



2016 EDITION

INTERNATIONAL INDEX OF ENERGY SECURITY RISK®

ASSESSING RISK IN A GLOBAL ENERGY MARKET



Highlights

This fourth edition of the International Index of Energy Security Risk (International Index) provides an updated look at energy security risks across different countries for the years 1980 through 2014. The risk index scores calculated for the United States and 24 other countries that make up the Index's large energy user group: Australia, Brazil, Canada, China, Denmark, France, Germany, India, Indonesia, Italy, Japan, Mexico, Netherlands, Norway, Poland, Russia, South Africa, South Korea, Spain, Thailand, Turkey, Ukraine, and the United Kingdom. The scores for these countries are reported in relation to an average reference index measuring risks for the Organization for Economic Cooperation and Development (OECD) member countries. The OECD average risk index is calibrated to a 1980 base year figure of 1,000.

2014 Energy Security Rankings

Table H-1 ranks the energy security scores of 25 large energy-consuming countries in 2014. This is a risk index, so keep in mind that the highest (best) rank has the lowest numerical risk score and the lowest (worst) rank the highest numerical risk score.

Top Five

Norway remains the most energy secure country in the large energy user group in 2014. It has held the top spot since 2006, and since 1980 it has never been out of the top five. Its total risk score of 733 is 16% below the OECD average score of 869 and the gap between it and the OECD has widened somewhat in recent years. Looking at the metrics individually, of the 20 "country-specific" metrics used in the Index, Norway scores in the top five in 11 of them, with only three in the bottom five. Mexico—which earned a number one ranking from 1980 to 1994—was the second ranked country with a score of 766. From 1980 to the early 2000s, Mexico's risk scores rose steadily in relation to the OECD baseline average, but this trend seems to have flattened. For the entire period from 1980 to 2014, only three countries have occupied the

top spot—Mexico, Norway, and the United Kingdom. At numbers three, four, and five, respectively, New Zealand, United States, and Denmark occupy the other top five spots in the ranking list for 2014.

Bottom Five




With a risk score of 1,944—124% greater than the OECD average—Ukraine continues to be the least energy secure country in the 25-nation large energy user group in 2014. Ukraine has not moved out of the 25th spot since 1992, with soaring risks averaging 175% above the OECD average since 1992, the first year of Ukraine data. Nevertheless, the country's risk scores have declined significantly from their 1995-1996 peak of just over 2,600, both in absolute terms and in relation to the OECD average. The country's scores are still extraordinarily high—about one-fifth higher than 24th-ranked Thailand—that much greater progress will be needed for the Ukraine to break out of the bottom position. Political turmoil in the country, however, could frustrate policies aimed at improving its energy situation. Thailand, Brazil, South Korea, and China, all with scores exceeding 1,200, make up the rest of the bottom five.

United States¹

The United States moved up two places to number four in 2014. The shale revolution continues to drive total U.S. energy risks downward, both absolutely and measured against the OECD average. Since 2000, the United States has improved its energy security relative to the OECD average, going from a total score 8% greater than to 5% less than the OECD average in 2014. Over the same period, its rank rose from 10 to 4. This vastly improved U.S. position in reference to its peers is due primarily to the huge increase in

¹ It should be emphasized that the index data presented here and the index data presented in the Energy Institute's *Index of U.S. Energy Security Risk* measure different things and are not strictly comparable, though the general trend is substantially the same. Moreover, the concern in this section is primarily with U.S. energy security risks in reference to those of the OECD average and other large energy users over time.

Table H-1. Energy Security Risk Scores and Rankings for 25 Large Energy Using Countries: 2014

Country	Risk Score	Large Energy User Group Rank
 Norway	733	1
 Mexico	766	2
 New Zealand	799	3
 United States	824	4
 Denmark	827	5
 United Kingdom	828	6
 Canada	832	7
OECD	869	
 Australia	903	8
 Germany	930	9
 France	932	10
 Poland	959	11
 Spain	1,017	12
 Italy	1,038	13
 Turkey	1,064	14
 Japan	1,068	15
 Netherlands	1,091	16
 Indonesia	1,123	17
 South Africa	1,185	18
 India	1,186	19
 Russia	1,192	20
 China	1,212	21
 South Korea	1,290	22
 Brazil	1,297	23
 Thailand	1,627	24
 Ukraine	1,944	25

unconventional oil and natural gas production from shale formations. The United States is one of 16 countries with a 2014 risk score lower than its 1980 score, nearly 250 points, or 23%, lower. This is a larger relative reduction than for all of but two countries: China (40%) and Denmark (34%). The best score for the United States in the International Index was 801 in 1998. Of the 20 country-specific metrics, the U.S. ranks in the top five in four of them (related to import risks and energy expenditures and prices) and the bottom five in three of them (related to per capita energy use).

Movers

All countries showed improved risk scores in 2014, and position the relative positions among them did not change appreciably in 2014. The United States and Australia showed the largest single-year improvement in their energy security rank, both climbing two places to number four and number eight, respectively. These two countries were among those with the biggest percent improvement in absolute risk scores in 2014, largely on the strength of the improving imports posture of both.

