of competition. Being able to remain in the market and compete at lower prices would favour producers who can afford operations

with low expenditures, efficient supply chains, and economies of scale; this is known as the *red ocean strategy*. Opposite this is a *blue ocean strategy*, where suppliers need to offer a differentiated product from the majority of their competitors; for example, commodities such as natural gas liquids (NGLs) and condensate, rather than natural gas. It is important to note that natural gas prices in Western Canada are the lowest compared to other hubs (Figure 1).

**Figure 1: Average Natural Gas Prices in Different Hubs from 2014 to 2018**



Source: Sproule. Modified by CERl to Canadian dollars with respect to the historical exchange rates

The second shale boom in the US attracted Canadian E&P and service companies due to market predictability, the possibility of producing high volumes, and short payback periods. However, there are skeptical views regarding the success of this wave because of the project economics, which resulted in increased insolvency in the US. For example, the breakeven price remained relatively high compared to the conventional production provided by other global suppliers such as Saudi Arabia, OPEC and Russia; low-profit margins and lower returns on investment discouraged investors and financial markets. It is important to note that successful economic models from shale reservoirs require maintaining high volumes of production, proper asset management, and continuous capital investment as the production decline rates are very high for shale reservoirs.

Applying the Altman Z-score model would reflect how different companies in Canada are affected by the decline of oil and gas prices post 2014, and how big players recovered in the downturn while smaller players remained in financial distress.

The Altman Z-score is a model created by Edward Altman in 1968 to predict the probability of bankruptcy in the near term. It requires different financial metrics that assess solvency, profitability, leverage, liquidity and turnover. When the ratio (z-score) is below 1.8, it means that there is a high probability that a company will go bankrupt within two years. The range between 1.81 and 2.99 is a grey area showing a financial struggle, while 3.0 and above means that the company is in the safe zone. It is important to note that this model was initially designed for the manufacturing sector. However, it has been frequently used in the literature to assess the financial health of oil and gas companies [4], [5].

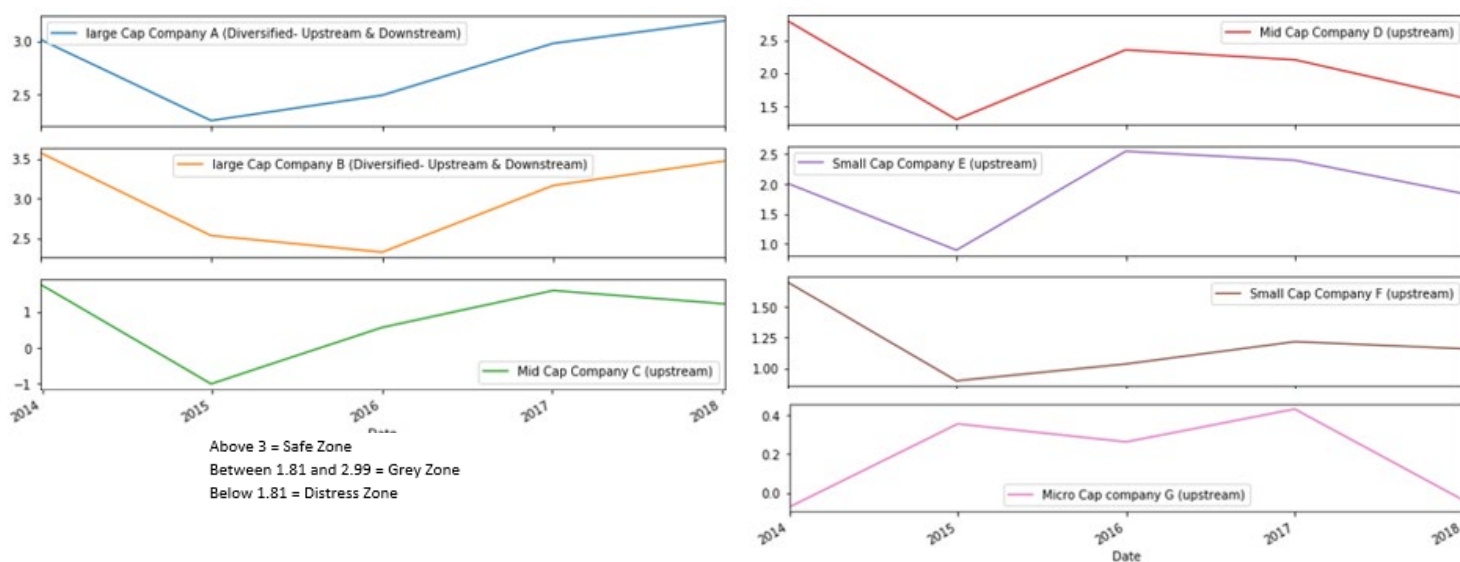
The CERI analysis applied the Altman z-score methodology to seven oil and gas producing companies currently operating in Canada, testing their financial performance after the 2014 oil downturn (Figure 2). The selection of those companies was based on the availability of the data on the Toronto Stock Exchange (TSX), company size (large, mid, small, or micro-cap), commodity type (i.e., natural gas), diversification level (upstream business only/both upstream and downstream) and domestic only or domestic and overseas exposure.

