Unconventional Shale Energy and the Strategies of Nations

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Introduction: Energy and Strategy

A dramatic shift towards unconventional shale gas as an energy source has distinct winners and losers in the international arena. Much of the literature has focused on the extent to which unconventional natural gas is transformative for markets overall, or for the power of particular states.[1] This chapter is more concerned with the question of how unconventional natural gas may come to factor in the grand strategy of nations—how it might become an instrument of power for some states, how it might become a source of either new alliances or new adversarial relationships, and how it might shift the risk calculations of nations as they pursue energy security. This chapter seeks to anticipate how unconventional gas may affect the statecraft of select nations.

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[1]See the following excellent assessments of impacts to specific countries: Michael Levi, *The Power Surge: Energy, Opportunity, and the Battle for America's Future*, Oxford University Press, 2013, David Buchan "Can Shale Gas Transform Europe's Energy Landscape?" Centre for European Reform, July 2013, and Leonardo Maugeri, "The Shale Oil Boom: A US Phenomenon," The Geopolitics of Energy Project, Belfer Center for Science and International Affairs of the Harvard Kennedy School, June 2013.

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Energy security has long been essential to the strategies of many nations, but often lost in the analysis is the extent to which energy figures into the grand strategy of nations variously as an end, a way, a means, or a combination of these. Each of these aspects has decidedly different characteristics. Energy scholar Meghan O'Sullivan has noted that, while consuming states seeking to secure adequate supply at affordable price may pursue energy as an "end," exporting states will find in energy revenues a "means" to resource their national ambitions, and may seek to use energy as a "way" of rewarding allies, and punishing adversaries—using energy as an important vehicle for the promotion of national interests that are not connected to energy directly.[2] Energy also factors into a grand strategy in terms of the risks and costs nations are willing to incur in its pursuit, both at home and abroad. Cost may be understood as what the state expects to incur according the plan, whereas risk is what *might* go wrong—losses that the state may incur if the plan doesn't succeed.[3] In attempting to understand the full potential impact of unconventional shale development on international security, it is useful to distinguish and investigate separately how unconventional gas may serve as the ends, ways and means of various states, what range of risks and costs states are willing to incur, and how nations might perceive this energy shift in terms of their grand security and their power broadly defined. Only by separating these elements of strategy is it possible to see clearly how differently the global shifts in unconventional gas development impact nations.

It is not possible, in one chapter, to address fully the role of emerging energy supply in the strategies of all nations. Rather, this chapter will focus on some key suggestive developments across a range of nations. This analysis will begin with a brief review of the endowments and needs of nations regarding natural gas. It will then examine the energy "ends" of importers, with a particular focus on Israel and the United States as illustrative examples of how unconventional gas success may shift the "ends" of nations in terms of their ability to secure sufficient energy resources. The next section will focus on the energy "ways" of exporting and importing countries. Drawing examples from ASEAN Asia and China, the section will illustrate how each is attempting to use an aspect of unconventional gas to forge new alliances that extend beyond energy. The next section will examine "means" of nations in terms of how new-found wealth associated with natural gas does and does not shape how states understand their interests. Australia and the United States will serve as the key cases in this section. The next section will offer an assessment of some of the risks and costs associated with a large-scale shift towards unconventional gas. The chapter will conclude with remarks on the role of unconventional natural gas in the energy strategies of nations.

[2]O'Sullivan (2013), p. 37.

[3]For an excellent discussion of costs and risk, see Deibel (2007), pp. 322–365.

The Endowments and Needs of Nations: Gas Demand and Supply

Although earlier developments in natural gas markets—most notably the shift towards LNG—seemed to push clearly in the direction of globalizing the gas market and making it more similar to oil markets, unconventional gas does not clearly strengthen this trend. Rather, unconventional gas development simultaneously pushes in both directions, depending on the endowments of nations: while China hopes to reduce exposure to global markets and vulnerable supply chains by producing more gas domestically, Japan seeks to encourage the United States to enter global markets as a new supplier. Endowments drive the impact of the shale revolution on the ends, ways and means of nations as well as their risk and cost preferences with respect to energy.

How one understands the amount of natural gas held by any one nation depends on one's technological optimism. If a conservative metric—proven reserves—is used, Table 1 shows the nations which hold the most natural gas reserves. As the table suggests, the United States reserves, while among the top five, lag significantly behind the top four. Even so, the US has been the lead producer since 2009. The Table 3 illustrates the extent to which the US embraces technical risk: the reserves-to-production ratio indicates that, without continued new discovery and technical innovation, the US could continue to produce at its present rate for less than 14 years, while Russia (the second largest producer) can maintain at its present rate for over 56 years. The United States' ambitious rate of production is due in part to the favorable economic and political climate, and in part because the US is willing to incur technological (and environmental) risk at home in an effort to reduce political risk abroad.

According to the Congressional Research Service of the United States, proven reserves is not a good metric to use in a field that is changing so rapidly. A recent report recommends, instead, using a measure of proven reserves plus estimated reserves for undiscovered, technically recoverable resources (UTRR)—an estimate of what can be extracted with current technology if price is not a factor. By this metric, the US has a natural gas resource base of 1809 tcf (51,225 BCM) or enough gas for approximately 79 years of production (assuming 2011 production levels). The report argues for using this new measure because, compared with data from 2006, the UTRR for natural gas in the United States has jumped almost 25 %.[4] Regardless of one's technological optimism, however, it is evident that the United States is producing at ambitious rates while others are lagging. Unsurprisingly, it is nations with slimmer proven reserves that pursue unconventional gas, using more technological innovation and risk to make up for less generous geological endowment.

[4]Congressional Research Service, Ratner et al. (2013), p. 22.

Table 1 Natural Gas World Proven Reserves and Production 2014*

	Reserves (TCM)	% of total 2013 world proven reserves	Reserves to Production Ratio (years)	% of total 2013 world production
Iran	34.0	18.2	>100	5.0
Russia	32.6	17.4	56.4	16.7
Qatar	24.5	13.1	>100	5.1
Turkmenistan	17.5	9.3	>100	2.0
USA	9.8	5.2	13.4	21.4
Saudi Arabia	8.2	4.4	75.4	3.1
UAE	6.1	3.3	>100	1.7

*Excludes gas that is flared or reinjected. Data from *BP Statistical Review of World Energy* June 2015, British Petroleum, tables on Natural Gas Proved Reserves (at end of 2014) and Natural Gas Production (at end of 2014) in trillion cubic meters, pp. 20 and 22

Till date, the United States has had remarkably more success with unconventional gas production than any other state. This success, according to energy scholar Leonardo Maugeri, can be explained by (1) property rights possessed by individuals and companies rather than by the state; (2) US shale formations being concentrated in sparsely populated regions (unlike Europe); (3) private financing forms such as venture capital which make it easier to fund independent companies; and (4) midstream and downstream infrastructure and water supply that are adequate (unlike China).[5] Scholar Holly Morrow adds to this list the widespread availability of geological data, which rose from explicit government initiatives, as an additional key factor. Morrow differs with Maugeri on the importance of individually owned mineral rights, noting that most systems find a way to compensate landowners for energy development, regardless of property rights.[6]

The US demand for natural gas is rising, driven by price, environmental advantages of gas relative to other fossil fuels, and the ability of natural gas in electricity generation to balance intermittent renewable supply as well as to meet unpredictable demand in mature grids. Gas in 2013 comprised 27 % of US electricity generation, and 28 % of total primary energy supply (up from 23 % in 2003).[7] Natural gas-fired power plants are expected to account for 73 % of added capacity in the United States between 2013 and 2040.[8] For this and other reasons,

[5]Maugeri (2013), p. 24.

[6]Morrow (2014), p. 7.

[7]IEA, United States Energy Overview 2014, International Energy Agency Member Countries Data, prepared August 2014, access at: http://www.iea.org/media/countries/slt/UnitedStatesOnepagerAugust2014.pdf.