Russia, on the other hand, saw its 2014 score improve the least as a percentage (2%) compared to the other 24 countries, with climbing risks in the transportation and environmental sectors in 2014 being the primary factors. As a result, Russia moved two places lower to 20th position.

Key Developments

Energy security risks for all countries in the large energy user group and for the OECD average fell in 2014, primarily because of much lower crude oil price volatility. This is the fourth consecutive year of declining volatility. Volatility can have profound effects on economies. Some amount of price volatility is inevitable, but large price swings over a short period of time create uncertainty about expectations of future prices. Highly volatile prices not only can jolt economies, they can lead to sudden and large shifts in international trade flows. In 2014, crude oil price volatility, measured as the three-year rolling average of annual change in price, was just below \$7 (in real 2014 dollars), its lowest level since 2004. This is well below the historical peak of nearly \$30 set in 2011. As a result, from 2011 to 2014, the index

for this measure dropped a whopping 1,405 points to a score of 419. No other metric moved nearly as much in 2014. Because crude oil is priced in a global market, price volatility is a “shared” risk that applies equally to all countries. That means the 46% decline measured for this risk in 2014 benefits everyone. This marks the fourth year of declining price volatility. The sharp decline in crude oil prices that began in 2014, however, means that we can expect to see price volatility rising in the next report. Indeed, the year-to-year change in the price of crude oil jumped from about \$4.50 in 2013 to \$13.00 in 2014, and indication of the higher volatility to come in 2015.

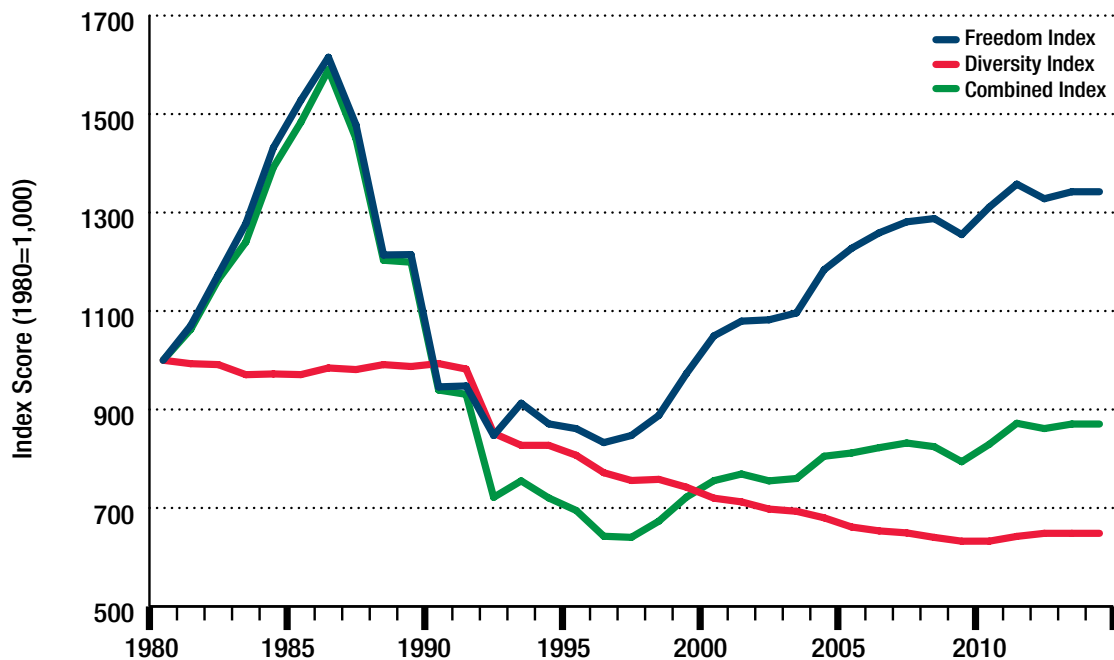
The recent decision by Saudi Arabia to sustain a high production level despite depressed global crude oil prices to capture greater market share has resulted in tremendous price volatility during 2014 and 2015.

Oil prices dropped sharply from more than \$100 per barrel to below \$50 per barrel. This strategy was aimed in large part at taking out as much U.S. production off the market as possible. Under a prolonged period of low oil prices, it was believed U.S. oil and natural gas production would be constrained.

Global crude oil production surged nearly 1.6 million barrels per day (bbl/d) in 2014. An increase in U.S. output of 1.2 million bbl/d, largely from “unconventional” sources, was primarily responsible for the jump. Greater production in Iraq (315,000 bbl/d), Canada (280,000 bbl/d), Brazil (230,000 bbl/d), and Iran (120,000 bbl/d) also contributed to the overall rise. The increase from these countries was more than enough to offset the declining oil output from a politically unstable Libya (450,000 barrels per day) and Mexico (105,000 bbl/d). The Mexican decline is a continuation of a long-term trend the Mexican government hopes will be reversed as a result of its liberalization of investment in its hydrocarbon sector can be reversed.

