

# NOTES

## A Lesson from the Shale Revolution in the United States, Canada, and China

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### ABSTRACT

*This Article surveys policy and regulatory responses taken by the governments of the United States, Canada, and China in response to the advent of fracking. It also adopts a comparative perspective to develop a list of considerations that the governments of countries already engaged, or thinking about engaging in, shale gas production could use to guide their respective legal frameworks in the context of shale gas development. Absent a dramatic overturn of economic, environmental, or energy policies in those countries, it would be fair to state that the United States, Canada, and China will continue to be the three largest shale gas producers in the world. Depending on their policy priorities, political environment, and the maturity of their shale gas developments, the regulatory reactions of the three countries have varied. Given the similar democratic governmental structures and political environments of the United States and Canada, this Article first discusses the current regulatory systems of the two countries together and China's regulatory system separately.<sup>1</sup> Next, this Article compares the three systems and identifies common issues that the three countries face. The similarities in the countries' government structures, jurisdictional conflicts, multidirectional mandates and policies, and lack of regulations that are targeted for shale gas production, provide information from which countries can use to develop their legal frameworks for shale gas extraction.*

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1. For the purpose of understanding the shale gas industry and regulations comparatively, specific and different nuances of the political environments in the United States and Canada will not be discussed in this Article.

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## INTRODUCTION

Innovations in hydraulic fracturing and horizontal drilling have brought about an advent of new energy development that continues to transform the energy market and regulatory framework of almost every country touched by the shale gas revolution.<sup>2</sup> This process—known as fracking, fracing, or hydrofracking—is making shale gas development economically viable in some countries, and as a result, is changing the dynamics of the international energy market.<sup>3</sup> Worldwide natural gas production is projected to increase by more than 150% by 2040, and shale gas is expected to account for 30% of that increase.<sup>4</sup> Currently, only four countries, the United States, Canada, China, and Argentina, produce shale gas in commercial quantities.<sup>5</sup> The United States is now the largest producer of shale gas in the world, and in 2015, shale gas production accounted for more than half of the United States’ natural gas production.<sup>6</sup> In 2040, it is projected that shale gas will account for more than 70% of the United States’ total natural gas production.<sup>7</sup> Canada has been the second-largest producer of shale gas since its first production in 2008, and is projected to increase its production to account for almost 30% of Canada’s total natural gas production by 2040.<sup>8</sup> China, as of 2015, has produced a relatively small amount of shale gas, but has ambitious plans to dramatically increase its shale gas production.<sup>9</sup> By 2040, shale gas is projected to

2. See John M. Golden & Hannah J. Wiseman, *The Fracking Revolution: Shale Gas as a Case Study in Innovation Policy*, 64 EMORY L. J. 955, 955-58. (2015).

3. Hannah J. Wiseman, *Risk and Response in Fracturing Policy*, 84 U. COLO. L. REV. 729 (2013); Hannah Wiseman, *Fracturing Regulation Applied*, 22 DUKE ENVTL. L. & POL’Y F. 361 (2012).

4. Faouzi Aloulou & Victoria Zaretskaya, *Shale Gas Production Drives World Natural Gas Production Growth*, U.S. ENERGY INFO. ADMIN. (Aug. 15, 2016), <http://www.eia.gov/todayinenergy/detail.php?id=27512>.

5. *Id.*

6. *Id.*

7. *Id.*

8. *Id.*

9. Paolo D. Farah & Riccardo Tremolada, *A Comparison Between Shale Gas in China and Unconventional*

account for more than 40% of China's total natural gas production, resulting in China replacing Canada as the second-largest shale gas producer in the world.<sup>10</sup> Commercial production of shale gas in Argentina is currently commercially limited, possibly due to shortages of specialized rigs and fracturing equipment, but Argentina's shale gas reserves may have unlimited potential, boasting the second-largest amount of recoverable shale gas (after China) and increased foreign investments in shale gas production.<sup>11</sup> Not to undermine the importance of Argentina's potential, this Article focuses on the United States, Canada, and China because the shale gas developments in these three countries have progressed enough to provide meaningful data to evaluate their governmental and regulatory responses in the context of shale gas production.

### I. THE ADVENT OF SHALE GAS

With growing concerns about the environment, energy dependence, and geopolitical issues with the use of fossil fuels, the United States' government and energy producers have searched for non-conventional energy sources like shale gas. The gas is often referred to as a "bridge fuel,"<sup>12</sup> reflecting the hope of transition from fossil fuels to carbon-free renewable resources. Shale gas is still a hydrocarbon, but has less detrimental environmental effects than other fossil fuels and is, at least for now, more economically efficient than renewable resources.<sup>13</sup> The excitement for shale gas to bridge the gap between the fossil fuels and renewable energy sources coupled with the commercial success of the Barnett Shale in north-central Texas have brought much attention to the United States' shale gas development since the early 2000s.<sup>14</sup>

In Canada, shale gas production first started in British Columbia in 2005,<sup>15</sup> and from 2005 to 2008, the increase in oil prices incentivized natural gas companies to jump into shale gas development, primarily in western Canada.<sup>16</sup> Even with increased oil prices, Canada has only explored shale gas development in a

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*Fuel Development in the United States: Water, Environmental Protection, and Sustainable Development*, 41 BROOK. J. INT'L L. 579 (2016).

10. Victoria Zaretskaya *China leads the growth in projected global natural gas Consumption* U.S. ENERGY INFO. ADMIN. (Oct. 25, 2017), <https://www.eia.gov/todayinenergy/detail.php?id=33472>.

11. *Id.*

12. Farah & Temolada, *supra* note 9, at 587.

13. *Id.*

14. *See id.* at 589; *see also* U.S. Energy Info. Admin., *Where Our Natural Gas Comes From*, ENERGY IN BRIEF (Jan. 10, 2017), [https://www.eia.gov/energyexplained/index.cfm?page=natural\\_gas\\_where](https://www.eia.gov/energyexplained/index.cfm?page=natural_gas_where).