[8]This assumes growing electricity demand as well as retirement of 97 GW of existing capacity. See EIA Annual Energy Outlook 2014, p. MT-17.

the Department of Energy projects that US demand will grow from a 2012 level of 25.6 to 31.6 tcf in 2040.[9]

Historically, natural gas is used near the places where it originates. The cost of moving gas often exceeds the cost of getting it out of the ground. Hence, both natural gas, and natural gas markets have a regional character: pipelines are the most common form of delivery. There is a significant cost difference between natural gas and LNG. According to the World Bank, pipelines remain more economical than LNG up to distances of 3500 km (2175 miles).[10] Despite this history, LNG is growing both in volume and as a share of global trade. LNG met approximately 10 % of world demand for natural gas in 2012.[11] In international natural gas trade, LNG's share constituted 33.4 % of world gas trade in 2014 (up from 31.4 % in 2013).[12]

Because of the trend towards LNG, the cost of moving cheap US natural gas to distant, more lucrative markets is often underestimated. The actual costs of exporting LNG must incorporate delivery to the LNG facility, liquefaction itself, shipping, storage, and regasification. According to *Pipeline and Gas Journal* author D.K. Das, these costs in 2011 added up to an approximate $3.17 per million British thermal units (MMBtu) above the cost of extraction.[13] Das' cost assumptions are optimistic compared to other industry analysis. Margins on gas projects are thin, and construction of new facilities is unlikely to proceed if global prices are low, or if the difference between US and other regional prices is not significant. Assuming a US price of $4–$4.50/MMBtu, recent industry analysis suggests that US exporters would need European natural gas prices around $9/MMBtu and Asian prices around $10.65/MMBtu to attain necessary profits.[14] As Table 2, below, illustrates, German natural gas prices in 2014 were probably not high enough to attract willing suppliers from the United States.

Transport explains part of the difference in price, and yet that difference across the regional markets remains striking. Table 2 shows a price range of $4.35–$16.33 in the same year. Not only did these prices vary dramatically by region, they also varied differently across time. Gas markets are not fully developed, and so the prices paid, especially in Asia, reflect an inability to supply the market reliably at

[9]Based on the reference case: EIA Annual Energy Outlook 2014, Department of Energy, p. MT-21.

[10]Krishnaswamy (2007), p. 17 (*The World Bank has not offered an update to this calculus, in spite of rising LNG trade since 2007*).

[11]NERA 2014 Economic Consulting, (Robert Baron, Paul Bernstein, W. David Montgomery and Sugandha D. Tuladhar, authors) "Updated Macroeconomic Impacts of LNG Exports from the United States," prepared for Cheniere Energy, Inc., by NERA Economic Consulting, March 24, 2014, p. 20.

[12]*BP Statistical Review of World Energy* June 2015, Gas trade tables and map, pp. 28–29.

[13]Das (2011) Das estimates $0.32 for transport if the facility is less than 300 miles from extraction, $1.09–$2.09 for liquefaction, $0.28–$0.61 for shipping, and $0.30–$0.38 for storage and regasification.

[14]Gloystein (2014).

Table 2 Natural gas prices: US$ per Million Btu*

	2008	2009	2010	2011	2012	2013	2014
Japan	$12.55	$9.06	$10.91	$14.73	$16.75	$16.17	$16.33
Germany	$11.56	$8.52	$8.01	$10.49	$10.93	$10.73	$9.11
United States	$8.85	$3.89	$4.39	$4.01	$2.76	$3.71	$4.35

*British Petroleum, *Statistical Review of World Energy* June 2015, Gas price tables, p. 27

the desired level. Asian markets are struggling to meet large and expanding demand: Japan and Korea, which have no domestic capacity and limited other energy options, are willing to pay more for secure supply—incurring greater economic cost in an effort to minimize risk. Because of Qatar's preference (and large role in the market), these states purchase according to long-term oil-based contracts. They are especially eager to diversify suppliers, to gain supply that does not transit the Strait of Malacca, and to negotiate deals with states that do not limit exports in an effort to control price (as does Qatar).[15]

Aiming at 2035, the International Energy Agency (IEA) expects differences in price across regions to narrow, but remain large throughout the time period.[16] This is in spite of the IEA's assumption that global demand for natural gas will experience the fastest rate of growth among fossil fuels, and will become the leading fuel in the OECD energy mix by about 2030. The IEA predicts that gas production will increase almost everywhere (except Europe) and that unconventional gas production will account for nearly 60 % of global supply growth by 2040.[17] An assessment cited by the Congressional Research Service suggests that global capacity to produce LNG will rise by almost 50 % by 2020. Because the study cited only counts projects that are operating, under construction, or have reached final investment decisions, less than 3 BCF/day of US supply is included in their analysis.[18] As global LNG capacity expands, consumers will enjoy more flexibility of supply and prices will (slowly) converge.

The IEA does expect the United States to remain the largest global gas producer out to 2035, but its role in international markets remains unknown (as the largest gas consumer, the US could out-produce all others, but still only engage marginally

[15]NERA 2012 Economic Consulting (W. David Montgomery, Robert Baron, Paul Bernstein, Sugandha D. Tuladhar, Shirley Xiong, and Mei Yuan, Authors) "Macroeconomic Impacts of LNG Exports from the United States." Prepared for US Department of Energy by NERA Economic Consulting, December 3, 2012, p. 34.

[16]International Energy Agency, "World Energy Outlook 2013 Executive Summary," OECD/IEA 2013, Paris, based on the WEO's central scenario for projections to 2035, p. 2 (henceforth "IEA-WEO 2013").

[17]International Energy Agency, "World Energy Outlook 2014 Executive Summary," OECD/IEA 2014, Paris, pp. 2–3.

[18]A PIRA Energy Group Study, cited at length in CRS 2013, CRS 2013, Ratner et al. (2013), p. 16.

in world markets). The key uncertainty is global price, and Qatar's likely behavior in a more competitive market. As the NERA 2012 report notes,

> …if countries like Japan and Korea become convinced that they could obtain secure supplies without long-term oil-based pricing contracts, and ceased paying a premium over margin cost, the entire price structure could shift downward.[19]

Because the US is not a low-cost producer of natural gas compared to Africa and the Middle East regions, the United States' comparative advantage is easily lost. The NERA 2012 study concludes that LNG exports are only economically feasible in a climate of high international demand and/or low US cost of production.[20] However, there are also political reasons why nations may prefer to develop long-term gas relationships with the United States. These will be examined in a later section.

The United States, then, is currently the most successful producer of unconventional natural gas. It does not enjoy the greatest geological endowments, but it has created a favorable climate for exploitation of unconventional gas at a moment in history in which demand for gas is rising rapidly. The production and demand trends noted above set the context within which states craft energy strategies, and use energy as a component in grand strategy. Subsequent sections will examine each of the strategic aspects of energy, beginning with a review of energy security as an "end" of statecraft.

Unconventional Gas and "Ends": The Political Economy of Energy-Importing Consumers

The unconventional gas provides an opportunity for nations that have long imported energy resources to consider the attractive possibility of producing their own gas and either reducing or eliminating their dependence on outside supply. Nations that lack energy self-sufficiency have long sought to create "baskets of risk" whereby they import multiple sources from multiple suppliers to mitigate risk from any single source or supplier. When a state no longer places acquiring sufficient energy supply from abroad as an important security "end" of foreign policy, that state can then decide what to do with surplus. Some states will emphasize the economic benefits of selling surplus, while others will develop the resource more slowly, favoring the prospect of long-term autarky. Among nations, the US and Israel—both nations that have traditionally imported energy—have experienced dramatic, recent shifts in energy fortunes. The two states have chosen to emphasize different benefits of their newfound endowments. Although Israel's change in fortune is associated with offshore natural gas (rather than unconventional), the difference in policy choices between Israel and the United States is instructive.

[19]NERA 2012, p. 13.

[20]NERA 2012, pp. 76–77.

