INTERNATIONAL INDEX OF ENERGY SECURITY RISK®

2015 EDITION

ASSESSING RISK IN A GLOBAL ENERGY MARKET

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Foreword

Even in the midst of a boom in U.S. crude oil production, there are many who persist in the belief that oil production in the United States matters little in world oil markets. The results of this third edition of the Institute for 21st Century Energy's International Index of Energy Security Risk should put this canard to rest once and for all. As we will see below, circumstances that just a few short years ago would have played havoc with world oil markets did not in 2013, primarily because of greater U.S. output.

Like the two preceding editions, this 2015 Edition of the International Index provides a comprehensive look at the relative energy security risks in the United States and 24 other large energy consuming countries from 1980 to 2013. This third edition incorporates the most up-to-date data through 2013 and methodological improvements to how energy prices are estimated for some countries. These revisions necessarily result in a somewhat different ranking of the energy security risks across these 25 countries, though the broader insights gleaned from the Index have not changed appreciably.

The results for 2013 would not have been appreciably different from the results in 2012 except for one factor—reduced crude oil price volatility—which was responsible for sending overall risks lower for all countries in the large energy user group. What is particularly noteworthy is that this occurred during a period of declining production from many traditional suppliers and political turmoil in the Middle East and other regions of the world where oil is produced. Consider that:

- Renewed political unrest in Libya in 2013 stymied a recovery in the oil sector and sent output down 450,000 barrels per day in 2013, about 730,000 barrels per day off its level in 2010, the year before that country's political crisis.

- Sanctions against Iran imposed because of its nuclear program resulted in reduced production of about 3.2 million barrels per day, a loss of 275,000 barrels per day alone in 2013 and more than 1 million barrels per day in since 2011.

- Supply disruptions stemming from ongoing violence from militant groups in Nigeria rose in 2013, contributing to a 155,000 barrels-per-day drop in output. As the Energy Information Administration (EIA) points out, crude oil production in 2013 was similar to the levels in 2008-2009, when disruptions were at record-highs.

- North Sea output from Norway and the United Kingdom slid a combined 165,000 barrels per day in 2013, a continuation of a trend that has been going on since 2001-2002.

The unconventional oil and gas boom that the United States and Canada are enjoying has helped propel both countries up the energy security rankings.

All together, the decrease in production from these countries amounted to a little more than 1.0 million barrels per day from 2012 to 2013, and since 2010, nearly 2.6 million barrels per day.

At the same time, demand in large emerging economies, many of which have to import most of the oil they use, has jumped sharply. Since 2010, demand in China, Brazil, India, and Indonesia has climbed 2.2 million barrels per day, accounting for close to the entire difference in global demand over that period of 2.5 million barrels per day.

Given these conditions of lower output, increased political tensions in key producing areas, and rising demand, a skittish global market characterized by a very high level of

crude oil price volatility would be expected in 2013. But 2013 was also notable for the one other thing: the large increase in oil pumped from North America, particularly the United States. Production from Canada and the United States leaped 1.1 million barrels per day from 2012 to 2013 (945,000 barrels per day in the United States), and since 2010, nearly 2.5 million barrels per day (2.0 million barrels per day in the United States).

The unconventional oil and gas boom that the United States and Canada are enjoying has helped propel both countries up the energy security rankings. The United States now sits in sixth place and Canada in seventh. But in addition to being a key factor in improving their own energy security, rising U.S. shale oil and shale gas production and Canadian oil sand production are lowering global supply and volatility risks for these fuels, which benefits everyone.

With even greater U.S. participation in global crude oil markets on the supply side that a free-trade export policy would encourage, the United States could help check market volatility by acting as a price smoother and lessening the use of energy as a geopolitical weapon.

At the time of writing, global oil prices have plunged from more than $100 per barrel to less than $50 per barrel. The price of crude oil collapsed for a variety of reasons: greater North American oil output, weak economies in much of the world leading to flat or declining demand, greater automobile efficiency, the loss of production discipline within OPEC (not all that great to begin with), and the unwillingness of Saudi Arabia to adjust its oil production to defend a higher price. We can expect, then, that high volatility will return and be one of the main themes of the next edition.