15. Nat. Res. Can., *Exploration and Production of Shale and Tight Resources*, ENERGY (Aug. 23, 2016), <http://www.nrcan.gc.ca/energy/sources/shale-tight-resources/17677>.

16. Jed Chong & Milana Simikian, *Shale Gas in Canada: Resource Potential, Current Production and Economic Implications* 5 (Library of Parliament, Pub. No. 2014-08-E, 2014), <https://lop.parl.ca/Content/LOP/ResearchPublications/2014-08-e.pdf>.

handful of provinces, including Alberta, British Columbia, and Saskatchewan.<sup>17</sup> However, the advent of shale gas and the subsequent decline in the price of oil has been a double-edged sword for Canada.<sup>18</sup>

Historically, Canada has been the United States' largest foreign supplier of natural gas, "fueling" the United States economy.<sup>19</sup> However, after the shale revolution, more United States gas has been imported into eastern Canada, which has contributed to the decline in Canada's gas production and depressed gas prices.<sup>20</sup> Nonetheless, low gas prices have benefited Canadian consumers and energy-intensive businesses and industries. In contrast to the United States, where the advent of shale gas production greatly benefits the United States' economy, Canada receives limited benefits because the loss of Canadian energy exports to the United States has possibly not been fully recovered by the decline in the global price of gas. Thus, the future of shale gas extraction in Canada is difficult to predict and will depend on multiple factors, but the Canadian shale gas industry is still expected to continue growing.<sup>21</sup>

China is believed to have the largest technically recoverable reserves of shale gas in the world. The Chinese government has been enthusiastic about developing and growing shale gas production, manifesting this ambition in its Twelfth Five-Year Plan.<sup>22</sup> As the largest emitter of greenhouse gas (GHG) emissions, and the largest source of the increase in GHG emissions, China's interest in substituting coal with shale gas as its primary fuel is exciting news not only for China, but also for the international community.<sup>23</sup> However, the increased interest in shale gas development introduces the risk that China could focus solely on developing shale production at the expense of investments in renewable energies, delaying renewable development.<sup>24</sup> China also faces several hurdles in achieving sustainable shale gas production, as China lacks comprehensive legal instruments that can adequately address the potential environmental hazards of shale gas operations, and poorly enforces its environmental laws and regulations.<sup>25</sup> These problems are also accompanied by the country's limited liberalization of gas prices, lack of technology,

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17. See David Crane et al., *Inextricably Intertwined: Canada and the United States as Global Partners in Securing Safe, Reliable, and New Sources of Energy*, 36 CAN.-U.S. L. J. 13, 16 (2011).

18. See Chong & Simikian, *supra* note 16, at 5.

19. Katia Opalka, *Oil and Gas: The View from Canada*, 26 NAT. RESOURCES & ENV'T (Fall 2011) at 37.

20. Chong & Simikian, *supra* note 16, at 5.

21. *Id.*; NATIONAL ENERGY BOARD, CANADA'S ENERGY FUTURE (2013), <https://www.neb-one.gc.ca/nrg/ntgrtd/fttr/2013/2013nrgftr-eng.pdf>.

22. Farah & Tremolada, *supra* note 9, at 580; U.S. ENERGY INFORMATION ADMINISTRATION, WORLD SHALE RESOURCE ASSESSMENTS (2015), <https://www.eia.gov/analysis/studies/worldshalegas/>.

23. Farah & Tremolada, *supra* note 9, at 590.

24. *Id.* Delayed renewable development is not limited to China. Though the extent of possible investment shifts could vary, both the United States and Canada should not readily disregard this problem.

25. *Id.* at 584.

and market barriers to resource extraction for private investors.<sup>26</sup>

## II. EXISTING REGULATORY FRAMEWORKS

### A. THE UNITED STATES & CANADA

Operating under federal systems, both the United States and Canada divide jurisdiction between federal and state/provincial governments.<sup>27</sup> Depending on the type and scope of the issue, either the federal or state/provincial government takes primary jurisdiction. While the United States appears to have a more centralized model of federalism than Canada, in general, the state/provincial governments in both countries have taken more active roles than their respective federal governments in regulating the shale gas industry. In China, the central government and ministry-level entities primarily promulgate laws and set forth standards relevant to the shale gas industry while the local governments enforce those laws and standards.

#### 1. The United States

In the United States, the federal government has limited jurisdiction over the licensing of onshore oil and gas development, except in regard to oil and gas activities on federally-managed lands. Under the Natural Gas Act (NGA), the Federal Energy Regulatory Commission (FERC) has jurisdiction over the transportation and wholesale of natural gas, and over companies engaged in those activities.<sup>28</sup> The United States federal government regulates environmental health and safety through major statutes, including the Clean Air Act (CAA),<sup>29</sup> Clean Water Act (CWA),<sup>30</sup> Resource Conservation and Recovery Act (RCRA),<sup>31</sup> Safe Drinking Water Act (SDWA),<sup>32</sup> and Occupational Safety and Health Act (OSHA).<sup>33</sup> However, fracking operations used in shale gas development are often explicitly exempt from federal regulations. The SDWA regulates underground

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26. *Id.* at 581.

27. Allan Ingelson & Tina Hunter, *A Regulatory Comparison of Hydraulic Fracturing Fluid Disclosure Regimes in the United States, Canada, and Australia*, 54 NAT. RESOURCES J. 217, 224 (2014).

28. FEDERAL ENERGY REGULATORY COMMISSION, A STAFF REPORT OF THE DIVISION OF ENERGY MARKET OVERSIGHT, ENERGY PRIMER: A HANDBOOK OF ENERGY MARKET BASICS 5 (2015).