Israel's Experience

Historically energy resource-poor, Israel first discovered gas in 2000, at the Mari-B field. This discovery was followed by offshore discoveries of Tamar Field, discovered in 2009, and Leviathan Field, discovered in 2010, the latter of which was the largest deepwater discovery in ten years. As of 2015, Israel is estimated to have 6.7 tcf (0.2 trillion cubic meters) of proven reserves. Although this is a modest amount compared to major exporters, the current reserves to production ratio suggests that Israel can extract natural gas at the current rate without further discoveries for over 25 years.[21]

How to best use that natural gas in Israel's national interest quickly became a point of debate in Israeli policy circles. The most promising finds were deep offshore, discovered by foreign companies. These companies (led by Noble Energy) wished to develop the gas for export, since Israel's consumption levels were not sufficient to justify investment in developing the offshore gas fields. Meanwhile, the government wished to secure long-term energy security, and was uncertain how domestic demand would develop if gas was more reliably available. Following rapidly on the Leviathan discovery, Israel (which had no Ministry of Energy at the time) offered an international tender for advice on how to establish a gas export policy—one that would best balance Israel's "desire to secure energy self-sufficiency, maintain competition in the gas sector, and make the greatest contribution to the local economy."[22]

In June 2013, after considering its options, the government of Israel adopted a policy limiting natural gas exports to about 40 % of the offshore reserves. Although the companies were hoping for less restrictive limits, the citizens of Israel appeared to support higher restrictions. In making the controversial 40 % announcement, Prime Minister Netanyahu argued "We did the right thing for Israel. Without gas exports, there will not be gas for the domestic market." He went on to note that saving the gas exclusively for Israel would be a populist mistake: 'A number of countries did this, and they saved the gas for themselves. It is still buried under the ground and water, beneath layers of populism and bureaucracy."[23]

Since the Tamar field began producing in 2013, Israel's energy consumption mix has changed significantly. Between 2012 and 2013, oil decreased 22 % and coal decreased 17 % as shares of Israel's primary energy fuels, while natural gas consumption increased 170 %.[24] Israel's Antitrust Authority ruled in December 2014 that development of the Leviathan field would not proceed as expected, due to concerns about the effect of monopolies on Israel's domestic energy market. As a

[21]British Petroleum, *Statistical Review of World Energy*, June 2015, table of Total Proved Reserves of Natural Gas, p. 20.

[22]Sandler (2011).

[23]Quoted in Reuters, "Israeli Government approves a 40 pct limit on natural gas exports," Reuters Jerusalem, Sunday June 23, 2013.

[24]Congressional Research Service, "Antitrust Case Complicates Israel's Energy Future," CRS In Focus Series, February 27, 2015, p. 1.

newcomer to regulation of export, Israel continues to have difficulty deciding how best to manage international companies. Potential development companies, meanwhile, have significant concerns about the domestic consumption quotas and other aspects of the regulatory regime, which may increase the difficulty of attracting companies to invest in additional prospective fields.[25]

Meanwhile, the Israeli government has been closely involved with decisions on how to export the 40 %. The government has approved plans to supply Egypt via the pipeline through which Israel once used to import gas from Egypt. The government also plans to supply Jordan with natural gas from the Tamar field, and the Palestinian Authority with natural gas once the Leviathan field begins producing.[26]

Israel's choice to limit exports is unsurprising given its national interests, but there was a cost. Israeli law existing at the time of discovery suggested that the foreign operator (Noble Energy) had the right to export at levels of its own choosing. Israel was willing to raise tensions with the developer—and potentially discourage future investment—in its effort to ensure that Israel could successfully become more autarkic in its provision of energy to its own people. The optimal rate of exploitation from the government's viewpoint depended on Israel's present and future natural gas needs. How much natural gas Israel needs per year, how much the price should be reduced if natural gas is produced domestically, and how much government policies should push Israel towards more dependence on natural gas and less dependence on other fuels all become contentious policy questions, as did the question of selecting trade partners. Israel has long been concerned with security of oil supply, due to Arab producer's historical dominance in the world oil markets. Shifts in endowments that have made the market less risky for Israel (discovering gas in its territory) have not persuaded the state that it can rely securely on world markets, and Israel continues to enshrine energy security in its oil policies.[27] Energy security defined as secure (even autarkic) supply remains a clear "end" of Israeli state policy, even as Israel has been found to be energy-rich and able to export, and the state has carefully selected its future trade partners. By contrast to Israel's prioritization of energy security, the United States has placed emphasis clearly on the economic benefit. It is largely US allies who have pushed the agenda of seeking new energy partnerships with the US.

The United States

Like Israel, the United States has reduced its imports of natural gas dramatically in the 2010s. An anticipated shift towards large-scale imports gave way to an

[25]Congressional Research Service, "Antitrust Case Complicates Israel's Energy Future," CRS In Focus Series, February 27, 2015, p. 2.

[26]US Energy Information Administration, "Israel Country Report and Analysis," Updated July 2015, access at: http://www.eia.gov/beta/international/analysis.cfm?iso=ISR.

[27]Shaffer (2011).

expectation of significant export. As late as 2008, it was expected that the United States was on the verge of becoming a large-scale net importer of natural gas. The leap in production of shale gas, even as it was underway, took the government and industry by surprise. As the 'shale gale' took off in America in 2008–2009, the United States Geological Survey (USGS), the Energy Information Administration (EIA) and the Potential Gas Committee all revised dramatically their estimates of recoverable natural gas reserves, but shale gas production quickly exceeded even the revised assessments.[28]

In 2015, the United States is estimated to have 345 tcf (9.8 trillion cubic meters) proven reserves, ranking fifth in the world in proven reserves. Although this is substantially more than Israel holds, the current US reserves to production ratio suggests that the United States can extract natural gas at its current rate without further discoveries for only 13.4 years.[29] Serious discussion of government limitations on the rate of exploitation are largely absent. Analysis focuses on price and its variable impacts. The US Department of Energy's *Annual Energy Outlook* in 2015 anticipates in its Reference Case that the US will become a net exporter of natural gas by 2017, and a net exporter of overall energy in 2019.[30] All of the cases considered in the *Outlook* predict a continued growth in dry gas production. There is no single focus of debate in the United States, as there was in Israel, on the matter of exports. Although the United States has built some key assumptions into its projections, there is no strong movement to identify an optimal export limit.

Debate in the United States with respect to export of natural gas turns on concerns regarding the impact of export on domestic prices, the environmental impact of shale gas, and the price volatility of export.

To some extent, the difference in natural gas perspectives between Israel and the United States can be accounted for by differences in endowments of natural resources and of the technological means to exploit the resources, but the essential difference between Israel and the United States appears to be the level of confidence in the markets—that price will, and should be, the key determinant of the rate of exploitation, and that market actors will lead over government actors in effectively organizing international trade of gas.

In our typology of ends, then, these two cases illustrate how importing states will differ on the extent to which energy resources should remain the focus of policy if endowments change in that state's favor.

The ends of states will diverge depending on their perceptions of threat and opportunity associated with critical national energy interests. Israel, with limited indigenous capacity to produce, is compelled to export at a level that will keep the producing companies interested in development, but the clear government priority

[28]Maugeri (2012), p. 44.

[29]British Petroleum, *Statistical Review of World Energy*, June 2015, table of Total Proved Reserves of Natural Gas, p. 20.

[30]US Energy Information Administration *Annual Energy Outlook 2015 with projections to 2040*, US Energy Information Administration, US Department of Energy, pp. ES-3 and 4.

remains on energy security and providing long-term self-sufficiency in natural gas for the Israeli consumer. By contrast, the United States is likely to continue its focus on commercial opportunity and overall prosperity.

The key advantage of the shift from being an importer to becoming an exporter of energy is that it allows an energy-endowed state to shift its focus from pursuit of energy as a key "end" of statecraft. In this respect, unconventional natural gas (or any newly discovered energy endowment) contributes significantly to the power and the options of a state. But being an exporter has other advantages as well. Israel, as evidenced by the government's involvement in energy export agreements is aware of the potential leverage power inherent in becoming a significant exporter of energy. The next section will focus on the "ways" in which states incorporate the concept of leverage in their assessments of energy trade.