The analysis determined that:

- Z-score trends moved in alignment with natural gas prices.
- Upstream companies have struggled with low commodity prices since 2014; other multinational companies in Canada recovered and maintained a better z-score due to their diversified portfolios. Note: some financial statements highlighted that low commodity prices favored other projects such as refineries, petrochemicals and LNG.
- Upstream companies face the risk of bankruptcy, no matter the size or market capitalization.

It is important to note that the large and mid-sized companies in this assessment have either canceled projects or are moving some of their assets away from Canada.

**Figure 2: Z-Scores for Different Oil and Gas Companies in Canada from 2014 to 2018**



Source: TSX, Financial Statements, 2019

Figure 2 shows a recent decline in the financial health of some companies after 2017. This decline shows a high dependency on natural gas sales. The steep decline after 2017 is due to the significant reliance on the AECO price, while the moderate decline shows the effect of selling other commodities and exposure to other natural gas markets such as Dawn and NYMEX. The increasing trend for big players is due to exposure to different project types such as the petrochemical sector. Also, the big players (Company A & Company B) maintained a better z-score and recovered from the 2014 downturn, while mid and small players (companies C, D, E & F) remain in distress or struggle. On the other hand, junior player company G is in deep financial distress and has a very high probability of bankruptcy.

## Regulatory and Legal Challenges

From the regulator's perspective, the issue of orphan wells is a real challenge. There is more routine work required, including policy development, inspections and enforcement. With bankruptcies, there is also an increase in time-consuming and costly non-routine work such as asset review, litigation preparation, and negotiations with the receiver as to who is responsible for managing the assets.

Proactive monitoring, compliance and enforcement are essential to limit the existence of inactive and suspended wells because the highest risk is associated with wells that do not have specific timeframes for final decommissioning [12], [13]. Regulators may have limited annual budgets and human resource capacity that may not allow continuous monitoring, especially for site visits. As most site visits are risk-based, efforts go to the highest priority sites such as insolvent company sites, oil spills and other incidents. Inactive and suspended wells get minimal attention and, eventually, they can become orphan and legacy wells. It is a cycle.

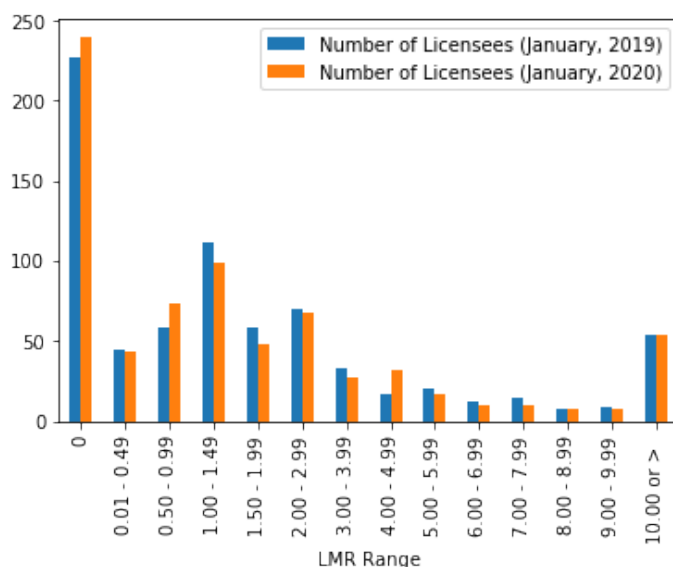
One landmark legal case is the Redwater case, *Orphan Well Association. v. Grant Thornton Ltd.*, which defined the legal situation of oil and gas bankruptcies in Canada where decommissioning costs are secured first in bankruptcy, before paying creditors. The Supreme Court of Canada (SCC) reinforced the law when it was heard on appeal. The SCC decision does not undermine the creditor's rights in the *Bankruptcy & Insolvency Act*, it just secures the decommissioning costs first.