29. 42 U.S.C. §§ 7401-7671(q) (West 2012). The CAA sets out federal requirements for permits and compliance for air emissions.

30. 33 U.S.C. §§ 1251-1387 (West 2012). The CWA sets out federal requirements for permits and compliance for water emissions.

31. 42 U.S.C. §§ 6901-6992(k) (West 2012). The RCRA sets out federal requirements for handling of hazardous waste.

32. 42 U.S.C. §§ 300f-300j-26 (West 2012) The SDWA establishes federal standards for drinking water protection.

33. 29 U.S.C. §§ 651-700 (West 2012). The OSHA establishes federal standards for health and safety for workplaces.

injection, the definition on of which, exempts “hydraulic fracking operations related to oil, gas, or geothermal production activities.”<sup>34</sup> Thus, fracking operations do not require permits under the SDWA as long as diesel fuels are not used for injection.<sup>35</sup> In addition, under RCRA, the disposal of wastewater from fracking operations is excluded from the regulation of hazardous waste.<sup>36</sup> The CWA and SDWA, however, still regulate certain methods for disposal of wastewater from fracking operations.<sup>37</sup> Fracking operations are also exempt from disclosure requirements under the Emergency Planning and Community Right-to-Know Act that requires industries to submit an annual “Toxic Chemical Release Form” to the Environmental Protection Agency (EPA).<sup>38</sup> However, voluntary industry disclosure is encouraged by the regulatory community and the Hazardous Materials Transportation Act requires disclosure of certain information through reporting processes.<sup>39</sup>

State governments in the United States have primary jurisdiction over property rights and shale gas production rates.<sup>40</sup> State governments also regulate environmental health and safety alongside the federal government.<sup>41</sup> Regulations and policies vary greatly depending on a state’s policy priorities, political environment, and the missions of its regulatory agencies, all of which affect shale gas production and industry development within the state.<sup>42</sup> For example, Texas and Pennsylvania have chosen to regulate fracking operations through existing state regulations for natural gas production, with some amendments. This flexible approach precipitated sharp increases in shale gas production in the two states.<sup>43</sup> On the other hand, following increased interest in shale gas production, New York imposed a moratorium on fracking until it established new regulatory standards based on studies concerning the effects of fracking operations.<sup>44</sup> Not only is the flexibility of states’ responses to fracking operations varied, the regulations promulgated by states also vary in scope and depth, which results in different trends for shale development in each state.<sup>45</sup>

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34. 42 U.S.C. §§ 300f-300j-26.

35. David B. Spence, *Federalism, Regulatory Lags, and the Political Economy of Energy Production*, 161 U. PA. L. REV. 431, 449–50 (2013) (referencing SDWA provision, §300h(d)(1)(B)(ii)).

36. See 42 U.S.C. § 6921(b)(2)(A) (West 2012); Spence, *supra* note 35, at 452.

37. See 33 U.S.C. §§ 1251-1387 (West 2012); 42 U.S.C. §§300f-300j-26 (West 2012).

38. 42 U.S.C. §§ 11001-11050 (West 2012).

39. 49 U.S.C. §§ 5101-5127 (West 2012).

40. *Id.*

41. Spence, *supra* note 35, at 453.

42. *Id.*

43. *Id.*

44. *Id.*

45. See *id.* at 454-58. For more information on state-specific regulations on hydraulic fracturing, see Thomas, E. Kurth, Michael J. Mazzone, Mary S. Mendoza, & Christopher S. Kulander, AM. L. & JURIS. ON FRACING, 58 RMMLF-INST 4-1 (2012); see also *Regulations by State*, FRACFOCUS: CHEMICAL DISCLOSURE REGISTRY, <http://fracfocus.org/regulations-state> (last visited Nov. 28, 2016).

## 2. Canada

In Canada, provincial governments primarily regulate major oil and gas production because provincial governments own the oil, gas, and other natural resources within their borders. The Canadian Constitution provides that provinces have exclusive authority to promulgate laws with respect to exploration, development, conservation, and management of nonrenewable resources in a province, including the rate of primary production.<sup>46</sup> The federal government is responsible for interprovincial and international energy trade, cross-jurisdiction pipelines, pollution prevention, habitat protection, regulatory oversight of chemicals, natural resource regulation in part of the Canadian North, offshore marine areas, and Aboriginal lands.<sup>47</sup> However, the line between federal and provincial jurisdiction has been blurred, and is subject to debate after the adoption of federal environmental assessment guidelines in the Canadian Environmental Assessment Act (CEAA).<sup>48</sup>

As in the United States, provincial governments have quickly responded to shale development by changing existing laws or developing new laws directed at fracking operations with their regulations differing from province to province.<sup>49</sup> For example, in 2012, Alberta revised its *Directive 059: Well Drilling and Completion Data Filing Requirements* to include new requirements for reporting water source data for hydraulic fracturing operations and water quality information for groundwater sources.<sup>50</sup> Since 2012, through its Drilling and Production Regulation, British Columbia has required fracking operators to disclose the fluids used for hydraulic fracturing operations.<sup>51</sup> In 2013, the New Brunswick government also required the mandatory disclosure of the fluid contents used for hydraulic fracturing operations at least thirty days before the operations proceeded.<sup>52</sup> In addition, the New Brunswick government required fracking operators to submit a risk assessment evaluating the potential health and environmental risks of each additive, including measures that will be used to address those risks.<sup>53</sup>

Although provincial governments have responded to shale development, the jurisdictional divide between federal and state/provincial governments in the United States and Canada creates tension and requires coordination between

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46. Constitution Act, 1867, 30 & 31 Vict., c 3, s. 91 (U.K.), reprinted in R.S.C. 1985, app II, no 5 (Can.).

47. *Regulation of Shale and Tight Resources*, NAT. RESOURCES CAN. (Aug. 23, 2016), <http://www.nrcan.gc.ca/energy/sources/shale-tight-resources/17680>.