Unconventional Gas and "Ways": New Weapons, New Alliances

To the extent that energy is used as a foreign policy tool to achieve outcomes that are not directly associated with energy trade itself, energy may be assessed as a "way" of statecraft. O'Sullivan notes that energy can be used either coercively by sellers or buyers in an effort to change behavior, or it can be used cooperatively to strengthen alliances, and build support for foreign policy positions.[31] In the present shift of energy trade's "center of gravity" towards Asia, new statecraft "ways" involving energy are evident on all sides. While Asian states fearing China's potential control of critical energy corridors seek to establish energy trade relationships with the United States, China itself seeks to establish overland corridors (and long-term energy trade partners) to diversify its import risk portfolio. A brief examination of these two cases illustrates the extent to which the potential role of unconventional gas is key to these emerging "ways" of energy statecraft.

Trans-Pacific Partnership (TPP)

The Trans-Pacific Partnership (TPP), even if it does not in the end succeed as a free trade area, is an illustration of the reality that the promise of energy trade dramatically changes how nations view the costs and benefits of a free trade agreement. Under current US law, nations that have a free trade agreement (FTA) with the United States have a clear advantage in establishing an energy trade relationship. The Natural Gas Act as amended provides that exports to FTA

[31]O'Sullivan (2013), pp. 30–47.

countries are "presumptively considered in the national interest."[32] Among the 20 nations with whom the United States has a Free Trade Agreement, only South Korea is a likely customer for LNG (Mexico is a likely long-term partner, via pipeline).[33] The US-Korea trade agreement entered into force on March 15, 2012.[34] The agreement was spurred to conclusion by South Korea, which, as the second-largest importer of LNG globally, was particularly interested in potential US exports of LNG once the United States' endowment became clear.

Although the current administration has looked favorably upon permission to sell LNG to non-FTA countries, contracts for energy export to nations with whom the US does not have a free trade agreement are decided on a case-by-case basis. The TPP (as well as the Transatlantic Trade and Investment Partnership—TTIP) is understood to be desirable for the promise it holds of preferential access to US LNG. This desire isn't about flexibility of markets, since the LNG projects currently being developed will most likely seek 20–30 year long-term supply contracts in order to attract finance.[35] It is, rather, an effort on the part of allies to use energy to further strengthen relationships with the United States through long-term import relationships.

This best explains Japan's May 2013 entry into the Trans-Pacific Partnership negotiations, three years after the original summit which they did not attend.[36] The failure to finish a deal in July 2015 was testament to the complexity of the agreement, which would have included over 40 % of the world economy.[37] Nevertheless, the willingness of Japan to engage the negotiations is a reflection of its concern regarding energy security. This concern was reflected in a meeting on 10 October 2013 of the House of Representatives Subcommittee on Energy and Power. The Committee hosted a forum on the Geopolitical Implications of US Energy Exports, and representatives from Asia—including Japan's Minister of Economy, Trade, Industry and Energy—were very engaged participants. In the words of Ambassador Ashok Kumar Mirpuri, Singapore's Ambassador to the US,

> Increased LNG exports to Asia would further anchor the US economic presence and further contribute to enhancing the region's energy security. In doing so, the US would strengthen its partnerships in the region, serving regional stability and its global interests.[38]

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[32]Congressional Research Service, Ratner et al. (2013), p. 14.

[33]CRS, September 17, 2013 p. 11.

[34]Office of the United States Trade Representative, Resource Center, Executive Office of the President, accessed 7 September 2015, at https://ustr.gov/trade-agreements/free-trade-agreements/korus-fta.

[35]Congressional Research Service, Ratner et al. (2013), p. 15.

[36]The original TPP meetings included Australia, Brunei, Chile, Malaysia, New Zealand, Peru, Singapore, Vietnam and the United States.

[37]Ami Miyazaki and Krista Hughes, "Pacific Rim Free Trade Talks Fail to Seal Deal" Reuters wire service, posted 07/31/2015.

[38]Quoted in "Prosperity at Home and Strengthened Alliances Abroad—A Global Perspective on Natural Gas Exports," Policy Paper Series from the US House of Representatives Committee on Energy and Commerce, Chairman Fred Upton, Vol 2, Issue 10, February 4, 2014, pp. 9–10.

The nations of Asia are seeking more than energy sales. The pivot to Asia, in energy terms, has already occurred. The sheer volume of demand increase in Asia has caused trade patterns to shift, and with that shift came new vulnerabilities.[39] Even if no players act aggressively, stress on the Strait of Malacca has changed significantly. Oil flowing through Malacca has increased from 7 million bbl/day in 1993 to 15 million in 2013, while LNG has more than doubled in just five years, from 1.6 tcf/year in 2009 to 4.2 tcf/year in 2013.[40] More than half of global LNG currently flows through the South China Sea (of which 50 % is destined to Japan). Although the gas comes from a range of sources—Qatar, Malaysia, Indonesia, and Australia—a rising concern about China's future role with respect to the sea lanes has inspired the rest of Asia to seek not only supply, but better yet secure supply that would rely less on the overstressed sea lanes, and perhaps best of all, supply from a power that might engage in ensuring the continued openness of all the sea lanes.

It is not surprising, therefore, that ASEAN Asia is looking to the US as a long-term supplier, and anticipating that US participation will simultaneously lower price, offer non-Malacca routes, and cause the US to keep an eye on Malacca as long as it is engaged in extensive energy trade in the region. For ASEAN Asia, this suggests that enticing the US into energy trade relationships is an important "way" of securing sustained US attention. China sees the potential as well, but draws a different conclusion.

China's Overland Energy Relationships

While ASEAN Asia is pursuing energy relationships with the United States, China is pursuing domestic exploitation of conventional gas, and trying to secure long-term import relationships with land powers that can supply it with additional gas imports. China is seeking gas from many sources, partly in an effort to meet its ambitious energy targets (the 2020 Five Year Plan expects gas to become 10 % of the energy mix, an increase of 6 % from 2010),[41] but it is also seeking routes whereby energy supply cannot be used as a "way" to discipline its behavior. If the US is likely to continue to be highly visible in the sea lanes, China wants to ensure that the sea lanes aren't its only option.

China began developing overland supply in 2007 when it completed a deal with Turkmenistan to export natural gas via Uzbekistan and Kazakhstan. The Central Asia-China Gas pipeline, a 1833 km pipeline connecting Turkmenistan to China is being expanding to four lines, and both Uzbekistan and Kazakhstan are now

[39]Klare (2015), p. 252.

[40]EIA, "World Oil Transit Chokepoints," US Energy Information Administration, November 10, 2014 report, pp. 8–11.

[41]See Holly Morrow for a case study of China: Morrow (2014), pp. 10–13.

contracted to produce natural gas for China's market. Total capacity of the lines will be 85 BCMA, of which Turkmenistan is contracted to supply 65 BCMA.[42] In less than a decade, Turkmenistan will transition from selling all of its gas to Russia, to selling nearly all its gas to China. Although it may seem that China is setting up Turkmenistan to compete with Russia, in fact China is seeking supply from both locations. The "Power of Siberia" pipeline, which broke ground in September 2014, will carry an additional 38 BCMA to China.[43]

Given that China is endowed with what is estimated to be the largest unconventional natural gas reserves in the world, it may seem counterintuitive that China is pursuing imports rather than developing unconventional gas at home. The reality is, China's ability to exploit unconventional gas remains unproven. In her investigation of why China has had little success so far in its efforts to exploit CoalBed Methane (which, in her estimation, should develop more rapidly than shale gas), Holly Morrow identifies several impediments: overlapping license problems; lack of pipeline connectivity, and—most of all—the bias of the state energy companies to invest in huge conventional projects that can leverage their scale.[44] Instead of developing its own resources, China is leveraging its ability to access large-scale conventional projects in nations where it can have a powerful (in the case of Turkmenistan, perhaps even a monopsonistic) relationship with the government that holds the resource.