The decreasing risk associated with greater supply diversity of natural gas production has been offset to a large extent by increases in production from countries with high risk profiles, such as Russia, Iran, Qatar, and Algeria. Figure H-1 shows how the production risk related to diversity of supply has seen steady, if unspectacular, improvement since the early 1990s. Two things are going on here: (1) the breakup of the Soviet Union created more natural gas producers

Figure H-1. Security of Global Natural Gas Production Risk Index: 1980-2014



(if not necessarily more natural gas production); and (2) increased output in places that did not produce much natural gas previously. For example, in 1990 there were 11 countries producing at least 1 quadrillion Btus of natural gas. Today there are 26. As Figure H-1 also shows, however, the freedom-weighted score attached to the average molecule of natural gas supplied to the market—a proxy for supply reliability—has since the early 1990s deteriorated because many of the producers who increased output have large reliability risk attached to them. (A not dissimilar pattern holds for crude oil output, but it is not as pronounced.)

As a result, natural gas import risks remain very high for many countries, especially in Europe and in Japan and South Korea. Large gas-producers in the large energy user group like Australia, Canada, Russia, the United States, and a few others have a tremendous advantage over countries that rely on imports of this fuel. Once forecast to be a large natural gas importer, the U.S. is now poised shortly to become a net natural gas exporter, which should not only improve the reliability of supplies but also the diversity of supplies. There also are abundant shale gas resources outside the United States, many of which are in large energy user group

countries (Table H-2). China, for example, has potentially the world's largest shale gas resource (followed by Argentina and Algeria). Australia, Canada, Mexico, Russia, and South Africa are others countries with very large resources. As these resources are developed, we can expect to see natural gas supply risks lower, but that could take many years. In the shorter term, growing output from Australia and the United States, in particular, will have a moderating effect on risk.

There continues to be a wide divergence in retail electricity prices, with those countries showing the highest risk being found largely in Western Europe, a trend that has increased the relevance of economic competitiveness in discussions of energy policy.

Seven of the bottom 10 countries for this metric in the large energy user group are located in Western Europe, while only one European country—Norway, which relies heavily on hydropower—is in the top 10 (and at number 10, just barely). Electricity prices in much of Western Europe and Japan have increased sharply in recent years and are now among the highest in the world, creating competitive pressures on industry. Brazil and Turkey are the only emerging economies with retail electricity prices in the bottom 10.

Table H-2. Estimated World Shale Resources

Region/Country	Unproved Technically Recoverable		Region/Country	Unproved Technically Recoverable	
	Wet Shale Gas (trillion cubic feet)	Tight Oil (billion barrels)		Wet Shale Gas (trillion cubic feet)	Tight Oil (billion barrels)
North America			Spain	8	0
Canada	573	9	Sweden	10	0
Mexico	545	13	United Kingdom	26	1
United States	623	78	North Africa		
Australia			Algeria	707	6
Australia	429	16	Egypt	100	5
South America			Libya	122	26
Argentina	802	27	Mauritania	0	0
Bolivia	36	1	Morocco	12	0
Brazil	245	5	Tunisia	23	2
Chile	49	2	West Sahara	9	0
Colombia	55	7	Sub-Saharan Africa		
Paraguay	75	4	Chad	44	16
Uruguay	5	1	South Africa	390	0
Venezuela	167	13	Asia		
Eastern Europe			China	1,115	32
Bulgaria	17	0	India	96	4
Lithuania	2	1	Indonesia	46	8
Poland	146	2	Mongolia	4	3
Romania	51	0	Pakistan	105	9
Russia	285	75	Thailand	5	0
Turkey	24	5	Caspian		
Ukraine	128	1	Kazakhstan	28	11
Western Europe			Middle East		
Denmark	32	0	Jordan	7	0
France	137	5	Oman	48	6
Germany	17	1	United Arab Emirates	205	23
Netherlands	26	3	Total		
Norway	0	0	7,577		419

Source: Energy Information Administration, World Shale Resource Assessments.

The use of affordable coal for power production in North America, Australia, and Asia, plus cheap natural gas in the North America, has kept electricity prices comparatively low in these regions. Large-scale hydropower, especially in Canada

and Norway, also has contributed to lower electricity prices. Figures H-2 and H-3 show the large divergence in energy prices for selected OECD countries that are in the large energy user group.