48. Opalka, *supra* note 19, at 38.

49. Ingelson & Hunter, *supra* note 27, at 224.

50. Penny Becklumb, Jed Chong, & Tim Williams, *Shale Gas in Canada: Environmental Risks and Regulation*, LIBR. OF PARLIAMENT 1, 4 (February 26, 2015), <https://lop.parl.ca/content/lop/ResearchPublications/2015-18-e.html#ftn37>.

51. *Id.* at 9.

52. See Ingelson & Hunter, *supra* note 27, at 224.

53. *Id.* at 225.

the two levels of government.<sup>54</sup> However, the United States appears to have a more centralized model of federalism than Canada.<sup>55</sup> This Article further discusses the different models of federalism in the next part, comparing structural concerns for the governments of the United States, Canada, and China.

## B. CHINA

China operates under a tripartite structure. The National People's Committee promulgates laws; the State Council promulgates regulations; various ministries promulgate rules; and departments within the ministries draft other legislative documents.<sup>56</sup> Regulation of the shale gas industry in China is "horizontally fragmented" and undertaken by multiple authorities at the ministerial level, including the National Development and Reform Commission (NDRC), Ministry of Land Resources (MLR), Ministry of Finance (MOF), Ministry of Environmental Protection (MEP), Ministry of Science and Technology (MOST), and the State Administration of Taxation (SAT).<sup>57</sup>

The NDRC regulates industrial policies and planning of the shale gas industry, including "targets, transportation, consumption, and pricing."<sup>58</sup> The MLR controls public tenders of shale gas blocks and entry thresholds.<sup>59</sup> The MOF and SAT jointly manage tax incentives for fracking operators, including grants and preferential fiscal policies.<sup>60</sup> MOST is in charge of the improvement and development of technologies for the geological environment in China.<sup>61</sup> MEP, taking the role of supervisor, determines minimum standards for water protection, wastewater treatment and recycling, air pollution, and animal and plant protection.<sup>62</sup>

Currently, there is no law that addresses or regulates the potential environmental impacts of fracking operations specifically.<sup>63</sup> Despite the Chinese government's expressed interest in shale development, the government has not promulgated any legislation or provided any guidance for "shale gas exploration, market application, and strategic planning."<sup>64</sup> However, there are some existing national regulations pertinent to shale gas development. The Water Pollution Prevention and Control Law (WPPCL) provides regulations for the protection of drinking water, prohibits the construction of drainage outlets in certain areas, and

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54. *Id.* at 224.

55. *Id.* at 225; *see also* Opalka *supra* note 19, at 38-39.

56. Farah & Tremolada, *supra* note 9, at 599.

57. *Id.*

58. *Id.*

59. *Id.*

60. *Id.*

61. *Id.*

62. *Id.* at 599-600.

63. *Id.* at 600.

64. *Id.*



includes strict penalties for violators.<sup>65</sup> It also permits provincial and municipal governments to fill in gaps left by the central government, but the language granting that authority is ambiguous as to which government authority has the responsibility for enforcing a law meant to fill a regulatory gap.<sup>66</sup> Therefore, absent specific guidelines for implementation, this provision is ineffective.<sup>67</sup> Additionally, other pertinent laws, including The Mineral Resource Law, which lays out a unified regional registration requirement for the exploration of mineral resources, and the Regulations of the People's Republic of China on Sino-Foreign Cooperation in the Exploitation of Continental Petroleum Resources, which promotes partnerships with foreign corporations in an effort to explore and produce unconventional gas in China, lack implementation mechanisms.<sup>68</sup> Ultimately, the existing regulatory framework is not as effective as China's national government purports it to be.<sup>69</sup>

### III. COMMON CONSIDERATIONS AND CHALLENGES FOR THE THREE COUNTRIES IN ESTABLISHING REGULATORY REGIMES FOR THE SHALE GAS INDUSTRY

#### A. STRUCTURAL CONCERNS

The United States, Canada, and China each have some form of national and sub-national governmental structure. Divided authority to legislate, enforce, and implement poses a common question of who shall regulate what, the answer to which differs in each country. Either based on their constitutions or the choices of their national legislature, these countries have delegated authority over operational, environmental, and market regulations to their sub-national governments to varying extents.

#### 1. Federalism Choice

Different approaches to federalism can be categorized into three types: dual federalism; cooperative federalism; and the "matching principle."<sup>70</sup> Dual federalism has three essential characteristics: it acknowledges the conflict between federal and state governments, considers the purpose and power of the federal government to be limited, and notes that state and federal governments have sovereign authority within their separate spheres.<sup>71</sup> On the other hand, coopera-

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65. *Id.* at 601.

66. *Id.*

67. *Id.*

68. *Id.* at 601-02.

69. *Id.* at 602.

70. Michael Burger, *The (Re)federalization of Fracking Regulation*, 2013 MICH. ST. L. REV. 1483, 1488 (2013).

71. *Id.* at 1489.

tive federalism promotes partnerships between state and federal governments.<sup>72</sup> Rather than allowing either the state or federal government to enjoy exclusive authority, it maintains an overlap of jurisdiction between the two and encourages cooperation in such areas of overlap.<sup>73</sup> Meanwhile, the “matching principle” determines the appropriate jurisdiction on a case-by-case basis, depending on the scale and scope of the problem.<sup>74</sup>

Several arguments exist in favor of federalization or centralization of environmental law. Professor Burger lays out seven main arguments.<sup>75</sup> First, interstate problems require a federal response. In the United States and Canada, federal governments have authority over issues and problems that exist across state borders.<sup>76</sup> Second, federalization can avoid the potential problem of states’ racing to the bottom by lowering their environmental standards to attract investments in industry.<sup>77</sup> Third, federal uniformity in regulations and standards can provide administrative and economic efficiency.<sup>78</sup> Fourth, federalization can ensure more resources for research and development in industry, which would help to create durable rules and provide effective enforcement.<sup>79</sup> Fifth, federalization can allow more diverse voices to be heard, enabling a different balance of interest-group influence.<sup>80</sup> Sixth, federalization can overcome a “not in my backyard” attitude. Seventh, federalism can respond to a national moral imperative.<sup>81</sup>