These examples of ASEAN members and of China seeking new ways of procuring energy that bind energy to larger alliances are illustrative of broader global trends. The increased focus on energy… particularly natural gas… as a "way" of statecraft is a striking development. Energy can be leveraged by consuming countries (such as China) or by producing ones. The emphasis in this section has been on Asia, but the political salience of energy relationships is also strikingly evident in the ongoing Russia-European Union crisis: Europe is continually having to weigh its access to cheap natural gas against support for Ukraine.

Yet another example of energy as a contemporary "way" of statecraft, explored by Robert Manning, is the evidence that surging US oil production made possible oil export sanctions on Iran, since without new US production such action would have destabilized a fragile global economy.[45] In considering "ways," it is evident that indigenous natural gas enhances security of the states endowed with it by reducing the leverage that outside actors can gain through the use of energy as a political weapon. For conventional exporters such as Russia, the diversification of sources will pose a challenge to its monopoly. For importing states such as China,

[42]EIA, "China International Energy Data and Analysis," US Energy Information Administration, Updated May 14, 2015, accessed 17 September 2015 at: http://www.eia.gov/beta/international/analysis_includes/countries_long/China/china.pdf.

[43]Gazprom Export website, "Power of Siberia," accessed 17 September 2015 at: http://www.gazpromexport.ru/en/projects/3/ Also confirmed by EIA "China International Energy Data and Analysis".

[44]Morrow (2014), pp. 10–11.

[45]Manning (2015), p. 120.

diversification will become an increasingly attractive strategic "end," precisely so that China does not become vulnerable to use of energy as a "way" of shaping its state behavior.

Pursuit of domestic resources is also highly attractive to states because it enables them to benefit from the additional "means" that self-sufficiency in energy can offer a state. Being an exporter is an attractive source of revenue if it is geologically possible, but for most states unconventional gas is most attractive if it reduces the vulnerabilities associated with import of energy. The following section turns to the question of means and the priorities of nations.

Unconventional Gas and "Means": The Wealth and Priorities of Nations

The literature on the "oil curse" is well-known. No state aspires to destroy its economy with a "Midas touch" that creates Dutch disease, currency instability, and fiscal unpredictability. It is widely understood, however, that the challenges are quite different for developed states which put appropriate mechanisms in place to manage their resource wealth. No oil company enjoys more international admiration than Statoil, and Norway has done quite well with its resource wealth. Because unconventional exploitation requires a sophisticated level of technology in addition to well-developed markets, the "break-through" states in unconventional gas are all developed states, ones which can aspire to use their natural gas to enhance domestic industry and lower the cost of production. Even so, the desire to engage in international markets is almost irresistible. Natural gas is on the rise in demand as much as in supply. World markets for energy are robust, and show no sign of declining in the medium term future. Nations that have the capacity to export energy reap economic benefits on world markets. For this reason, the question of how to enter the market—and thereby best benefit the state—is a burning question for developed states that find themselves with unconventional natural gas resources. In an effort to understand how states might differently perceive the "means" that energy wealth can bring, it is illustrative to contrast Australia and the United States.

Australia

The coalbed methane (CBM) production boom in Australia predated the "shale gale" in the United States. The CBM boom was driven by a 2000 government mandate that 13 % of power generation should come from gas. This led to a spike in domestic demand, and given the guaranteed market, the industry began to succeed, and estimated reserves rose dramatically as companies searched with greater intensity. Australia's estimated reserves of CBM rose from 5 BCF in 1996 to

15,000 BCF in 2008.[46] CBM accounted for almost 13 % of total natural gas production by 2012, and if technically recoverable reserves estimates are correct, Australia could rank 6th in the world for unconventional gas.[47]

This boom in reserves, coupled with low domestic prices, a history of international gas trade, and proximity to Asian markets, led developers to focus on export of coalbed methane in the form of LNG. In her case study of Australia CBM, Holly Morrow notes the ironic consequence of ambitious CBM-LNG projects—there is now an expected shortage of gas in the domestic market of eastern Australia. As the industry increased the speed of development, companies consolidated or were bought out, until prospective LNG projects came to own ¾ of the CBM reserves. The companies prepared to market that CBM internationally rather than domestically. The realization that export of LNG would indirectly lead to much higher domestic prices led to a deterioration of public support for CBM. In addition, Australia is a high cost producer, and as Asian prices fluctuated downwards, projects slowed down—reducing availability of natural gas for domestic markets even before the companies were able to begin actual LNG export. Public opinion, which did not develop at the outset when the industry had maximum momentum, is now increasingly opposed to fracking. Morrow draws the lesson that, if the government wishes to develop unconventional resources, it will need to identify the risks, regulate them well, and communicate with the public.[48]

Australia has become a cautionary tale to many policymakers in America. The idea that entering the world market may imperil the domestic market is a strong message. The distance from markets, and the undeveloped state of LNG export capacity in the United States made it less possible for an unconventional boom to cause citizens to see their own costs increase before the advantages of unconventional exploitation were fully evident.

The United States

In the United States, the domestic market is established in law as primary. This is illustrated by the Alaska-Japan LNG crisis. In spite of rising demand in Japan for natural gas after the nuclear disaster at Fukushima, the United States' only LNG export terminal, which had traditionally supplied Japan, remained closed for three years. The LNG facility, known as Kenai, in Nikiski, Alaska, was inactive starting in 2011, and its license expired in March 2013. US export rules clearly specify that export cannot be allowed to damage local supply. Declining productivity of the gas field supplying Nikiski was the reason why exports were halted, and exports were

[46]Morrow (2014), p. 13.

[47]EIA Australia Country Analysis, US Energy Information Administration, August 28, 2015, accessed at: http://www.eia.gov/beta/international/analysis.cfm?iso=AUS.

[48]Morrow (2014), pp. 13–16.

resumed only when reinvestment in the field ensured that the region surrounding Nikiski would be fully supplied prior to resumption of export. Kenai received a new license in April 2014.[49]

Most US official documents express the assumption that the US will begin exporting in 2016 and will become a modest net exporter by 2017. The amount that the US will export, however, and how that will be determined remains unclear. The Department of Energy projections assume that US net exports by 2040 will range somewhere between 3.0 and 13.1 tcf. In the DOE reference case, price is expected to more than double during the same period, from the 2015 price of $3.69–$7.85 per million BTU.[50] The Congressional Research Service has criticized available government analysis for its vagueness. The price increase estimates range from 9.6 to 32.5 %, leaving "enough latitude in their results for supporters and opponents of exports to promote their opinions."[51]

Given the uncertainties, some analysts argue that the United States has no obligation to offer its natural gas to world markets at all. On this question, the US is pulled between GATT exemptions for natural resources and the US traditional role as an advocate of free trade. GATT Article XX(g) provides for member countries to take action "relating to the conservation of exhaustible natural resources if such measures are made effective in conjunction with restrictions on domestic production or consumption." This article is understood to mean that nations may regulate the sale of an exhaustible national resource, taking into account their national interest. The logic is that, since such resources can only be sold once, the national interest may not reside in selling the resource as rapidly as possible.[52] Writing for Congressional Research Service in March 2013, Brandon Murrill raised the specific question of whether a US government-imposed restriction on LNG exports could be considered an actionable subsidy to downstream users of natural gas (users such as the petrochemical industry) under WTO rules. He posits that it cannot, based on the precedent that an actionable subsidy must be specific to a group of enterprises or industries.[53] The precedent of selling natural gas to domestic consumers at prices far below the regional trading price is well-established by Russia, which had to display only that it achieved cost-recovery in natural gas before being admitted to the WTO.[54]

If, however, the US were to invoke GATT XX(g), this would mark a decided change in position for the United States. The US was the main complainant against China in the WTO regarding its limits on the export of rare earths and other metals,

[49]According to the website of ConocoPhillips, which operates the Kenai facility. See http://alaska.conocophillips.com/what-we-do/natural-gas/lng/Pages/kenai-lng-exports.aspx.

[50]EIA Annual Energy Outlook 2015, p. ES-2.

