Understanding and Mitigating Well-Integrity Challenges in a Mature Basin

David Hardie, Anita Lewis
Senior Advisors

September 29, 2015
Surface Casing Vent Flow (SCVF) & Gas Migration (GM)
Well demographics

Well-integrity challenges

Life cycle approach to mitigate challenges
Western Canada
British Columbia, Alberta, and Saskatchewan

By year-end 2015, there will be 600 000 wells drilled in western Canada.

- Active: 236,755 (40%)
- Inactive: 139,247 (23%)
- Abandoned: 207,359 (35%)
- Licensed/New drill: 9,735 (2%)
Types of wellbore leakage:
- SCVF and GM (8 per cent)
- Casing failures (2 per cent)
- Abandonment plug failures (2 per cent)
Factors Influencing SCVF/GM

» Geography and geology
» Primary cementing
» Well deviation
Wells with Reported SCVF/GM

Data provided by the Alberta Energy Regulator, the British Columbia Oil and Gas Commission, and the Saskatchewan Ministry of Economy
Influence of Cement Top

Cement at Surface

Low Cement Top
Cement top below surface casing shoe
Assessing Risk

Percentage (%)

Flow Rates (m³/d)

Non-Serious

Serious

<1
1-9.9
10-99.9
100-299
300-1000
>1000

Alberta
British Columbia
All wells had reported cement returns to surface during drilling of the well.
Alberta: Leakage in Abandoned Wells

- Prior SCVF/GM
- Regulatory requirements
- Age of well
Alberta: Leakage in Abandoned Wells

- Historic leak: 16%
- No historic leak: 6%
- Not likely tested/reported: 6%
Impact of Regulatory Requirements

Alberta: Leakage in Abandoned Wells

Impact of Regulatory Requirements Graph:
- Pre-Dir 9: 6.7%
- 1966 - 1991: 7.4%
- 1995 - 2003: 4.1%
- 2004 - 2007: 4.1%
- 2008+: 11.6%

Sealed cap abandonments
Vented cap abandonments
Alberta: Leakage in Abandoned Wells

Leaking Abandoned Wells by Age

- Pre 1966: 44%
- 1966 - 1975: 6%
- 1976 - 1985: 27%
- 1986 - 1997: 9%
- After 1997: 14%
What are the Risks?

- Fugitive emissions
- Groundwater contamination
- Spills
- Public safety
- Credibility of regulator
Well Integrity: How Are We Addressing the Issue?
Well Integrity: How Are We Addressing the Issue?

» Directive 079: Surface Development in Proximity to Abandoned Wells
  • Management versus repair

» Draft IRP # 25: Primary and Remedial Cementing
  • Improving well construction practices

» Assessing risks through pilot projects and data-driven modelling
Well-Integrity Risk Assessment Model

Well Risk

- Well Construction & Design
- Well Integrity & Operations
- Consequence

AER
Mitigating Well Integrity Risks

Assessment of leakage risk

Directive 079: Surface Development in Proximity to Abandoned Wells

Abandoned Well Integrity Assessment Project

Directive 020: Well Abandonment

Well Information Management System

SPE: Various Initiatives

DACC IRP 25 – Cementing

CSA – New well standard

IRP24: Hyd. Fracturing

AER URF Initiative

Frac Focus

AER Rules & Directives
Building a Healthy and Sustainable Energy Sector

Liability Management

Long-Term Public Protection

Regulatory Initiatives
Leading the next era in energy regulation

www.aer.ca

@aer_news

www.youtube.com/user/ABEnergyRegulator

http://blog.aer.ca

www.linkedin.com/company/alberta-energy-regulator