Shale formations, some quite large, are located in many countries around the world, but replicating the U.S. shale experience in others countries will not be easy. The United States has many advantages that make it an attractive place to tap shale formations: the technologies were invented here; the shale resource is very large; the infrastructure needed to support the industry is extensive; the land owners also own the mineral rights; and the economic culture is entrepreneurial. It also has helped that large shale formations under state and private land were available for development, because large swaths of federal land are off limits to producers. So while the rest of the country is enjoying an oil and gas boom, federal lands will continue to experience a bust because of federal policy that locks out about 80% of them to exploration and production.

How countries with shale deposits take into account the U.S. experience developing its shale resources in developing their own approach to exploiting these resources is something that will bear watching.

Most other countries lack many of these assets, and in many, the technology largely responsible for increasing U.S. unconventional oil and natural gas production from shale and tight formations—hydraulic fracturing,[1] which has been used successfully and safely in the United States since the late 1940s—is controversial. At least three European countries in the large energy user group, some with very large shale resources, have banned the use of this technology at least for the time being. Other countries, such as Bulgaria, also have bans in place on hydraulic fracturing. Countries that choose to forego the use of hydraulic fracturing technology risk missing out on the potential competitiveness and energy security benefits of the practice similar to those seen in the United States.[2]

Indeed, the different treatment of certain new and not so new technologies and resources is something of an emerging theme in the International Index. How countries with shale deposits take into account the U.S. experience developing its shale resources in developing their own approach to exploiting these resources is something that will bear watching.

How countries address nuclear power is another. Some states made a decision on nuclear power long ago. Italy—which has the highest retail electricity prices in the 25 countries examined in this report—finished phasing out its nuclear plants in 1987, and Australia and Denmark have banned the technology entirely.

The Fukushima Daiichi nuclear accident in Japan in March 2011, however, renewed the debate over nuclear power, the world's largest source of emissions-free electricity. Since Fukushima, Japan has had to depend increasingly on imports of coal, oil, and natural gas to fuel power plants called into action after the government acted to close virtually all of its nuclear fleet. These actions have harmed the country's balance of trade and increased its relative energy security risks, an untenable situation in a country with few energy resources of its own. It is likely, then, that Japan will reopen at least half, and probably more, of its plants in the near future.

Outside of Japan, the largest consequence of Fukushima's was in Germany. Nuclear power has for many years been controversial in Germany, and the accident prompted the government there to reverse an earlier decision to keep its nuclear plants operating and instead shut down all of its nuclear capacity by 2022. The situation in Germany is different in many aspects to Japan's, not least of which is that it has a large coal resource that could be used to fuel coal-fired plants that could supplant the nuclear plants and provide base load power. Germany also has the second highest retail electricity prices among the 25 large energy using countries examined in this report (only Italy's are higher). Shutting down its nuclear plants undoubtedly will increase the country's power sector and import risks, but some of those risks could be ameliorated by adopting technologies that take advantage of Germany's domestic resources and keep electricity costs under control.

France also is considering lessening the contribution of nuclear power in electricity generation, a move that would reduce diversity within the power sector, increase its exposure to import risks, and raise electricity prices. A complicating factor is that, unlike Germany, France does not have a coal resource it can fall back on. It does, however, have a very large shale resource, but a ban on hydraulic fracturing renders it off limits to production. Removing this option from the table would certainly complicate any plan to wean France off of nuclear power.

The United States benefits from one of the lowest average electricity prices in developed countries (though it is rising), thanks in part to a large fleet of nuclear plants generating about one-fifth of U.S. electricity. But with five plants closing over the last few years, preserving nuclear power in the U.S. is becoming more of a challenge. Contributing factors include low natural gas prices, a renewables policy that distorts competitive electricity markets to the detriment of nuclear power, and a moribund waste policy that is looming larger as a source of uncertainty. The federal government's failure to implement a workable waste solution is no longer a problem that can be pushed off to the future. Developing and implementing a stable and workable policy to safely and efficiently manage the country's used nuclear fuel and nuclear waste is crucial to ensuring the viability of this integral energy source.

While some countries are considering limiting nuclear power, other countries, such as China, see increasing nuclear power as a way to boost energy security and reduce emissions of air pollutants, especially in its eastern cities.

While some countries are considering limiting nuclear power, other countries, such as China, see increasing nuclear power as a way to boost energy security and reduce emissions of air pollutants, especially in its eastern cities. We can expect China to reap considerable energy security benefits from expanding its nuclear generating capacity in the coming years.