[51]CRS 2013, Ratner et al. (2013), p. 19.

[52]See Carey (2009), pp. 783–810.

[53]Murrill (2013).

[54]For a detailed discussion of Russian domestic energy policies and Russian trade in energy, see T. Sabonis-Helf, "Russia and Energy Markets," Chapter 2 in *New Realities in Global Energy Security*, Edited by John Deni, Army War College Press, December 2014.

and the WTO found in favor of the complainant in that case, which turned on interpretation of GATT XX.[55] In acknowledgement of this precedent, the Congressional Research Service suggests it may be necessary for the US to restrict its own production (for reasons of conservation or protecting human health) in order to make a successful case that trade must be restricted.[56] More broadly, retreat from open markets in the sale of natural gas would bring into question the US's traditional position as a promoter of free trade.

If the US were to opt to export, estimates of both quantity and percentage of production vary widely, and no clear guidance has been provided in this regard. Based on the parameters provided by DOE, the first NERA (2012) analysis assumed that LNG exports would range between 6 and 9 billion cubic feet/day (BCF/day), between 9 and 18 % of US domestic production at the time of the study.[57] The subsequent NERA (2014) analysis assumed higher export levels—the highest case scenario has exports exceeding 53 BCF/day.[58] The Department of Energy, in its 2014 Annual Energy Outlook, predicts a higher volume, but lower percentage of exports. Their reference case focuses on an export level of 15 %.[59] An examination of actual infrastructure suggests a trend towards relatively high export levels. Although only 2.76 BCF/day of LNG export capacity is currently under construction in the US, a total of 7.26 BCF/day capacity has already been approved, and an additional 18.7 BCF/day has been formally proposed to the appropriate federal licensing authority.[60] If all this capacity were to be built, the US would have infrastructure in place to export 26 BCF/day. At 2013 production levels, this would represent the capacity to export 39 % of US gas produced.[61]

In aggregate economic terms, export of LNG (according to the NERA 2012 and 2014 studies) is a net benefit to the United States even at higher levels. However, those benefits are not distributed evenly. There would be clear losers as well as winners if the United States chose to pursue LNG exports at a significant level. The CRS report notes that economic effects are likely to vary significantly from

[55]World Trade Organization, Dispute DS431, "China—Measures Related to the Exportation of Rare Earths, Tungsten and Molybdenum," final report 29 August 2014, names the US as the key Complainant, with 18 other nations listed as third parties. See: http://www.wto.org/english/tratop_e/dispu_e/cases_e/ds431_e.htm.

[56]CRS 2013, Ratner et al. (2013), pp. 14–15.

[57]NERA 2012 Economic Consulting (W. David Montgomery, Robert Baron, Paul Bernstein, Sugandha D. Tuladhar, Shirley Xiong, and Mei Yuan, Authors) "Macroeconomic Impacts of LNG Exports from the United States." Prepared for US Department of Energy by NERA Economic Consulting, December 3, 2012, p. 3.

[58]NERA 2014, p. 11.

[59]EIA Annual Energy Outlook 2014, p. MT-23.

[60]Data from Federal Energy Regulatory Commission Office of Energy Projects, maps of Existing and Proposed Export and Import Terminals, as of December 3, 2014, access at: http://www.ferc.gov/industries/gas/indus-act/lng.asp Offshore facilities are approved by MARAD, by FERC. See table in the appendix.

[61]In 2013, the US produced 24,282 BCF—66.5 BCF/day. Data from EIA, US Natural Gas production, access at: http://www.eia.gov/countries/country-data.cfm?fips=US&trk=m#ng.

region to region, and that regional impacts "…may diverge from impacts on the nation as a whole."[62] The greatest negative impacts will be felt by regions especially dependent on natural gas inputs to electricity generation, regions that host energy-intensive manufacturing,[63] and those regions in which natural gas makes up a significant part of heating. The greatest positive impacts will be felt by regions involved in natural gas production, and by regions where flaring of associated natural gas will be reduced once the demand for and price of gas rises. NERA 2014 notes that exports of LNG would lead to a shift in sources of income, in that labor income would grow more slowly while capital and net resource income grows more rapidly than in a no-exports scenario. Despite this, the report expects that overall household income would increase. Capital income, resource income, and tax income would all increase more than labor income decreases.[64]

Low gas prices are a comparative advantage for industry in the United States, but American citizens have long enjoyed some of the lowest energy prices in the world, and this would continue even in a high export scenario due to the cost advantages of indigenous gas. It has been argued that current prices are in fact too low. The IMF has described the US as among the top three subsidizers across the world in absolute terms, noting that US subsidies total $502 billion/year, while China totals $279 billion and Russia totals $116 billion.[65] The IMF has stated that, although the US, as a wealthy country, does not spend in excess of 5 % of GDP on energy subsidies, the US (like many developed nations) engages in 'insufficient energy taxation,' and thereby aggravates climate change.[66] Meanwhile, the US government acknowledges energy subsidies, but places the estimate much lower, describing direct federal financial interventions and subsidies in energy as constituting $37.2 billion in 2010.[67]

In comparing Australia to the United States, it appears that Australia, as a nation that traditionally exports commodities and fuels, did not carefully examine or adjust for domestic impacts of export. The United States, by contrast, focuses rather closely on the domestic market. However, as an artifact of seeing itself as a consuming nation (rather than a producing nation), the United States shows few signs of considering the uses of energy to better secure non-energy goals. Instead, the US remains focused to date on the commercial wealth associated with energy

[62]CRS 2013, Ratner et al. (2013), p. 6.

[63]Defined in the NERA 2012 report as manufacture which "…has energy expenditures greater than 5 % of the value of its output and serious exposure to foreign competition" to include paper and pulp manufacturing, as well as chemical, glass, cement and primary metal manufacturing. See NERA 2012, pp. 17, 64 and 68.

[64]NERA 2014, pp. 8–10.

[65]IMF, "Energy Subsidy Reform: Lessons and Implications," Staff Team led by Benedict Clements, International Monetary Fund, January 28, 2013, p. 13.

[66]IMF Press Release: "IMF Calls for Global Reform of Energy Subsidies: Sees Major Gains for Economic Growth and the Environment," International Monetary Fund Press Release No 13/93, March 27, 2013.

[67]EIA, Information Requests, access at: http://www.eia.gov/analysis/requests/subsidy/.

production. The key debate about unconventional gas export centers more on how much to sell (and with what impact on the domestic economy) rather than to whom to sell LNG.

Australia and the United States focused differently on how energy constitutes the "means" … a critical component of state resources. While Australia allowed its well-developed export sector to focus on the global market to the detriment of its domestic demand, the United States has significant policy focus on ensuring full supply to domestic markets, counting on overall economic growth to produce increased revenue for the state. The two nations have in common a growing concern among the polities about the costs and risks of the development of unconventional gas.

Costs and Risks of a Strategic Shift Towards Unconventional Gas

No strategic assessment is complete without consideration of costs and risks. To the extent that unconventional gas has set new terms of the game in international energy, it is essential to consider the costs and risks of this shift for nations pursuing energy security as an end—as well as for those states which use energy as part of the means and ways of statecraft. Polities of many states are concerned about the environmental risk associated with unconventional gas. This issue is a critical aspect of cost and risk, but one beyond the scope of this chapter on geopolitics. This chapter will instead focus on risks and costs associated with the infrastructure of trade, the risks to conventional gas-rich states, and the implications of natural gas becoming "more like oil" in international markets.

Concentration of Energy Infrastructure

Although unconventional gas is highly distributed, one characteristic of its exploitation in the United States so far is that it has exacerbated an already existing concentration of energy assets in one vulnerable location: the Gulf of Mexico. The industry-led nature of energy development in the United States has allowed companies to default to areas that are "industry friendly" and to emphasize the commercial advantages of clustering of related industries over the potential security disadvantages.