Regulators in Western Canada have implemented liability management programs to ensure that decommissioning costs are secured when a company's asset to liability ratio goes below a limit. This limit is determined monthly by calculating a ratio that reflects the current Liability Management Rating (LMR) of a company, and also requires a refundable security deposit to cover decommissioning and reclamation costs when the company's rating goes below the threshold of 1.0, which would be when the deemed asset (including production) is less than the deemed liability. Regulators expect companies to maintain a ratio above 1.0 [6]–[8] by reducing liabilities or increasing assets. Companies below the threshold may not be able to pay a security deposit, reduce liabilities, increase assets, or pay the orphan well levy, leading them into bankruptcy.

There are a few cases that highlight flaws in the program. The primary flaw with the current system is that it does not consider a company's financial position – it only looks at an arbitrary ratio. For example, the ratio for Houston Oil & Gas in 2019 was below the threshold and there were no security deposits. The company handed the keys over to the AER, and the OWA put the company into receivership in October 2019, leaving approximately 1200 sour gas wells [6], which demonstrates that identifying the risk is not enough to fix the issue [9]. A low liability rating can affect a potential purchase and other liquidation options. For example, Strategic Oil & Gas tried to sell some assets in 2018. However, the prospective purchaser was not able to meet the LMR requirements to facilitate the necessary license transfers. Eventually, Strategic Oil & Gas obtained protection under the *Companies' Creditors Arrangement Act (CCAA)* in April 2019 [3].

Regulatory mechanisms may or may not solve the issue, but the true solution is resolving the financial and economic aspects. In the past, large companies did exploration and production for new reservoirs and made the highest profits. As these reservoirs became less profitable, these big players sold their assets to smaller companies who could still make profits from the reserves due to the lower overheads. The main issue is that those smaller companies became responsible for all the decommissioning costs, which they could not afford when the oil and gas prices dropped. It is important to note that the number of licences below the threshold increased over a short period in Alberta (Figure 3).