Figure H-2.
Electricity Prices for Households: 2014

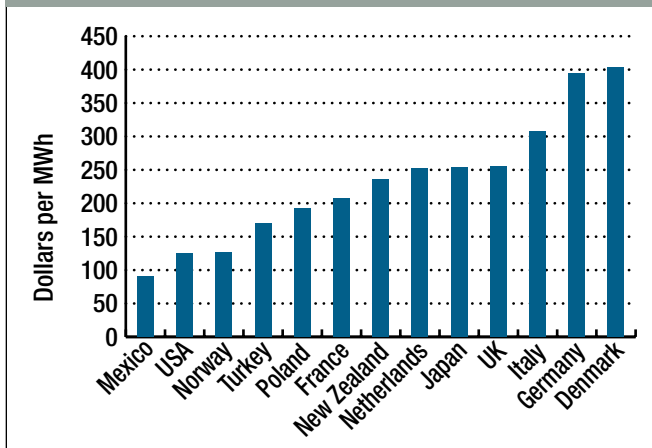
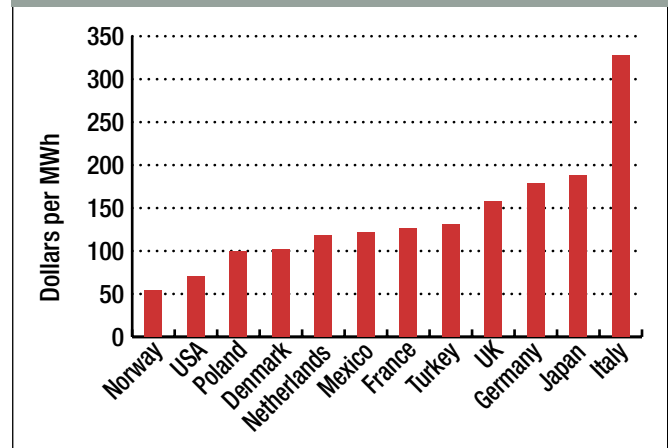


Figure H-3.
Electricity Prices for Industry: 2014



Source: International Energy Agency, Key World Energy Statistics 2015.

Fossil fuels will continue to be the primary global source of energy for decades to come, and coal will be the primary fuel for electrification. Fossil fuels currently provide about 85% of all global energy supply. The International Energy Agency's IEA's *2015 World Energy Outlook* forecasts that by 2040, fossil fuels will still provide 75% to 70% of the world's energy. Developing and emerging countries are moving ahead rapidly with electrification of their economies, and it appears that, despite the Paris climate change deal agreed to at the end of 2015, coal will continue to play central role. Indeed, data from Platts World Electric Power Plants Database shows that nearly 1.2 terawatts of new coal-fired power plants are under construction or in the planning phase, accounting for nearly 40% of the total generating capacity of all generating technologies now under construction or planned (see Figure H-4). China and India alone account for 70% of the total coal capacity under construction or planned, and Asia about 89%. The capacity of natural gas- and oil-fired power stations also is expected to grow considerably over the next few years, by about 565 billion and 50 billion watts, respectively.

Improvements in energy intensity, which can help moderate other energy security risks, are something of a mixed bag. Energy intensity measures the amount of energy needed to produce a unit of GDP and can be improved both through greater energy efficiency and relative shifts in economic activity from more to less energy intensive activities (e.g., from industrial to service

activities). Although of the developed countries in the large energy user group continue to see declines, often very large declines, in energy intensity, the economies in transition and the emerging economies show greater variation. Looking at the trends for the last five years, those countries with lower GDP per capita tend to show the smallest decreases, if not actual increases, in energy intensity while the more economically advanced countries tend to show the largest decreases (though usually not as large as for developed economies). This is consistent with observed patterns among over much longer periods of time. As incomes rise, so do the resources available for investment in new, more efficient technologies and a shift to less energy-intensive economic activity. The result is that energy intensity tends to rise as countries develop, peak, and then decline. A similar pattern is seen in carbon dioxide emissions intensity. Data measuring per capita GDP and carbon dioxide emissions per unit of GDP show that poor that emissions intensity is higher in middle income countries than in either poor or wealthy countries. As countries move from middle income to high income, we can expect that their energy and emissions intensities will begin to improve decline more rapidly.

Historical Trends in International Energy Security Risks: 1980-2014

Energy security risk scores for the large energy user group countries show a variety of trends over the years. On average, however, the rise in total energy security risk scores for this group of countries since