On the other hand, several arguments exist in favor of decentralization or devolution. Professor Burger introduces five main arguments.<sup>82</sup> First, decentralization may allow more democratic and responsive decision making.<sup>83</sup> Second, decentralization may encourage innovation, allowing states to be “laboratories of democracy” or experimentation.<sup>84</sup> Third, decentralization may enable more narrowly tailored decision making for various local conditions.<sup>85</sup> Fourth, decentralization can enable adaptive management or other experimentalist or “New Governance” regimes.<sup>86</sup> Fifth, decentralization might promote inter-jurisdictional competition, leading to economically efficient regulation.<sup>87</sup>

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72. *Id.*

73. *Id.*

74. *Id.* at 1489-90.

75. *Id.*

76. *Id.*

77. *Id.*

78. *See id.*

79. *Id.* at 1490-91.

80. *Id.* at 1491.

81. *Id.*

82. *Id.*

83. *Id.*

84. *Id.* (citing Justice Brandeis’ dissent in *New State Ice Co. v. Liebmann*, 285 U.S. 262, 311 (1932)).

85. *Id.*

86. *Id.* at 1492.

87. *Id.*

In the United States and Canada, divided jurisdiction between federal and state/provincial government has created the practice of coordination with regard to energy and environmental regulations, or “cooperative federalism.”<sup>88</sup> On the other hand, federalism in China looks most akin to the “matching principle” because the central government intervenes on an ad hoc basis whenever it deems its engagement fit or necessary. Due to political, environmental, technological, and economic considerations in the shale gas industry, the United States, Canada, and China have to adapt to new scenarios and new players and adopt a regulatory approach that best serves their policy interests, provided that such a shift in policies and a federalism approach would not preclude a certain level of uniformity and consistency in their policies. As discussed earlier, there are numerous arguments that legitimize both centralization and decentralization, and each country should keep the question of who shall regulate what and how in mind as they move forward in shale gas production.

## 2. The United States & Canada

The question of who shall regulate the shale gas industry has been heavily discussed since shale gas started being extracted in the United States and Canada.<sup>89</sup> With the inherent tension in federalism, the governments of the United States and Canada have taken slightly different approaches in the context of shale gas. In the United States, the federal government has several existing laws and regulations governing the natural gas industry, but they exempt shale gas. In 2010, Congress directed the EPA to assess the impact of shale gas on drinking water, and in 2015, the EPA completed the study and issued a draft assessment concluding that there was no systemic impact on drinking water resources.<sup>90</sup> Despite the EPA Science Advisory Board (SAB)’s review of the draft assessment, which expressed concern over the ambiguity and inconsistency in the EPA’s conclusion,<sup>91</sup> the EPA’s finding that “the injection of hydraulic fracturing fluids . . . does not justify additional study” meant that the responsibility to regulate the effects of fracking on drinking water was left to the states, with a few exceptions.<sup>92</sup> Rather than amending the laws to include shale gas production in the scope of existing regulations, or conducting additional analysis on the

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88. Ingelson and Hunter, *supra* note 27, at 224.

89. E.g., Stephanie Scott, *Who “Shale” Regulate the Fracking Industry?*, 24 VILL. ENVTL. L. J. 189 (2013); Spence, *supra* note 35.

90. U.S. ENVIRONMENTAL PROTECTION AGENCY, ASSESSMENT OF THE POTENTIAL IMPACTS OF HYDRAULIC FRACTURING FOR OIL AND GAS ON DRINKING WATER RESOURCES (EXTERNAL REVIEW DRAFT) (2015), <https://cfpub.epa.gov/ncea/hfstudy/recordisplay.cfm?deid=244651>.

91. U.S. ENVIRONMENTAL PROTECTION AGENCY, SAB REVIEW OF THE EPA’S DRAFT ASSESSMENT OF THE POTENTIAL IMPACTS OF HYDRAULIC FRACTURING FOR OIL AND GAS ON DRINKING WATER RESOURCES (2016), [https://yosemite.epa.gov/sab/sabproduct.nsf/fedrgstr\\_activites/HF%20Drinking%20Water%20Assessment!OpenDocument&TableRow=2.3#2](https://yosemite.epa.gov/sab/sabproduct.nsf/fedrgstr_activites/HF%20Drinking%20Water%20Assessment!OpenDocument&TableRow=2.3#2).

92. See Burger, *supra* note 70, at 1518-19.

impacts of the shale gas extraction at the federal level, the federal government chose to let the responsibility to regulate fracking fall to state governments. The 2005 amendment to the Energy Policy Act, now part of the SDWA, which mostly exempts fracking from “underground injection activities,” suggests the federal government’s intention is to have state governments regulate the fracking operations in their respective jurisdictions even though the legislative history of the SDWA does not expressly suggest that Congress considered whether the federal government or states should regulate fracking.<sup>93</sup> In 2015, the Interior Department’s Bureau of Land Management (BLM) adopted a final regulation of fracking on federal lands, which strengthens a framework of safeguards and disclosure requirements in the shale gas industry.<sup>94</sup> Fracking operations on federal lands, however, account for only 11% of the total natural gas supply and 5% of the total oil supply in United States.<sup>95</sup> Thus, until now, much of the United States’ regulation has been left to state authorities, and consequently, some states with shale gas reserves have quickly responded by amending or promulgating rules to regulate the industry. In some states, federal and state agencies have disagreed over who should regulate the shale gas industry and how this should be done. In such instances, federal agencies, such as the EPA, have expressed their interest in regulating and preempting the state’s natural gas regulations.<sup>96</sup> For example, the federal government questioned Pennsylvania’s ability to properly regulate the fracking industry and preempted its natural gas regulations.<sup>97</sup> The EPA also intervened in Wyoming’s gas industry by releasing an extensive report from its three-year study on the water quality in Wyoming, suggesting a possible link between hydraulic fracturing and groundwater pollution.<sup>98</sup> This form of cooperative federalism may allow for more catered approaches to distinctive needs and circumstances of each state or region. However, to avoid regulatory confusion and unfairness caused by cooperative federalism with coordination in only some states, the federal government’s treatment of each state and its regulations should be consistent throughout all states in the United States.