Policies targeting the use of coal also could compromise energy security by limiting access to what is for many countries, especially the United States, one of the most secure sources of energy. In the United States, regulations governing greenhouse gas emissions being proposed by the Environmental Protection Agency (EPA) could result in the loss of more than 45 gigawatts of coal-fired electric generation capacity—on top of the roughly 70 gigawatts of announced retirements because of other EPA regulation—which could severely curtail a big U.S. advantage: a diverse power generation sector. A recent study by IHS Energy concluded that the

current diversified generation portfolio "lowers the cost of generating electricity by more than $93 billion per year" and that today's diverse fuel mix "produces lower and less volatile power prices compared to a less diverse case with no meaningful contributions from coal and nuclear power and a smaller contribution from hydroelectric power."[3] EPA regulations targeting coal plants also would have a devastating effect on the diversity of electricity generation and on the price of electricity, as a recent report by NERA Economic Consulting shows.[4]

In Europe, however, where natural gas costs about three times more than it does in the United States, countries are rediscovering the advantages of lower-cost electricity generated from coal. Europe is learning the hard way that its exorbitant energy prices, a result largely driven by policy choices, are harming the competitiveness of its energy-intensive industries. As a result, economic competitiveness has gained greater resonance in Europe's energy policy debates.

Meanwhile, coal will remain the fuel of choice for many emerging economies like China and India because it is cheap and plentiful, key considerations for governments with an overriding interest in boosting their economies and lifting their people out of poverty.

Over the past couple of years there have been many favorable trends in energy markets that have tended to lower risks. There are, however, a number of warning signs suggesting things could get very bumpy over the next few years, beginning perhaps next year, and could become apparent in next year's International Index, which will take into account 2014 data.

One thing is clear. The biggest obstacle to energy security is not a lack of energy resources; there are plenty of these. More often than not, it is the policy choices countries make, for better or worse, that have the largest impact. The International Index will continue to sift through the clues and indicate what works and what does not. There is no denying the many challenges the countries in our Index face, but the opportunities also are there for those with the foresight to seize them.

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Highlights

This third 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 2013. 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, Russian Federation, 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 Co-operation and Development (OECD) member countries. The OECD average risk index is calibrated to a 1980 base year figure of 1,000. Keep in mind that a higher score means higher risk, a lower score means lower risk.

2013 Energy Security Rankings

Table H-1 ranks the energy security scores of 25 large energy-consuming countries in 2013, the most recent year data is available. 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.

Norway remains the most energy secure country in the large energy user group in 2013 and, except for three years when it was ranked second, (2003, 2004, and 2008), has been ranked in the top spot since 2001. Its total risk score of 774 is 15% below the OECD average score of 912 and the gap between it and the OECD has widened somewhat in recent years. Mexico—which earned a number one ranking from 1980 to 1995—was the second ranked country with a score of 802. Since 1980, Mexico's risk scores have tended to rise in relation to the OECD baseline average. If this trend persists, it may be reflected in poorer rankings in future years. For the entire period from 1980 to 2013, only three countries have occupied the top spot —Mexico, Norway, and the United Kingdom. At numbers three, four, and five, respectively, Denmark, New Zealand, and the United Kingdom round out the top five spots in the ranking list for 2013.

The United States remained just outside the top five, coming in at number six in the large energy user group, the same as in 2012. The shale revolution continues to drive total U.S. energy risks downward, both absolutely and measured against the OECD average. Moreover, greater oil and natural gas production in the United States (and sixth-ranked Canada also) was instrumental keeping crude oil price volatility in check, which contributed to lower risks for all countries.

Ukraine continued to be the least energy secure country in the large energy user group in 2013. With a 2013 score of 2,009, its overall risk was 120% above the OECD average. Ukraine has not moved out of the 25th spot since 1992, the first year data for the country became available. Nevertheless, it is one of the few countries that has seen its energy security risk score decline since the mid- to late-1990s, both absolutely and relative to the OECD baseline average (from 229% above the OECD average in 1996 to 120% above in 2013). Despite this improvement, the country's scores are still extraordinarily high—about one-quarter 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 South Africa make up the rest of the bottom five.