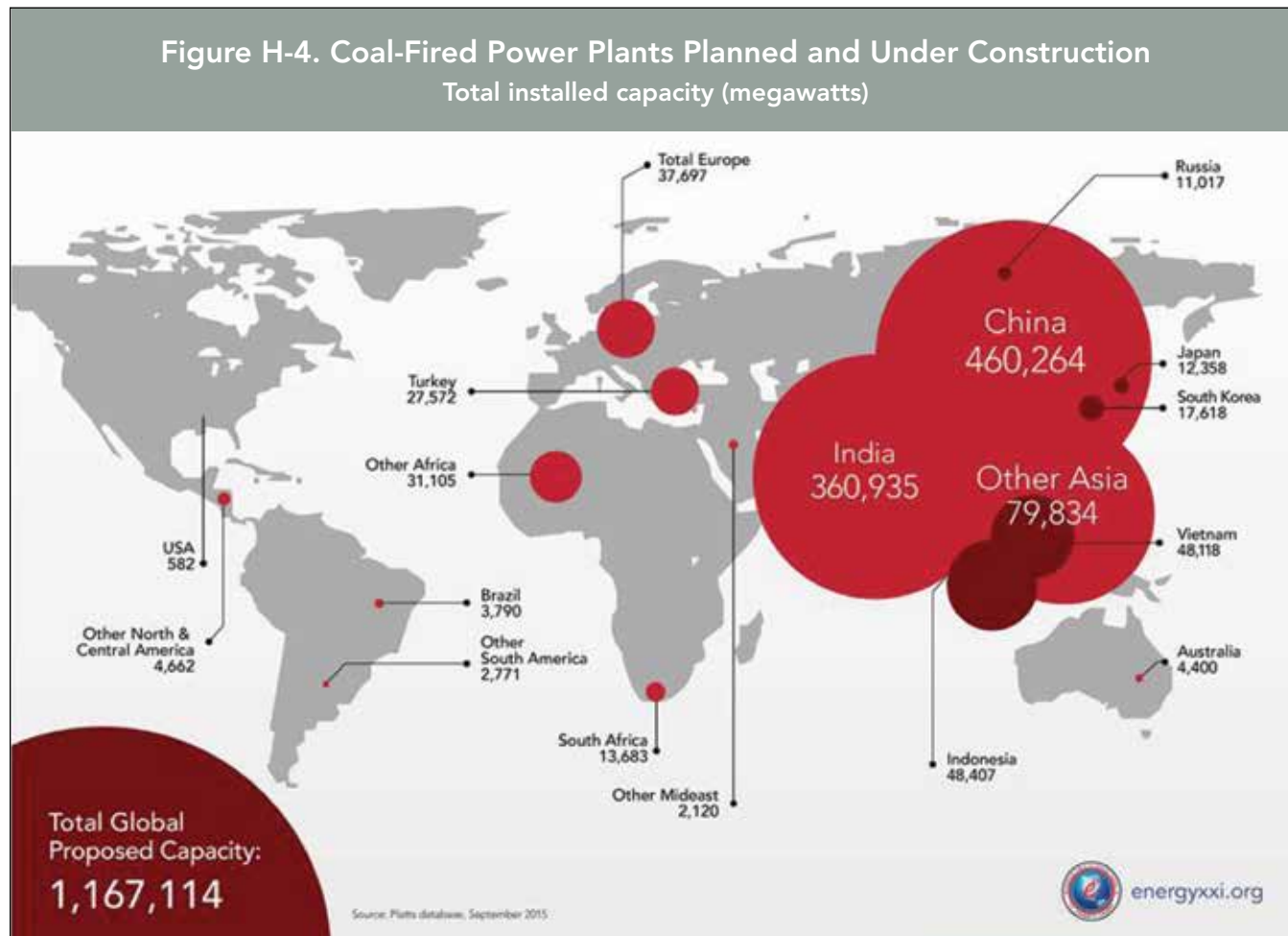
about the early 2000s stabilized in the late 2000s and declined sharply after 2010. From the beginning of our database in 1980, the average country in the large energy user group saw its total risks decline through the 1980s, level out in the 1990s, rise in the 2000s, and decline in the 2010s (Figure H-5). The overall decline in risk since 2011 has been driven primarily by a decline in the price volatility of crude oil, but as was mentioned earlier, this risk metric is expected to move higher in the next couple of years because of the sharp drop in crude oil prices that began in 2014 and continued on into 2015 and through the early part of 2016. Whether the expected rise in volatility will be enough to send total risk scores higher remains to be seen. Ongoing long-term improvements in energy use metrics, such as energy intensity and petroleum intensity, will continue to put downward pressure on risks in many countries. If these and other trends can be maintained, and if the unconventional oil and gas revolution can be replicated in other countries, the

steep drop in overall risk measured over the last couple of years could carry on well into the future.

The improvement in overall energy security risk in 2014 was, with but a few inconsequential exceptions, the third consecutive year of declining risks for most countries in the large energy user group. All 25 countries have a lower overall risk in 2014 compared to 2011. Of the 23 countries in the large energy user group in existence since 1980, all but seven have lower total energy security risks in 2014 than they did in 1980, a year of extraordinarily high risk.² Of the seven countries with higher risks in 2014 than in 1980, all but one (Australia) are emerging economies.