Significant offshore oil and gas infrastructure in the Gulf of Mexico is co-located with the Strategic Petroleum Reserves. Additional energy infrastructure is under construction. The Gulf Coast Pipeline project, commissioned in January 2014 will

carry an additional 700,000 barrels of oil a day into the Gulf for shipping. This concentration of energy assets constitutes a significant vulnerability to severe weather events, accidents or terrorist actions.[68] The potential proliferation of LNG facilities complicates this issue further. According to the Federal Energy Regulatory Commission Office of Energy Projects, as of December 3, 2014, 11 proposed export facilities (for a total of 18 BCF/day) and 3 proposed import facilities (for a total of 3.6 BCF/day) are sited in the Gulf of Mexico.[69] An additional 12 facilities, which are at an earlier stage of proposal development, also potentially located in the Gulf of Mexico, are listed as "Potential LNG Export Terminals." These facilities would total an additional 16.25 BCF/day of natural gas throughput if constructed. The Gulf of Mexico is simultaneously more critical and more vulnerable as energy developments progress.

Severe weather events are already in evidence. According to the US Government, extreme weather events are expected to intensify due to climate change, and the "number of Gulf Coast electricity substations exposed to inundation caused by storm surge from Category 1 storms is projected to increase from 225 to 337 by 2030 due to sea-level rise."[70] In 2012, the Gulf of Mexico produced 19.5 % of all US oil, and 6 % of all US natural gas. Production shut-in during the 2012 hurricane season totaled 14 million barrels of oil and 32.1 billion cubic feet of natural gas.[71]

In addition, the concentration of LNG facilities together with other energy infrastructure is sometimes considered a potentially attractive terrorist target. For the 40-year history of LNG use, the safety record has been excellent[72] and no tankers or land-based facilities have been attacked by terrorists. In an age of terror, however, the US government Sandia Laboratory conducted an in-depth analysis of risk of intentional breach of an LNG cargo tank. They concluded that such a breach would likely produce an ignition source and an LNG fire. In such a scenario, they assessed the most significant impacts "on public safety and property" would be within 500 m of the incident itself, and even in the case of very large spills, impacts

[68]Note that, of the three instances in which the International Energy Agency has ordered emergency draw-downs of Strategic Petroleum Reserves of member states, one was in response to Hurricane Katrina. Department of Energy, "International Energy Agency Members release strategic petroleum stocks," June 24, 2011, US Energy Information Administration, access at: http://www.eia.gov/todayinenergy/detail.cfm?id=1950.

[69]Federal Energy Regulatory Commission Office of Energy Projects, maps of Existing and Proposed Export and Import Terminals, as of December 3, 2014, access at: http://www.ferc.gov/industries/gas/indus-act/lng.asp.

[70]US Government, "Quadrennial Energy Review: Energy Transmission, Storage and Distribution Infrastructure: Summary for Policymakers," April 2015, p. S-10.

[71]EIA 2013.

[72]As in the case of compressed gas, LNG is only flammable when the air-natural gas mix is 5–15 %. If there is less air, there isn't sufficient oxygen for a flame. If there is more air, the gas becomes rapidly too diluted to ignite. See FERC, Federal Energy Regulatory Commission, "LNG Overview," can be accessed at: http://www.ferc.gov/for-citizens/citizen-guides/lng.asp.

would be substantially lower only 1600 m away.[73] In their assessment, this means that the zone at highest risk in an intentional LNG spill includes narrow harbors or channels, underpasses of major bridges or tunnels, and times when the tankers are within 500 m of major infrastructure elements. These parameters should influence the siting of energy facilities in the Gulf.

Protection of the Sea Lanes

If US interests in the Gulf of Mexico are more directly at risk in an age of LNG exports, US interests in the Middle East are less so. To the extent that the United States has reduced (and continues to reduce) its reliance on the Middle East to supply energy, the United States' strategic interests in the Strait of Hormuz are reduced. While the United States retains non-energy interests in the Middle East, it is increasingly allies of the US, rather than the US itself that are vulnerable to interruptions of supply. The energy pivot to Asia, however, ensures that other powers will find their interests in the Middle East rising. In particular, China's increasing dependence on free flow of energy from the region has caused its strategists to begin contemplating a shift in responsibility.

The US has acted as the security guarantor in the Persian Gulf since the Carter Doctrine, and secondarily has ensured flow through the Strait of Malacca. Energy Security scholar, Robert Manning, notes that

> This US role has meant other major oil consumers have been largely free-riding on the US provided public good of stability and sea lane security. This is especially true of China, which is in the midst of building a blue water maritime capacity. One key question is whether the combination of redefined US interest, the reality of a growing Middle East-Asian energy nexus, and new or enhanced naval capabilities of China, India, Japan, the Republic of Korea, and other actors results in burden-sharing in regard to the security of sea lanes.[74]

The US is unlikely to give up its strong interest in maintaining free flow of commerce in general and energy in particular on the sea lanes in the medium term. If the US pursues a role as a significant exporter of LNG, it will continue to engage in energy trade routes as an exporter rather than an importer. However, this shift will require some changes: both new routes and improvements to old routes will be necessary. If the US is to provide LNG to Asia competitively, the widening of the Panama Canal is critical.[75] Even if new routes include Panama and the recently completed New Suez, pressure on the existing routes will remain high. The Strait of Malacca remains the primary route—once oil has cleared the Straits of Hormuz—for oil heading to Asia, and LNG from the Middle East will likely follow that route.

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[73]Sandia (2004).

[74]Manning, p. 124.

[75]CRS 2013, Ratner et al. (2013), p. 16.

Even if unconventional gas reduces pressure on the sea lanes in some locations, it will increase energy trade in others, so strategists should watch for a shift in routes rather than a decrease in the tempo of interstate trade.

The Future of Conventional Gas-Rich States

Unconventional gas is likely to impact the routes of trade—but also the players that matter. Although it is possible that Moscow will diversify and modernize, taking advantage of its own considerable shale,[76] it is more likely that shale will be pursued most successfully by states that do not have large conventional endowments. As Holly Murrow's research demonstrates, unconventional resources do not tend to attract the interest of companies or states that have the opportunity to pursue large fields, which are more profitable and require less effort per unit of production. In addition, she notes, "quasi-monopolistic control of the energy sector is poorly suited to unconventionals," which are "still an innovation game."[77] For these reasons, the winners in unconventional gas are not likely to be the traditional major exporters.

A rise in new energy players does suggest a Russia that finds itself falling further behind in energy markets as it fails to innovate.[78] It also suggests a possible weakening of the US-Saudi bond, as Robert Manning predicts.[79] The shift in energy powers that matter to the global economy will produce some significant dislocation. Although there may be evidence to support Tom Friedman's memorable "first law of petropolitics," which holds that "when the price of oil rises, the quality of governance in petrolist states always falls,"[80] it does not follow that a decline in energy prices and/or a diminution of power of the petrostates will lead in any direct path towards better governance at home. Significant shifts in the structure of world energy markets will be associated with instability, as they were in the late 1980s. This may well be a set of risks that the energy-dependent states are willing to incur—making the Middle East less important to US energy is longstanding goal—but such risks need to be addressed in energy strategy. Another risk, which major importing states have long stated their willingness to embrace, is the economic risk of a freer market in natural gas.

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[76]Manning, p. 123.

[77]Morrow (2014), p. 12.

[78]For a detailed discussion of Russia, see the author's "Russia and Energy Markets" Chapter 2 in *New Realities: Energy Security in the 2010s and Implications for the US Military*, Edited by John R. Deni, Strategic Studies Institute and U.S. Army War College Press, February 2015.

[79]Manning, p. 124.

[80]Friedman (2006).

Price Stability: If Gas Is More like Oil, Who Wins?