Table H-1. Energy Security Risk Scores and Rankings for 25 Large Energy Using Countries: 2013

Country	Risk Score	Large Energy User Group Rank
Norway	774	1
Mexico	802	2
Denmark	819	3
New Zealand	855	4
United Kingdom	866	5
United States	885	6
Canada	893	7
OECD Average	912	
France	942	8
Germany	944	9
Australia	962	10
Poland	987	11
Spain	1,037	12
Italy	1,043	13
Turkey	1,087	14
Japan	1,088	15
Netherlands	1,106	16
Russia	1,115	17
India	1,164	18 (tie)
Indonesia	1,164	18 (tie)
China	1,172	20
South Africa	1,175	21
South Korea	1,306	22
Brazil	1,307	23
Thailand	1,616	24
Ukraine	2,009	25

Key Developments

Energy security risks for all countries in the large energy user group and for the OECD average fell in 2013, primarily because of much lower crude oil price volatility. This is the third consecutive year of declining volatility. In 2013, crude oil price volatility, measured as the three-year rolling average of annual change in price, was just $13.69 (in real 2013 dollars), its lowest level since 2010, when it peaked. As a result, from 2012 to 2013 the index for this measure dropped a whopping 993 points to a score of 963. No other metric moved nearly as much in 2013. Because crude oil is priced in a global market, price volatility is a "shared" risk that applies equally to all countries. That means the 51% decline measured for this risk in 2013 lowered the overall energy security risk scores for all countries but had no real impact the rankings, which are more dependent on differences in country-specific risks. This marks the third year of declining price volatility from its record-high level of $40.46 in 2010. Price 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.

Greater North American crude oil output of 1.1 million barrels per day (945,000 barrels per day from the United States and 190,000 barrels per day from Canada), largely from "unconventional" sources, was a major factor in keeping price volatility in check in 2013. The increase from North America was more than enough to offset the declining oil output from Libya (450,000 barrels per day), Iran (275,000 barrels per day), whose oil production is under international export sanctions, and Nigeria (155,000 barrels per day). The "price smoothing" role that increasing output from North America can play will become an even more important factor moderating risks as North Sea oil output from the United Kingdom and Norway continues to slow.

The benefits of greater unconventional oil and natural gas production from shale oil and gas formations also continue to confer benefits on the United States that cut across a broad range of risk metrics. Increasing oil and gas production—most notably from the Bakken and Three Forks formations in the Williston Basin in North Dakota and the Eagle Ford and Permian Basins in Texas, the Marcellus Shale in Pennsylvania and surrounding states—were primarily responsible for the observed jump in U.S. output for these products. Lower oil and gas import supply and expenditure risks have contributed to lower overall risk scores for the United States From 2000 to 2013, the U.S. index scores for oil import risks moved from a large energy user group ranking of 10th to seventh and for natural gas from 15th to a tie for first. Largely as a result of these changes, , the overall energy security risk score for the United States over the same period climbed from 12th to sixth.

Although global natural gas supply risks rose in 2013 because of greater production from countries with high risk profiles, such as Russia, Iran, Qatar, Algeria, and others, the increase was much less than it would have been because of the modifying effect of expanded production from U.S. shale formations. As a result, natural gas import risks remain very high for many countries, especially in Europe and in Japan and South Korea. It is now expected that by 2020, the United States will be a net exporter of natural gas. Large gas-producers in the large energy user group like Australia, Canada, Russia, the United State, 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, and shipments once destined for the United States are being diverted to European and other markets. Japan, too, is looking at U.S. natural gas as a reliable source of energy as it considers the future of its nuclear plants (well more than half of which are almost sure to resume operation). Of the volumes of liquefied natural gas (LNG) approved for export by the U.S. Department of Energy (DOE), almost all will be headed to Japan. The world has plenty of natural gas, and as we have seen in 2013, other countries also are expanding natural gas production, so it is important that DOE quickly approve applications to export LNG if the U.S. is to establish a presence in global natural gas markets. Russia's use of natural gas as a geopolitical weapon, which has European countries

clamoring for greater access to U.S. gas, is yet another reason to approve new licenses in a timely manner.

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 (Table H-3). 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. 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. 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-1 and H-2 show the large divergence in energy prices reported by the International Energy Agency (IEA) for selected OECD countries that are in the large energy user group.