**Figure 3: Number of Licensees vs. LMR Range in Alberta**



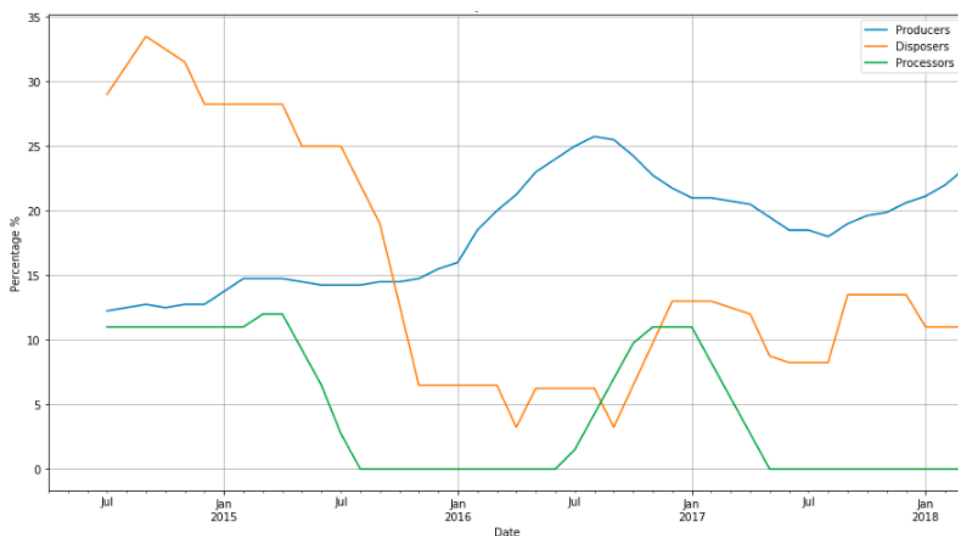
Source: AER, 2020

Other expenses associated with orphan wells add an additional financial burden to the industry. The Orphan Well Levy is an industry-paid levy to decommission orphan wells; however, it may not be enough to grow proportionally with the increased inventory of orphan wells. In Alberta, the levy increased from \$30.4 to \$45.3 million in 2018, was set at \$60 million in 2019, and is budgeted for \$65 million in 2020 [8] [9] [7]. The impact of one bankruptcy can yield hundreds or thousands of orphan wells (e.g. Trident Exploration abandoned 4,400 wells)[10]. Each company's levy is based on the ratio of its liabilities to the industry's liabilities. For example, large companies have higher liability values (and assets) so their share of the levy is higher compared to smaller companies. [15]. When large-cap companies sell or move assets, sell their shares in projects, or reduce their assets and liabilities in Canada, it means that, over time, smaller companies will be the main contributor for those levies, possibly leading to more bankruptcies.

In March 2020, the Government of Alberta announced a new plan, *A Blueprint for Jobs*, to create jobs in the province. Part of this plan is to provide the OWA with \$100 million loan to decommission more orphan wells[11].

The issue of orphan wells in British Columbia (BC) is also critical. Past trends demonstrate an increase in the risk of bankruptcy especially for producers (Figure 4). However, a new legislation, *Dormancy and Shutdown Regulation*, came into effect in BC in 2019 to set timeframes for dormant sites that have not met a certain threshold of activity but still have a viable operator[14], [15]. The decommissioning regulations in BC also became more stringent as a result of the new *Comprehensive Liability Management Plan* that aims to ensure 100% of the costs of reclamation are paid by industry [15], sets timelines for decommissioning, and issues permits based on operator's compliance history.

**Figure 4: Percentage of Oil and gas Companies below LMR Threshold in BC**



Source: BC Oil & Gas Commission, 2019

## Financial and Economic Challenges

The recoverable volume of oil and gas reserves in a reservoir is the biggest asset for an E&P company. As production commences, those volumes decrease over time to an uneconomical level, which requires companies to be constantly developing other resources and prospects to ensure sustainability. If a company cannot replace and grow reserves, it may not be able to keep a strong balance sheet due to the lower sales income and ongoing operating expenditures, salaries, levies, taxes and other expenses.

Another challenge is that natural gas prices are currently low, so shifting to other commodities with higher prices such as condensates, NGLs and light crude oil might be essential to improve the financial status of a company. However, this requires financing and more capital investments for exploration and development including drilling, processing and transporting commodities to the nearest market. When financing options are limited, an E&P company is at risk; in some cases, the only option would be the liquidation of assets, restructuring or downsizing the company. The company may try to sell its wells to a different operator and move assets to other projects.

As a result of the Redwater decision, creditors are less likely to finance upstream projects as the lending risk has increased and the stock market for similar projects is in continuous decline. As stated earlier, financing is an essential and ongoing process to remain in business. As the oil and gas fields become mature, funding would be required to develop new oilfields to maintain the desired production rates to maintain cash flows.

Another financial implication for companies already in financial distress is that the trustee would have limited options to manage and liquidate assets, especially when there is a significant number of worthless assets. Meanwhile, the regulator may not allow license transfers to another owner unless specific conditions are met, such as a closure plan for inactive and suspended wells; liabilities are packaged with the valuable assets; or security is posted to cover unfunded liabilities. It is important to note that when a regulator enforces the law upon a bankruptcy as the SCC decision supports, it diminishes the value of the assets [2].

## Opportunities

There are recent efforts by the industry to identify opportunities and solutions for orphan wells. The focus is decreasing the number of inactive and suspended wells, which aligns with regulator plans in Western Canada to set timelines for decommissioning. One of these opportunities was proposed by the Petroleum Services Association of Canada (PSAC) that recommends that the federal and provincial governments introduce a policy and fiscal tool that would facilitate a Resource Environmental Tax Credit (RETC) for investors in junior E&P companies through providing tax credits for decommissioning of inactive and suspended wells. It provides incentives for small operators to meet their environmental obligations, remain in the market, and create more jobs [17]. However, this solution is only suitable for operators who can maintain a healthy financial situation and not rely upon expense credits generated by decommissioning work.