As in the United States, in Canada, much of regulation has been left in the hands of provincial governments. The provincial governments have exclusive authority to promulgate laws with respect to exploration, development, conservation, and management of nonrenewable resources in a province, including the rate of primary production. However, certain legislative triggers, such as the Fisheries Act Section 35(2), trigger the federal environmental assessment require-

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93. *Id.* at 1520.

94. 43 C.F.R. § 3160 (2015).

95. Gibson Dunn, *U.S. Department of the Interior Releases Final Rule Updating Regulations Governing Hydraulic Fracturing Operations on Federal Land* (Mar. 24, 2015), <http://www.gibsondunn.com/publications/Documents/US-Dept-of-Interior-Releases-Final-Rule-Updating-Regulations-Governing-Hydraulic-Fracturing-on-Federal-Land.pdf>.

96. Scott, *supra* note 89, at 192.

97. *Id.*

98. *Id.* at 193-94.

ment under CEAA.<sup>99</sup> To avoid a situation in which every project in Canada becomes subject to CEAA, the federal Department of Fisheries and Oceans (DFO) issued letters of advice and has told project developers that if a project follows the letters of advice, the CEAA is not triggered.<sup>100</sup> Likewise, the DFO chose to reserve detailed review for major projects and to provide general guidelines or letters of advice for minor projects.<sup>101</sup> By adopting this approach, the federal government has expressed its preference for limiting its assessment to projects that are federal in nature for the purpose of ensuring on-the-ground coordination in the interest of efficiency.<sup>102</sup> Therefore, provincial regulatory bodies are able to update their regulatory frameworks in response to shale development, helping to ensure safe operation, environmental protection, and resource conservation.<sup>103</sup> Like state regulations in the United States, provincial regulations for natural gas development differ to varying extents.<sup>104</sup>

With the inherent tension between federal government and state/provincial governments, some conflicts of jurisdiction and authority exist around shale gas regulation. However, United States' statutes and the Canadian Constitution reserve the primary right of regulation to state and provincial governments, respectively. Nevertheless, when federalism conflicts arise in the absence of clear direction in the context of shale development, the federal government and state/provincial governments have expressed their distinctive preferences as to who shall regulate what. In the United States, the federal government and agencies have in some instances, like Wyoming, expressed their interest in preempting states' shale regulation to effectuate the federal standards. On the contrary, in Canada, the federal government has expressed its preference to limit its review to major projects and general problems only. Thus, despite similar structural systems, the United States and Canada have reacted somewhat differently to the advent of shale gas production and regulation.

### 3. China

Although the Chinese governmental structures resemble federalism as it exists in the United States and Canada, in that national and sub-national governments share authority, the practical effect of its structure is quite different. Operating under a tripartite structure in which the National People's Committee, the State Council, and various ministries and departments within the ministries have separate roles, China has yet to devise a working legal framework for its shale gas

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99. Opalka, *supra* note 19, at 38; Fisheries Act, R.S.C. 1985, c. F-14, s. 35 (Can.).

100. Opalka, *supra* note 19, at 38.

101. *Id.*

102. *Id.* at 39.

103. *Regulation of Shale and Tight Resources*, *supra* note 47.

104. *Id.*

industry.<sup>105</sup> The existing regulation for the shale gas industry is “horizontally fragmented,” meaning that “[h]orizontally, several institutions are involved at every level of government.” Such horizontal fragmentation can potentially result in serious gaps between regulations and consequently, make them ineffective.<sup>106</sup>

The role of the central government in China is quite distinctive, compared to its role in the United States and Canada. Given its unitary socialist system of government and the political importance of the exploitation of natural reserves, the shale industry, especially at this stage, is “extremely prone to [s]tate intervention.”<sup>107</sup> The central government exclusively controls the granting of exploration rights and organizing auctions. In the first round of tendering for shale gas exploration rights, bidding is open only to invitees who are state- and province-controlled oil and gas enterprises.<sup>108</sup> The Chinese government excludes foreign companies from bidding in order to retain control over the scope of investments and the production ratio.<sup>109</sup> In the second round of tendering, the bidding is also open to state-owned enterprises in other industries and privately held Chinese investment entities.<sup>110</sup> The purpose of expanding the bidding pool is to foster greater competition and innovation in the nascent shale gas industry.<sup>111</sup> Nevertheless, the Chinese government still has effective control over which entities can access its shale gas industry.<sup>112</sup> Therefore, the entry into, development of, and production rate of the shale gas industry are effectively all determined by the central government. The cooperation in this stage is more between the central government and the state-influenced entities than between the central and provincial governments.

The role of the provincial- and municipal-level governments in China appears to be limited to regulation and enforcement of the laws, standards, and goals provided by the central government and the ministries.<sup>113</sup> For example, as part of the growing transparency initiatives in China, the local governments are required to make periodic disclosure of pollution quantity control targets under the Law on Prevention and Control of Water Pollution (WPPCL).<sup>114</sup> The local governments also have authority to promulgate their own water pollution prevention standards to fill the regulatory gap left by the central government under the WPPCL.<sup>115</sup> However, the WPPCL’s ambiguous provision, without clear guidance from the

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105. See Sarah Yuskaitis, *Get Fracking: How China is Institutionally Unprepared to Handle the Technological Advances of a Shale Revolution*, 38 SUFFOLK TRANSNAT’L. L. REV. 179 (2015).