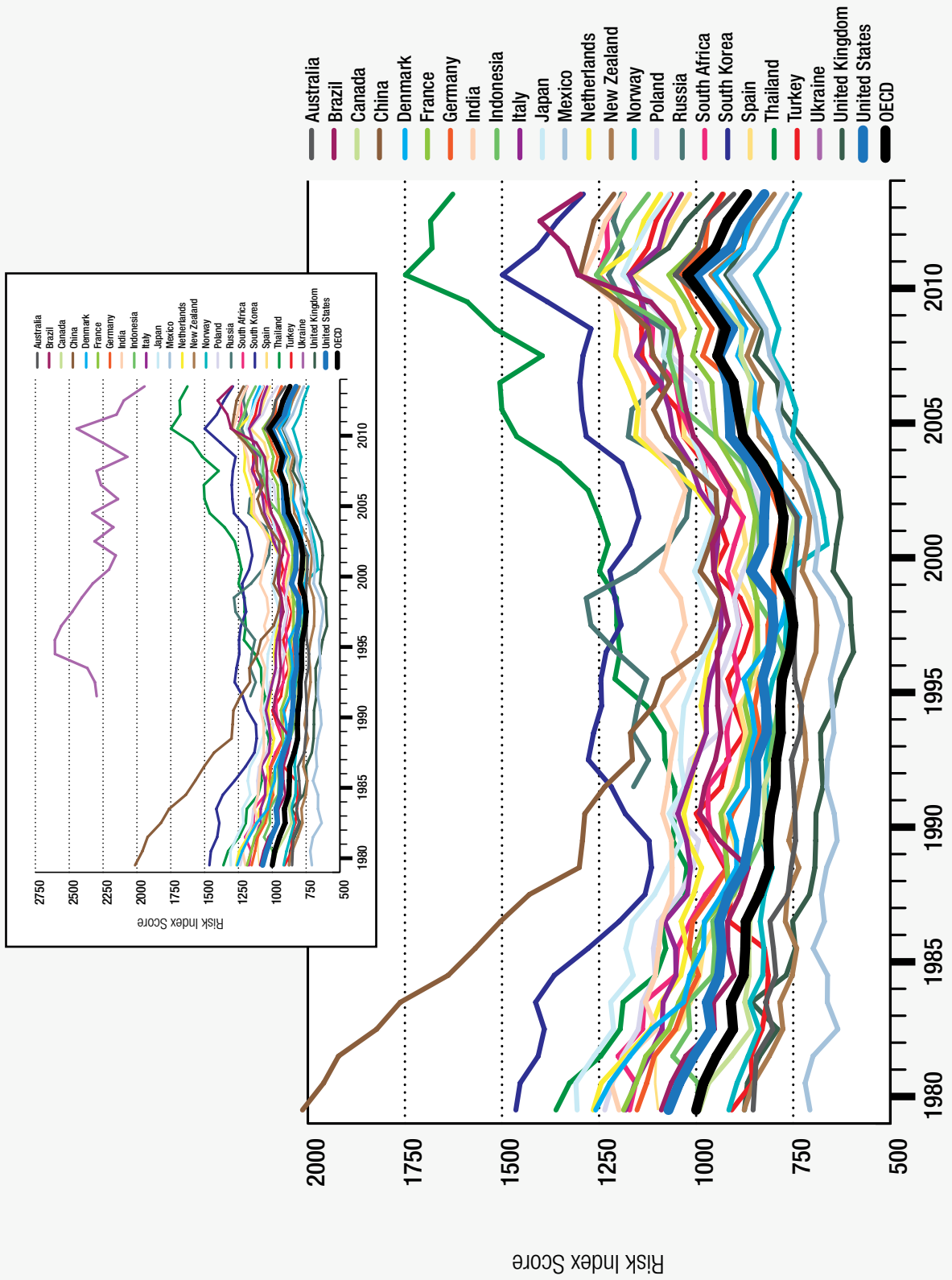
The decade of the 1990s was the best for energy security risks. Of the 23 countries in the large energy

2 Excludes the Russian Federation and Ukraine, for which data begin in 1992. The 2013 total risk score for each country is lower than its 1992 score.



Source: Platts World Electric Power Plants Database.

Figure H-5. Energy Security Risk Index Scores for Large Energy User Group: 1980-2014



user group in existence in 1980, 12 of them (mostly economically advanced) had their best risk score somewhere between 1990 and 1999. Given the high share of oil in the energy mix of developed countries, this is hardly surprising considering the large drop in oil-related risks during the 1990s. For the United States, it was 1998,³ as it was for the OECD average. The best scores for the three former Soviet Bloc countries come after 2002, reflecting vastly better energy use risk scores

³ The 2014 edition of the Index of U.S. Energy Security Risk has 1992 as the year with the lowest risk score. The difference stems from the fact that data limitations require the use of a different, smaller set of metrics for the International Index.

over time as these economies become more efficient (though they still have a long way to go before they see scores near the OECD average).

Rapid moves up or down the large energy group ranking are uncommon, but when a number of factors are aligned within a country, rapid movements do occur and can be sustained over a long period.