In the late 1980s, it is widely understood that the United States collaborated with Saudi Arabia to depress the price of oil, weakening the Soviet Union and reducing the "means" available to it to engage in proxy conflicts. The price collapse of the 2010s, by contrast, was not done by design. It was, rather, a collision of a highly structured market with disruptive technology. Fracking has destroyed the price stability imposed by OPEC and Russia (which cooperated with OPEC since 2001). The irony, of course, is that the disruption was caused by high-priced producers of oil and natural gas. The break-even price in oil varies widely: Saudi Arabia enjoyed an estimated cost of production and transport per barrel of $7, while tight oil in the United States is estimated to have a cost of production and transport of $85 per barrel.[81]

Although increases in production from shale fields in the past decade are remarkable, fracking in oil and in gas is a relatively expensive process, very sensitive to price fluctuations. Shale oil development, as Leonardo Maugeri notes, takes place on a per-well basis, not on a field basis, and therefore critically depends on short-term oil prices, especially since peak production is achieved early in the well activity, and most production is competed within two years of production.[82] Although such wells can be brought back into production relatively quickly, the industry depends on continuous drilling. At low prices, such drilling is likely to fall off.

The situation for unconventional natural gas is similar: drilling is more intensive and must be continuously developed. Morrow offers the contrast within Australia between conventional and unconventional gas wells, noting that "In Australia, for example, a two-train CBM-based LNG project requires about 6000 wells to be drilled, versus fewer than 100 for two trains of conventional LNG."[83] Unconventional gas requires continuous drilling, which in democratic societies means it would require ongoing strong public support. In addition, high prices in Asia in natural gas have been created in no small measure by Qatar playing the role of "swing producer." If Japan and Korea stop paying a premium to Qatar over the margin cost, the entire price of gas could shift downward. Such a shift would rapidly make US LNG non-competitive.[84]

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[81]Production, Transport and Total are marginal cost, from Swiss National Bank, SNBCHF.com, "Shale and Oil Sands: Market Price Compared to Production Costs, Sept 2014, http://snbchf.com/global-macro/shale-oil-oil-sands/ Transport indicates delivery to major distribution channel.

[82]Maugeri (2013), p. 14.

[83]Morrow (2014), p. 3.

[84]NERA 2012 Economic Consulting (W. David Montgomery, Robert Baron, Paul Bernstein, Sugandha D. Tuladhar, Shirley Xiong, and Mei Yuan, Authors) "Macroeconomic Impacts of LNG Exports from the United States." Prepared for US Department of Energy by NERA Economic Consulting, December 3, 2012, pp. 13 and 76–77.

In the case of unconventionals, the costs of drilling tend to be higher, the need to drill is more continuous. How, then, can unconventional gas compete? What advantage does unconventional production have in the longer term? The key is in what is known as the "fiscal break-even price." While the break-even price denotes the actual cost of production, the fiscal break-even price is a measure of how desperately a petrostate requires oil and gas revenues. While Russia's actual break-even price in 2014 was estimated at $30 for onshore oil, its fiscal break-even price was estimated by the Ministry of Finance at $96 per barrel,[85] meaning that the budget would only balance if oil remained at that rate. Russia was not alone—the IMF estimate for other petrostates in 2014 notes that Saudi Arabia required $84.30, Iran $126.50, and Iraq $117.90.[86] When states rely on oil dollars to balance budgets, the state itself—not just the industry—suffers from price fluctuations, making the states less able to tolerate market shifts. While the United States could simply cease to export and keep low-priced gas at home, states that rely on exports for revenues would suffer more significant impacts.

It is clear, then, that a shift to unconventional fuels is disruptive, yielding new winners and losers. Costs to the new producing states include having to secure new sea lanes (while preserving the old ones), having to harden infrastructure and spend both dollars and policy attention on physical energy security. Risks to those states include a more volatile market, a need to manage relations between the industry and the polity, any unanticipated domestic environmental impacts of unconventional development, and possible political destabilization in nations that are old producers.

Conclusions: Unconventional Energy and the Strategies of Nations

In conclusion, unconventional gas is striking in the extent to which it can have an impact on each of the elements of strategy and therefore it has the potential to change the grand strategy and statecraft of nations. An examination of unconventional energy that disaggregates the elements of strategy demonstrates the extent to which unconventional energy impacts states differently. Table 3 reiterates the distinctions.

[85]Data from "Record Fall in Oil Prices Threatens Russian Budget" 7 Oct 2014 at http://rbth.com/business/2014/10/07/record_fall_in_oil_prices_threatens_russian_budget_40409.html.

[86]"Fiscal Break-Even Oil Prices for Major OPEC Members" OGFJ 3 April 2014 at http://www.ogfj.com/articles/2014/04/fiscal-break-even-oil-prices-for-major-opec-members.html and IMF Statistical Appendix Regional Economic Outlook Update, at https://www.imf.org/external/pubs/ft/reo/2014/mcd/eng/pdf/menapst0514.pdf.

Table 3 Elements of energy strategy

ENDS	**WAYS**
Energy Importing States seek to secure adequate supply at affordable price: finding new sources of supply (domestic or new foreign suppliers) enhances their energy security Energy Exporting States seek to maintain their ability to extract and export. They may seek to ensure access to markets as well	Energy Importing States can use their ability to purchase (or boycott) energy from Exporting states as a basis for alliances or effective sanctions Energy Exporting States can use their ability to supply or withhold energy as a tool of statecraft to extract other concessions from importing states
MEANS	**COSTS AND RISKS**
Energy Importing States seek to maintain favorable balances of trade by not importing too much energy Energy Exporting States have resources as a source of state revenue (and therefore, power). Management of those resources will vary by country	All states incur economic, environmental, political and technological risk in the pursuit of secure energy. States seek to establish a "basket of risk" and are typically willing to incur added cost in some ways that reduce risk. The extent to which states will accept cost to reduce risk varies

In terms of ends, the energy importing states with unconventional gas will be able to produce more gas domestically, and become less reliant on outside supply. This will afford such states the option of reducing the emphasis of energy as an "end" in their international statecraft even if (as in the case of Israel) domestic policy retains a focus on the strategic significance of energy. For energy exporting states, demand for their energy sources is not likely to disappear, but the ability to use such exports as a way—enabling them to extract non-energy concessions from importing states—may diminish as importers diversify into their own backyards. Some importing states, such as the members of ASEAN, will seek to use unconventional LNG energy imports as a "way" to enhance alliances with market-oriented new gas powers such as the United States. In terms of means, unconventional gas may provide some formerly importing states with more favorable balances of trade as they import less. Exporting states, meanwhile, are likely to find continued revenue, but how these resources are spent will vary by country and price may become more, rather than less volatile. In terms of risks, unconventional gas as pursued by formerly importing states represents a shift—accepting environmental risk and potentially higher cost in exchange for reducing the political risk of imports. States seeking to export unconventional gas will also incur costs associated with hardening infrastructure and ensuring free passage on sea lanes.

Examining unconventional gas from a grand strategy perspective suggests some opportunities, but also some limitations on natural gas as a potential instrument of power: Unconventional gas will neither replace conventional, nor allow most states to become autarkic. Given its higher cost, and the price-sensitivity of fracking to volatile markets, it is not likely to take over the market if conventional gas is available. It is a valuable "means" of diversity, but not a replacement.

The US comparative advantage lies in reducing the use of energy as a "way" for other states. Exports of unconventional gas are only likely in a climate of high international demand; lowered production costs; or as an aspect of broader strategic relationships. Only in times of higher price, or times of international instability, will US LNG supply be perceived as essential outside the US. Unconventional gas has the promise of enhancing resilience, but only if the state plays a role in recognizing the security needs and contributions of gas exploitation.

Managed strategically, unconventional natural gas does hold out the potential of changing the grand strategy of nations. Policy analyst Michael Klare has noted, "While energy technology is constantly changing, conflict over energy is likely to recur so long as major consuming states continue to rely on supplies derived from distant and unruly areas."[87] The real strategic promise of unconventional gas is that it sets out the possibility that a state which choses to prioritize development could fundamentally shift its reliance… and perhaps even come to serve the international community as a reliable supplier. That would redefine energy as a different kind of strategic "end." To do so effectively, however, would require a strategic approach which takes into account the significance of unconventional gas to each element of grand strategy.

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[87]Klare (2015), p. 239.

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