Even though Alberta has the highest amount of orphan wells in Canada, it is in a better position to deal with the orphan wells/legacy wells issue than other Canadian provinces that are less reliant on hydrocarbon extraction such as Ontario. This is because there are more hydrocarbon resources to produce, which means higher value of assets compared to the total liabilities in the province. A holistic liability management plan is important in the upcoming years to ensure abandonment of all orphan wells in the province before the total liabilities exceed the value of the assets. The plan was published in a recent study by Sproule that shows the opportunity and the recommended business model (Figure 5). The implementation would require policy and regulatory improvement, applying best practices of asset management, a holistic liability management plan on at the provincial level and synergies between stakeholders.[18].

**Figure 5: Value of Assets vs Liabilities in Alberta**



Data source: Sproule, 2020

## SWOT Analysis for Orphan Wells in Canada

<p style="text-align: center;"><b>Strengths</b></p> <p><b>Knowledge, experience and funding options</b></p> <ul style="list-style-type: none"> <li>• Existing upstream industry willing to pay orphan well levies, identify technical areas to reduce decommissioning costs, collaborate, and work efficiently to reduce the overall costs.</li> <li>• There are comprehensive regulations, standards, directives and guidelines in place to ensure proper decommissioning.</li> <li>• Recent provincial regulatory understanding of the regulatory gaps; new endeavors to improve the current frameworks by focusing on compliance and enforcement checks, modernize the existing liability management rating system to look at the company's financial health and performance history, and set timelines for the cleanup of all wells in a province, more stringent licensing requirements.</li> </ul>	<p style="text-align: center;"><b>Weaknesses</b></p> <p><b>Market, economic and financial challenges</b></p> <ul style="list-style-type: none"> <li>• Oversupply reduces the commodity price, potentially leading to bankruptcies, which may remain until the market reaches the general equilibrium state. Higher breakeven supply costs, increased regulatory costs, increased sovereignty and project risks affect financing.</li> </ul> <p><b>Legal, regulatory and environmental challenges</b></p> <ul style="list-style-type: none"> <li>• Regulatory burdens and other pressures on the industry are causing bankruptcies for junior and small-sized companies, while medium-sized and large caps can move their assets/business out of Canada.</li> <li>• Regulatory mechanisms in place cannot control the situation; the orphan well inventories are increasing in different provinces.</li> <li>• Regulators do not have required financial and human resource capacity to ensure compliance and enforcement of orphan, inactive, suspended and legacy wells.</li> <li>• Environmental opposition adds legal, regulatory and financial burdens on industry, leading to the departure of the big players from Canada.</li> <li>• Focus is on climate change, with most of the funding going to low-carbon projects at R&amp;D and demonstration levels, while orphan wells not being addressed.</li> </ul>
<p style="text-align: center;"><b>Opportunities</b></p> <p><b>Macro-level improvements</b></p> <ul style="list-style-type: none"> <li>• Take advantage of cheap natural gas prices in western Canada by accelerating natural gas-based projects such as LNG and provincial diversification projects.</li> <li>• Implement social and environmental programs that contribute to GDP and create jobs through the decommissioning of orphan and legacy wells in Canada.</li> </ul> <p><b>Micro-level improvements</b></p> <ul style="list-style-type: none"> <li>• Modernize regulatory frameworks with cost-benefit considerations.</li> <li>• Provide incentives to encourage existing operators to decommission in-active/suspended wells.</li> <li>• Facilitate and implement relevant asset management business models that satisfy E&amp;P producers, government and citizens.</li> </ul>	<p style="text-align: center;"><b>Threats</b></p> <p><b>Environmental and social consequences</b></p> <ul style="list-style-type: none"> <li>• Major health issues for citizens living in the vicinity of orphan wells.</li> <li>• Life threatening hazards due to the exposure to H<sub>2</sub>S gases; possible fires and explosions due to methane leaks; adverse impacts on soil, water, and air quality; and uncontrolled methane leaks to the atmosphere.</li> <li>• Direct and indirect burdens on landowners/farmers such as litigations, decrease in land value, challenges during buying/selling, etc.</li> </ul> <p><b>Large orphan wells inventory that could continue to increase</b></p> <p><i>"If the status quo is maintained, we can expect to see more orphaned wells and higher levies ultimately resulting in more bankruptcies and even more orphaned wells. It's a cycle that needs to be broken. Without question, reform is coming."</i> [19]</p>

Data source: CERl



## Conclusion

Orphan wells are a recognized problem. There are different challenges contributing to the orphan well issue that include a company's financial situation, the economy, the environment and regulations. The solution is complex and requires efforts and reforms from all stakeholders. It is important to consider all options to allow oil and gas operators to remain in business and be able to meet their decommissioning obligations. Without proactive steps from policy makers, the number of orphan wells will continue to grow in Canada, adversely impacting Canadians for decades.