106. See Farah & Tremolada, *supra* note 9, at 599.

107. *Id.* at 595.

108. *Id.* at 596.

109. *Id.*

110. *Id.*

111. *Id.*

112. *Id.*

113. See *id.* at 599–60.

114. *Id.* at 625.

115. *Id.*

central government or the law itself, has not been very effective in generating active legislative action from local governments.<sup>116</sup> While the state/provincial governments in the United States and Canada take relatively active roles in legislating and regulating their own local laws and regulations, the local governments in China take a more active role in enforcing the laws and regulations promulgated by the central government or the ministry-level entities. In Canada, exploration and production rights for oil and natural gas are granted through a bidding process, except in Quebec, which operates on a first-come, first-served basis. In contrast to China, administration of this bidding process is primarily undertaken by provincial governments.<sup>117</sup> Depending on differing provincial regulations for oil and gas, provincial regulators may require certain licenses or permits or require regular drilling reports, geophysical log data, or well-testing data to be made public.<sup>118</sup> Though Canada and China have the formal similarity of having a bidding process for granting of shale gas exploration and development rights, their actual processes and effects are quite different.

#### B. POLICY CONCERNS

Governments and agencies have different, often conflicting mandates with regard to shale gas regulation. Oil and gas conservation, protection of various mineral rights, protection of the environment, economic growth, energy independence, and energy security are all relevant policy mandates in the context of shale gas development.<sup>119</sup> Policy priorities change, depending on the circumstances, and therefore so do regulations. Consequently, there is often a compromise made to implement policies, depending on the priorities of that time.

In the United States, given its long history of energy dependence and concerns about energy security, the advent of fracking received a fairly warm welcome. In addition, the economic gain coupled with the energy export opportunities of shale gas development that will continue to be brought to the United States are not insignificant. Fortunately, the United States' excitement over the possibility of shale gas bridging the gap between conventional energy sources and renewable energy has not resulted in the complete abandonment of its mandate of environmental protection. For example, in 2010, New York placed a moratorium on shale gas development by issuing an Executive Order banning the practice of "high-volume, horizontal hydraulic fracturing" until the Department of Environmental Conservation (DEC) completed a review to confirm that the practice was

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116. *Id.*

117. *Regulation of Shale and Tight Resources*, *supra* note 39.

118. *Id.*

119. *See* Wiseman, *supra* note 2, at 382.

environmentally safe.<sup>120</sup> Then in 2014, New York announced a complete ban on hydraulic fracturing because of health and environmental concerns.<sup>121</sup> Also, Maryland, whose governor reasoned that “possible environmental risks of fracking outweighed any potential benefits,” and Vermont, mainly because of water contamination concerns, banned fracking.<sup>122</sup> Moreover, environmentalists and nongovernmental organizations have been actively questioning and challenging the environmental impacts of fracking operations and shale gas extraction that are not yet well known. However, shale gas production puts environmental protection policy in a unique position. It is not a clear-cut question whether prioritization of shale gas development would necessarily adversely impact the environment. Provided that the EPA’s finding of no systemic impact on drinking water resources and recent studies’ finding that there is no significant relationship between properly managed fracking operations and water quality are correct, the shift in the country’s primary energy source from coal to natural gas would actually reduce environmental pollution. Though the potential adverse impacts of fracking may still be unknown because of the lack of relevant data, lack of data should not serve as an excuse for lack of further studies and regulation. Also, cooperative federalism should not justify the regulatory gap and imbalance caused by state-specific regulations and standards because otherwise, the environmental impacts of shale gas operations would remain unchecked and uncontrolled in certain states. However, regardless of the ongoing debate over environmental effects of shale gas production, shale gas development in the United States and its share in the energy market will keep growing.<sup>123</sup>

In Canada, the federal government takes a relatively less active role in regulating and prioritizing shale gas production as compared to the United States because Canada has been not as enthusiastic about shale gas development as the United States has been. Before the shale gas revolution, Canada was the largest foreign supplier of natural gas for the United States. With the advent of shale gas, the United States can now supply its own natural gas and export its excess natural gas supply to foreign countries, including Canada. Given such ambivalence toward shale gas development, Canada has left regulating shale gas extraction to

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120. William J. Brady & James P. Crannell, *Hydraulic Fracturing Regulation in the United States: The Laissez-Faire Approach of the Federal Government and Varying State Regulations*, 14 VT. J. ENVTL. L. 39, 56-57 (2012).

121. Thomas Kaplan, *Citing Health Risks, Cuomo Bans Fracking in New York State*, N.Y. TIMES (Dec. 17, 2014), <https://www.nytimes.com/2014/12/18/nyregion/cuomo-to-ban-fracking-in-new-york-state-citing-health-risks.html>.

122. Jon Hurdle, *With Governor’s Signature, Maryland Becomes Third State to Ban Fracking*, STATE IMPACT (Apr. 4, 2017), <https://stateimpact.npr.org/pennsylvania/2017/04/04/with-governors-signature-maryland-becomes-third-state-to-ban-fracking/>; see also NewsCorp, *Vermont Becomes First State to Ban Fracking*, FOX NEWS (May 17, 2012), <http://www.foxnews.com/politics/2012/05/17/vermont-becomes-first-state-to-ban-fracking.html>.

123. Gregory S. Mcrae & Carolyn Ruppel, *The Future of Natural Gas, MIT Study on the Future of Natural Gas*, xiii (2010), [http://www.mit.edu/jparsons/publications/NaturalGas\\_Report\\_Final.pdf](http://www.mit.edu/jparsons/publications/NaturalGas_Report_Final.pdf).



its provincial governments and agencies. However, Canada's higher energy security has given the country more time to research and study the potential effects of shale gas extraction on the environment before diving into its production.

