

The governance of hydraulic fracturing in unconventional resources: the elements, form and effectiveness of the regulations

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Aspects of hydraulic fracturing

Hydraulic fracturing is a process used globally in energy recovery operations to increase fluid conductivity in the rock matrix. It has been used in the oil and gas sector since the late 1940s and also in coal seam gas (CSG) activities in Queensland to a small extent (<10% of wells) since the early 2000s. In combination with horizontal drilling and other advanced technologies, it has dramatically altered access to hydrocarbon reserves in very low permeability strata such as shales and tight sandstones.

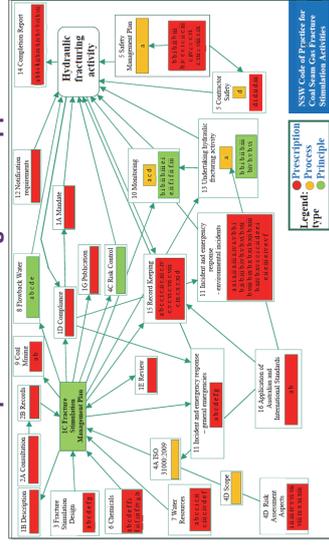
The advances in recovery the technology brings has seen the sector rapidly develop across the globe. The United States in particular has seen a substantial increase in hydrocarbon recovery in the last 20 years using this technology.

However, for various reasons, the term “fracking” has become associated with a social response. Governments have moved to regulate this aspect of the energy sector in response to the social response to the widespread application of this technology. This is because the technology is frequently deployed in clear view of the public, in a landscape previously utilised for agriculture or urban development.

Rule form

A typology of rules was developed identifying nine types of prescription rules, two types of process-based rules, four types of principle-based rules and two types of performance-based rules.

How is performance regulation applied?



What does it all mean?

- Hydraulic fracturing presents similar potential environmental impacts across the world.
- Regulatory frameworks may involve a number of players (federal, state or local) but the focus is very similar.
- Performance regulation seems to be applied more often to highly engineered aspects and at, or closer to, the well.
- The elected official (minister, governor, supervisor) has a high level of decision-making at the commencement and during the activity of fracturing. Senior professionals (public servants) have a largely bureaucratic role.
- Analysis of compliance data did not resolve the question as to whether prescription or performance regulation is more effective in reducing adverse events.

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The research question

This research investigated whether the form of regulation constraining hydraulic fracturing (whether it is prescriptive or performance based), was related to the maturity of petroleum development in the jurisdiction where unconventional resources are being accessed with hydraulic fracturing.

Methodology

Regulations have been systematically ‘deconstructed’ using the Institutional grammar tool. This tool is used to compare the diverse legal constructs found across jurisdictions from a range of cultures and constitutional frameworks. Each rule was analysed to determine the rule form, i.e. prescriptive through to performance based.

Geospatial location of performance regulation

Wellhead	Wellbore	Off-site
P1: Change design	P1: Geologic and seismic risk	P1: Chemical disclosure
P2: Well integrity and BOP	P2: Environmental risk assessment	P1: Baseline water quality
P3: Construction and completion	P3: Engineering specifications for containment	P1: BTEX and hydrocarbons
P4: Appliance protection	P4: Well management	P2: Compliance and enforcement
P5: Atmospheric emissions management	P5: Protection of water sources	P3: Off-site wells
P6: Radiocative substances	P6: Fluid waste management	P4: Hydraulic fracturing report
P7: Plug and abandon	P7: Emergency management	P4: Geospatial limitations
	P8: Impact management	
	P9: Wellhead and BOP prevention	
	P10: Site rehabilitation	

Aspect includes use of some principle-performance statements.

The application of risk conditions to permits

Fracked wells	Risk regulation	
Alberta	7,700	No
British Columbia	4,400	No
Colorado	18,168	No
Illinois	0	No
Pennsylvania	6,651	No
Wyoming	1,126	No
Queensland	425	No
Western Australia	7	Yes
South Australia	4	Yes
New South Wales	0	Yes
South Africa	0	Yes
Brazil	0	Yes

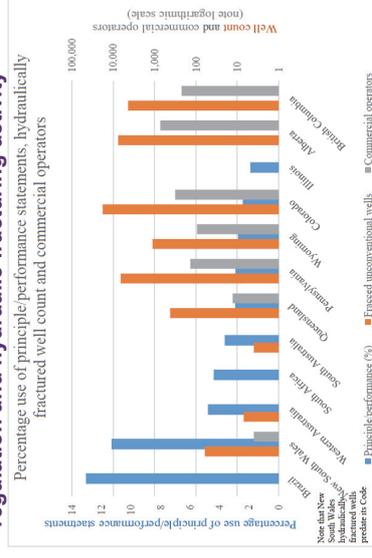
Jurisdictions considered

- USA – Colorado, Illinois, Pennsylvania, Wyoming
- Canada – Alberta, British Columbia
- Australia – Western Australia, South Australia, New South Wales, Queensland
- South Africa
- Brazil

Results

Nearly 2,000 rules were deconstructed and categorised. Overwhelmingly, jurisdictions use prescription (88.5%) or process (8.2%). The use of performance-type rules have been used in only 3.3% of regulatory opportunities.

The inverse relationship between performance regulation and hydraulic fracturing activity



- Prescription regulation provides a framework that supports a high level of unconventional resource development.
- The incorporation of risk assessment conditions within permits or as an obligatory regulatory requirement is not associated with a vibrant petroleum development sector.
- Application of performance regulation is limited by imprecision in assessing compliance.
- The use of performance regulation is not cheaper or easier than prescription.
- This study is the first to provide a detailed quantitative analysis of different regulatory forms using a unequivocal regulatory-form typology.
- Performance regulation has a restricted role but for such a high frequency activity as hydraulic fracturing, prescription is the regulation of choice.