Trends in country rankings tend to be driven by four types of factors: (1) global factors that affect all countries and which are largely immune to policy responses; (2) country-specific factors such as resource base, stage of

Table H-3. Energy Security Rankings for Large Energy User Group: 1980-2014

	1980	1985	1990	1995	2000	2005	2010	2011	2012	2013	2014
Australia	2	4	3	3	4	8	8	9	9	10	8
Brazil	10	8	13	16	17	13	13	22	22	23	23
Canada	7	7	5	5	7	6	6	7	7	7	7
China	23	23	23	21	19	19	20	21	21	21	21
Denmark	18	14	9	10	5	4	5	4	3	4	5
France	15	13	12	11	11	11	10	10	10	9	10
Germany	12	12	11	9	8	7	9	8	8	8	9
India	16	19	21	20	21	20	22	20	20	20	19
Indonesia	8	10	7	6	9	12	17	19	18	17	17
Italy	14	16	18	17	16	18	15	12	13	13	13
Japan	20	21	19	19	20	15	12	15	16	15	15
Mexico	1	1	1	2	2	3	2	2	2	2	2
Netherlands	19	15	17	18	15	21	21	17	15	16	16
New Zealand	4	2	4	4	3	5	4	5	5	3	3
Norway	6	6	6	7	6	2	1	1	1	1	1
Poland	17	20	16	14	12	10	14	13	11	11	11
Russia	–	–	–	23	22	22	19	16	17	18	20
South Africa	13	17	14	15	14	14	18	18	19	19	18
South Korea	22	22	22	24	23	23	23	23	23	22	22
Spain	11	11	10	12	13	16	11	11	12	12	12
Thailand	21	18	20	22	24	24	24	24	24	24	24
Turkey	5	5	15	13	18	17	16	14	14	14	14
Ukraine	–	–	–	25	25	25	25	25	25	25	25
United Kingdom	3	3	2	1	1	1	3	3	4	5	6
United States	9	9	8	8	10	9	7	6	6	6	4

economic development, population density, climate, and others; (3) technology innovation and adoption; and (4) energy policies. Table H-3 ranks energy security risks over time. Although large annual movements, either up or down, in the ranking list are uncommon, the interplay among many different factors, such as technology developments, political crises, natural disasters, policy changes, or combinations of these, can result in unusually large changes annual in rank among the large energy user group. As the table shows, Canada, Mexico, New Zealand, South Korea, and Ukraine have shown the least variation in total risk ranking for the entire period since 1980 (or in the case of Ukraine, 1992). Some countries, on the other hand, have shown a great deal of variation in ranking over the years.

- Since 2011, Brazil has seen its risk scores deteriorate greatly relative to the OECD average, especially in metric scores related to energy expenditures and energy expenditure intensity. Brazil also has seen a large increase in import and transportation related risks. Brazil has slipped 10 places, from number 13 in 2010 to number 23 in 2014.
- Denmark moved sharply up the table between 1985 and 1990, when it became a net exporter of natural gas, and again between 1995 and 2000, when it became a net exporter of oil. It now stands at number five in the ranking.
- Natural disasters and their aftermath also can impact energy security in often unpredictable ways. In the case of the Fukushima Daiichi incident in Japan, for example, it reversed previous gains in risk reduction.
- Poland has improved to ranking significantly since the breakup of the Soviet Union. Greater energy efficiency made necessary by market forces and a lowering of risk surrounding coal exports have made Poland far more energy secure, but it still has considerable room for further improvement.
- Turkey's risk score increased 151 points from 1985 to 1990 caused by rising risks associated with greater imports of natural gas needed to supply new gas-fired power stations. As a result, the country's risk ranking worsened from fifth in 1985 to 15th in 1990, showing how a clear policy choice can lead to significant energy security consequences.
- The United Kingdom also has seen its position tumble from the top spot in 2005 to number six in

2014. Greater risks associated with rising imports and very high electricity prices have been the main reasons for the United Kingdom's downward slide.

- The relatively recent ascent of the United States up the rankings is a good example of how technology innovation and adoption, in this case of hydraulic fracturing, horizontal drilling, and advanced seismic imaging, have changed energy security for the better despite, rather than because of, federal policies.

No country scores well in every energy risk category or scores poorly in every category. Countries that score very well in the Index also can face sometimes significant energy security challenges.

Of the 29 metrics used in the International Index, nine are "universal" metrics that apply equally to every country (e.g., the price of crude oil) and 20 are "country-specific." Scores for these 20 country-specific metrics for 2014 were ranked (Table H-4). The table shows that even a country the top-ranked country, Norway, with 11 of 20 metric scores ranked in the top five, also has three metric scores ranked in the bottom five (two of which are ranked dead last—energy consumption per capita and electricity capacity diversity). But as you would expect, countries that score well tend strongly to have more metrics in the top five than in the bottom five. Last-ranked Ukraine, for instance, has eight metrics in the bottom five and just two in the top five.

On average, the five top ranking countries in 2014 for overall energy security have 7.8 individual metrics scores ranked in the top five and 1.2 metrics scores ranked in the bottom five. (Fourth-ranked United States had four metric scores ranked in the top five and three scores ranked in the bottom five.) The five countries with the worst overall scores in 2014 had an average of only 1.6 metric scores ranked in the top five and 6.4 metric scores ranked in the bottom five. For many countries that score well, reversing or offsetting negative trends while maintaining positive trends is the order of the day. The other 15 countries in the middle averaged 4.1 metric risk scores both in the top five and bottom five. (The number of metrics in the top and bottom five for each country can be found in the Energy Security Profiles.)