Focusing on the following solutions is critical:

- Facilitate major projects to create domestic demand for natural gas producers
- Modernize related polices to reduce unnecessary burdens on the industry
- Set timeframes for decommissioning
- Ensure continuous monitoring and enforcement
- Collect security bonds when applicable
- Ensure licencing is based on performance or historical records
- Provide incentives for junior producers for a limited time
- Provide funds to accelerate the cleanup process
- Facilitate a predicable business environment to attract big players who contribute significantly to orphan well levies

## References

- [1] Orphan Well Association, 'What is an Orphan?', Orphan Well Association.
- [2] Haynes And Boone., 'Oil Patch Bankruptcy Monitor', 2020.
- [3] Insolvency Insider, 'Recent Filings | Insolvency Insider', 2019. [Online]. Available: <https://insolvencyinsider.ca/filing/>.
- [4] S. Bracegirdle, 'Using the Altman z-score model to test bankruptcy in the Oil Industry', 2019.
- [5] Business Compass, 'Altman Z-Score Analysis of Tamaska Oil and Gas Limited (TMK)', 2014. [Online]. Available: [http://www.altmanzscoreplus.com/articles/AltmanZScorePlus\\_TMK\\_Tamaska\\_Oil\\_and\\_Gas\\_Limited.html](http://www.altmanzscoreplus.com/articles/AltmanZScorePlus_TMK_Tamaska_Oil_and_Gas_Limited.html).
- [6] AER, 'Liability Management Rating and Reporting', 2020. [Online]. Available: <https://www.aer.ca/regulating-development/project-closure/liability-management-programs-and-processes/liability-management-rating-and-reporting>.
- [7] Government of Saskatchewan, 'Licensee Liability Rating Program | Liability Management', Government of Saskatchewan, 2019. [Online]. Available: <https://www.saskatchewan.ca/business/agriculture-natural-resources-and-industry/oil-and-gas/liability-management/licensee-liability-rating-program>.
- [8] BC Oil & Gas Commission, 'Liability Management Rating Program', BC Oil and Gas Commission, 21-Nov-2012. [Online]. Available: <https://www.bcogc.ca/industry-zone/liability-management-rating-program..>
- [9] Court of Queen's Bench of Alberta, 'Receivership Order'. 2019.
- [10] OWA, 'Appointment of Receiver for Trident Exploration', 2019. [Online]. Available: [http://www.orphanwell.ca/wp-content/uploads/2019/05/OWA-Media-Release-Trident-Exploration\\_2019-05-03.pdf](http://www.orphanwell.ca/wp-content/uploads/2019/05/OWA-Media-Release-Trident-Exploration_2019-05-03.pdf).
- [11] Government of Alberta, 'A Blueprint for Jobs', 2020.
- [12] L. Muehlenbachs, '80,000 INACTIVE OIL WELLS: A BLESSING OR A CURSE?', 2017. [Online]. Available: <https://www.policyschool.ca/wp-content/uploads/2017/03/Inactive-Oil-Wells-Muehlenbachs-1.pdf>.
- [13] F. Stewart, 'What Has Changed Since The Grant Thornton Case?', 2019.

- [14] BC Oil & Gas Commission, 'Dormancy and Shutdown Regulation', 2019. [Online]. Available: [http://www.bclaws.ca/civix/document/id/complete/statreg/112\\_2019](http://www.bclaws.ca/civix/document/id/complete/statreg/112_2019).
- [15] BC Oil & Gas Commission, 'Comprehensive Liability Management Plan', 2019.
- [16] EPA, 'Inventory of US Greenhouse Gas Emissions and Sinks', 2018.
- [17] PSAC, 'PSAC Budget Recommendation', 2019.
- [18] Sproule, 'Fulfilling Decommissioning Obligations', 2020.
- [19] F. Stewart and K. Cameron, 'Post Redwater', 2019. [Online]. Available: <https://www.policyschool.ca/post-redwater/>.

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