In China, despite a recent shift in focus to minimize pollution from the beginning of the production process and to emphasize harmony between nature and humans, the existing regulatory framework does not adequately address the risks associated with shale gas exploration or production.<sup>124</sup> Traditional environmental laws in China are primarily focused on economic development and the use of natural resources. The traditional approach emphasizes remediation and passive reactions rather than prevention of environmental pollution.<sup>125</sup> However, both The 2003 Law of the People's Republic of China on the Promotion of Clean Production and The 2002 Law of the People's Republic of China on Environmental Impact Assessment aim for sustainable development, focusing on the principle of "pollution prevention first."<sup>126</sup> Despite the expressed goals of sustainable development in these two laws, ambitious economic policy goals for shale gas development are expressed in the Eleventh, Twelfth, and Thirteenth Five-Year Plans with less emphasis on environmental regulations and policies of sustainable growth.<sup>127</sup> In addition, to promote shale gas exploration, the NEA, responsible for establishing new energy projects and ensuring implementation of the central government's policies, adopted financial incentives and relaxed regulations for the shale gas industry.<sup>128</sup> Although China has recognized its need to address environmental concerns for sustainable growth in the context of shale gas development, such recognition has not practically affected policy and regulation.

Due to different economic and environmental situations, the three countries have different policy priorities. There is no right or wrong answer as to which policy priority should come first. However, adequate discussion of a comprehensive list of policy considerations has to happen before any country's policy priorities are implemented into a form of regulation or legislation, at either the national or sub-national level.

### C. IMPLEMENTATION/ENFORCEMENT CONCERN

Although discussions about structural and policy concerns would help the countries determine who will primarily regulate what and in which direction generally, discussions about implementation and enforcement concerns would help them determine how and what to regulate specifically. In an ideal world, comprehensive and universal regulation of the industry will work. However, with

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124. Yuskaitis, *supra* note 105, at 198.

125. Farah & Tremolada., *supra* note 9, at 605-06.

126. *Id.* at 607.

127. *See* Yuskaitis, *supra* note 105, at 194.

128. *Id.* at 196.

a limited amount of human, administrative, and financial resources available to both federal and state/provincial governments, and a mandate to secure economic profit, governments will have to make tough decisions.<sup>129</sup> There are many levels and ways in which the governments can regulate the shale gas industry, and there are three primary but non-exhaustive questions that the countries must ask.

First, governments have to decide how to allocate their resources on inspection and enforcement of their environmental policies. Having a well-funded inspection budget will result in more thorough inspections and therefore possibly more detection of violations of regulations. However, violations do not necessarily lead to enforcement actions.<sup>130</sup> Depending on the severity and seriousness of the detected violations, governments will need to decide whether to enforce against such violations.

This, too, is partly due to limited resources and a mandate for economic profit. Inadequate allocation of resources to inspection would result in regulations without teeth, leaving numerous violations without proper enforcement. Also, fairness issues of law enforcement could arise because infrequent inspection with strict enforcement will leave many violations undetected while some detected violations would be punished severely.

Second, federal governments will have to decide which area of the shale gas extraction process they want to focus on: injection, drinking water contamination, surface water use, and risks of surface spills. Depending on a government's views on the potential impacts of shale gas production and operation on the environment, their focus would shift accordingly. For example, in the United States, the focus on injection has been pervasive, which is illustrated by the EPA's study, which primarily focused on whether fracking operations will adversely affect underground water sources.<sup>131</sup> To effectively control and limit the environmental effect of shale gas production, more comprehensive studies and regulations are needed to address potential problems, regardless of the stage of development in which they occur. In addition to water and underground migration, the issues of air pollution, seismic risks, road problems, noise, and community disruption also require additional, case-by-case attention and discussion.

Third, governments have to find a balance between public disclosure requirements and protection of intellectual property rights in the shale gas industry. In drawing the line between the two, a government must weigh the economic benefits of protecting intellectual property rights against the public health and safety concerns at stake if fluid contents used for fracking operations are not disclosed.<sup>132</sup> Most federal and state/provincial governments require some disclo-

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129. See Wiseman, *supra* note 2, at 370.

130. *Id.* at 378.

131. *Id.*

132. Ingelson & Hunter, *supra* note 27, at 219.

asures in regard to fracking, but the extent and scope of such disclosure requirements vary.<sup>133</sup> Also, a more invasive public disclosure requirement will benefit the general public and will especially benefit communities and individuals near fracking operations. Timely disclosure of certain information is necessary for workers and members of the public to receive a diagnosis and, if needed, appropriate medical treatment.<sup>134</sup> However, disclosure requirements that are too extensive can burden shale gas production companies and potentially deter production and investment activities. Therefore, governments must study and decide how much and what kind of information is necessary for determining the potentially harmful effects of certain fluids to local residents and the general public to ensure the public's health and safety.

#### CONCLUSION

Domestic policies for the shale gas industry in the United States, Canada, and China are not only important for those three countries, but also affect the international community in terms of energy, economy, and the environment. Given the varying pace of shale gas development in these three countries, current policies and regulations differ. A comparative analysis of the legal frameworks of these three countries provides an opportunity to learn about similar concerns shared by these countries in regard to government structure, policies with conflicting mandates, and choices to focus on in implementing and enforcing regulations. These common considerations and challenges provide countries moving forward with shale gas production a list of considerations for evaluating their existing regulations and/or promulgating new regulations. Countries contemplating the possibility of shale gas production can also prepare their legal framework by thinking about such considerations in advance of development. At least in the United States, Canada, and China, the shale gas revolution has begun, and the legal frameworks must follow.

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133. *Id.* at 252.

134. *Id.* at 253.