Table H-4. Energy Security Metric Rankings for Large Energy User Group: 2014

Fuel Import Metrics				
Petroleum Import Exposure	Natural Gas Import Exposure	Coal Import Exposure	Total Energy Import Exposure	Fossil Fuel Import Expenditures per GDP
1. Canada	1. Australia	1. Australia	1. Canada	1. Canada
1. Denmark	1. Canada	1. Canada	1. Russia	1. Russia
1. Mexico	1. Denmark	1. China	3. Norway	3. Norway
1. Norway	1. Indonesia	1. Indonesia	4. China	4. Denmark
1. Russia	1. Netherlands	1. New Zealand	5. Mexico	5. Mexico
6. Brazil	1. New Zealand	1. Poland	6. Denmark	6. United Kingdom
7. United States	1. Norway	1. Russia	7. Brazil	7. United States
8. United Kingdom	1. Russia	1. South Africa	8. South Africa	8. Brazil
9. Indonesia	9. United States	1. Ukraine	9. United States	9. Australia
10. Thailand	10. Thailand	1. United States	10. Australia	10. New Zealand
11. China	11. China	11. Norway	11. Indonesia	11. France
12. Australia	12. India	12. India	12. India	12. Germany
13. South Africa	13. Mexico	13. Mexico	13. Ukraine	13. Italy
14. New Zealand	14. Brazil	14. Germany	14. New Zealand	14. China
15. India	15. United Kingdom	15. Turkey	15. Thailand	15. Japan
16. Ukraine	16. Ukraine	16. Thailand	16. Poland	16. Spain
17. Italy	17. Poland	17. United Kingdom	17. United Kingdom	17. Poland
18. Turkey	18. South Africa	18. Spain	18. France	18. South Africa
19. Germany	19. Germany	19. Brazil	19. Netherlands	19. Netherlands
20. Poland	20. Italy	20. South Korea	20. Germany	20. Indonesia
21. Netherlands	21. Japan	21. Italy	21. Spain	21. Turkey
22. France	22. Turkey	22. Denmark	22. Italy	22. India
23. South Korea	23. Korea, South	22. France	23. Turkey	23. South Korea
24. Spain	24. France	22. Japan	24. South Korea	24. Thailand
25. Japan	25. Spain	22. Netherlands	25. Japan	25. Ukraine

Table H-4. Energy Security Metric Rankings for Large Energy User Group: 2014

Energy Expenditure Metrics			Price & Market Volatility Metrics	
Energy Expenditure Intensity	Energy Expenditures Per Capita	Retail Electricity Prices	Energy Expenditure Volatility	GDP Per Capita
1. United Kingdom	1. India	1. Indonesia	1. Mexico	1. Norway
2. France	2. Indonesia	2. India	2. New Zealand	2. Denmark
3. Norway	3. Mexico	3. China	3. Norway	3. United States
4. United States	4. China	4. South Africa	4. Canada	4. Netherlands
5. Denmark	5. South Africa	5. United States	5. United Kingdom	5. Germany
6. Germany	6. Ukraine	6. Canada	6. United States	6. United Kingdom
7. Spain	7. Turkey	7. South Korea	7. France	7. Canada
8. Japan	8. Poland	8. Mexico	8. Germany	8. Australia
9. New Zealand	9. Thailand	9. Thailand	9. Netherlands	9. Japan
10. Italy	10. Russia	10. Norway	10. Spain	10. France
11. Mexico	11. Spain	11. Australia	11. Italy	11. New Zealand
12. Australia	12. Brazil	12. New Zealand	12. Denmark	12. Italy
13. Canada	13. France	13. Russia	13. Turkey	13. Spain
14. Poland	14. United Kingdom	13. Ukraine	14. Japan	14. South Korea
15. Netherlands	15. Italy	15. Poland	15. South Korea	15. Poland
16. Turkey	16. New Zealand	16. France	16. Australia	16. Turkey
17. India	17. Germany	17. Turkey	17. India	17. Mexico
18. South Korea	18. Japan	18. United Kingdom	18. China	18. Russia
19. South Africa	19. United States	19. Netherlands	19. Poland	19. South Africa
20. Russia	20. Denmark	20. Brazil	20. South Africa	20. Brazil
21. China	21. Australia	21. Japan	21. Indonesia	21. China
22. Indonesia	22. Canada	22. Spain	22. Russia	22. Thailand
23. Brazil	23. South Korea	23. Denmark	23. Thailand	23. Ukraine
24. Thailand	24. Norway	24. Germany	24. Ukraine	24. Indonesia
25. Ukraine	25. Netherlands	25. Italy	25. Brazil	25. India



Institute for 21st Century Energy
U.S. Chamber of Commerce
1615 H Street, NW
Washington, DC 20062
Phone: (202) 463-5558 Fax: (202) 887-3457
energyinstitute@uschamber.com
www.energyxxi.org



AN AFFILIATE OF THE
U.S. CHAMBER OF COMMERCE



Printed on Recycled paper