In Japan, deteriorating risks for fuel imports and electric power sector connected to the sharp decline in electric power generation from its nuclear facilities that begin in 2012 after the Fukushima Daiichi nuclear incident in March 2011 were more than offset by greatly declining crude oil volatility. As a result, its overall energy security risk improved in 2013. By March 2012, all but two of the country's 54 nuclear reactors had been shut down under public pressure and electricity production from nuclear power was about 35% of the level generated in 2011. During 2013, nuclear generation was at about 5% of the 2011 level. As a result, Japan continues to face growing energy import and expenditure, electricity capacity diversity, non-carbon generation, and overall price volatility risks. As a result of the knock-on effects of the Fukushima accident, the country's total risk ranking fell from 12 in 2010 to 17 in 2012 before inching back up two places to 15 in 2013.

The energy intensity in emerging economies and economies in transition continues to improve as energy efficiency and economic changes take hold, moderating if not a reducing overall energy security risks. 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). Large year-over-year drops of at least 100 points were recorded in the energy intensity risk measures for China, India, Indonesia, and Ukraine in 2013, helping these countries reduce their total energy security risk scores. Nevertheless, all of these countries are ranked in the bottom 10 for the energy intensity metric, meaning they still have plenty of opportunities for further gains. Not surprisingly, highly efficient developed countries that show the least amount of nominal improvement, have achieved already very high levels of energy efficiency and

Figure H-1.
Natural Gas Prices for Industry: 2013

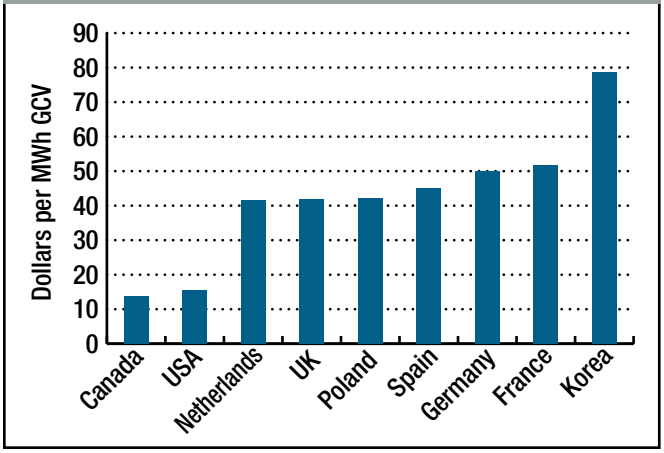
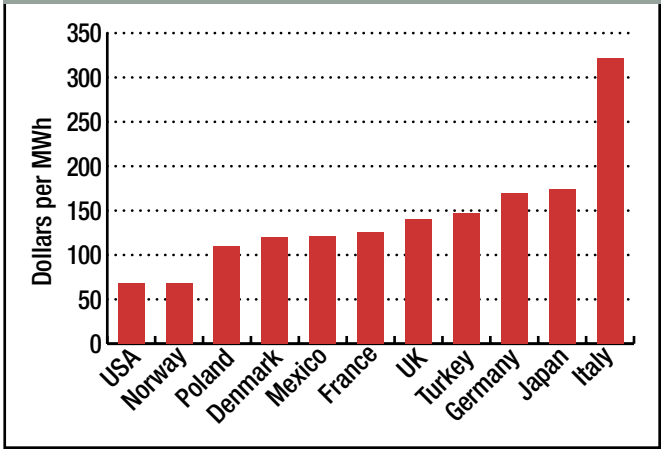


Figure H-2.
Electricity Prices for Industry: 2013



greater contribution of the service sector to economic growth. With much of the low hanging fruit already being picked, we should expect to see emerging economies continue to outperform developed economies in this area.

Historical Trends in International Energy Security Risks: 1980-2013

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-3). It is perhaps too early to tell whether the drop in the average total energy security risks since 2011 marks the beginning of a significant downward trend of the type seen in the 1980s or if this is merely a temporary respite from a longer-term upward trend driven by short-lived circumstances that cannot be sustained for any length of time. The U.S. shale revolution, however, has been one of the main factors in driving down risk, both directly (as in the case of lower U.S. crude oil and natural gas imports, for example) and indirectly (as in the case of lower-than-expected volatility in the global price of crude oil because of higher U.S. and Canadian oil output offsetting cuts elsewhere). Long-term and ongoing improvements in energy use metrics, such as energy intensity and petroleum intensity, will continue to undergird further gains by putting continual downward pressure on risks. If these and other trends can be maintained, and in the case of the shale revolution replicated in other countries, the steep drop in overall risk measured over the last couple of years could continue well into the future.

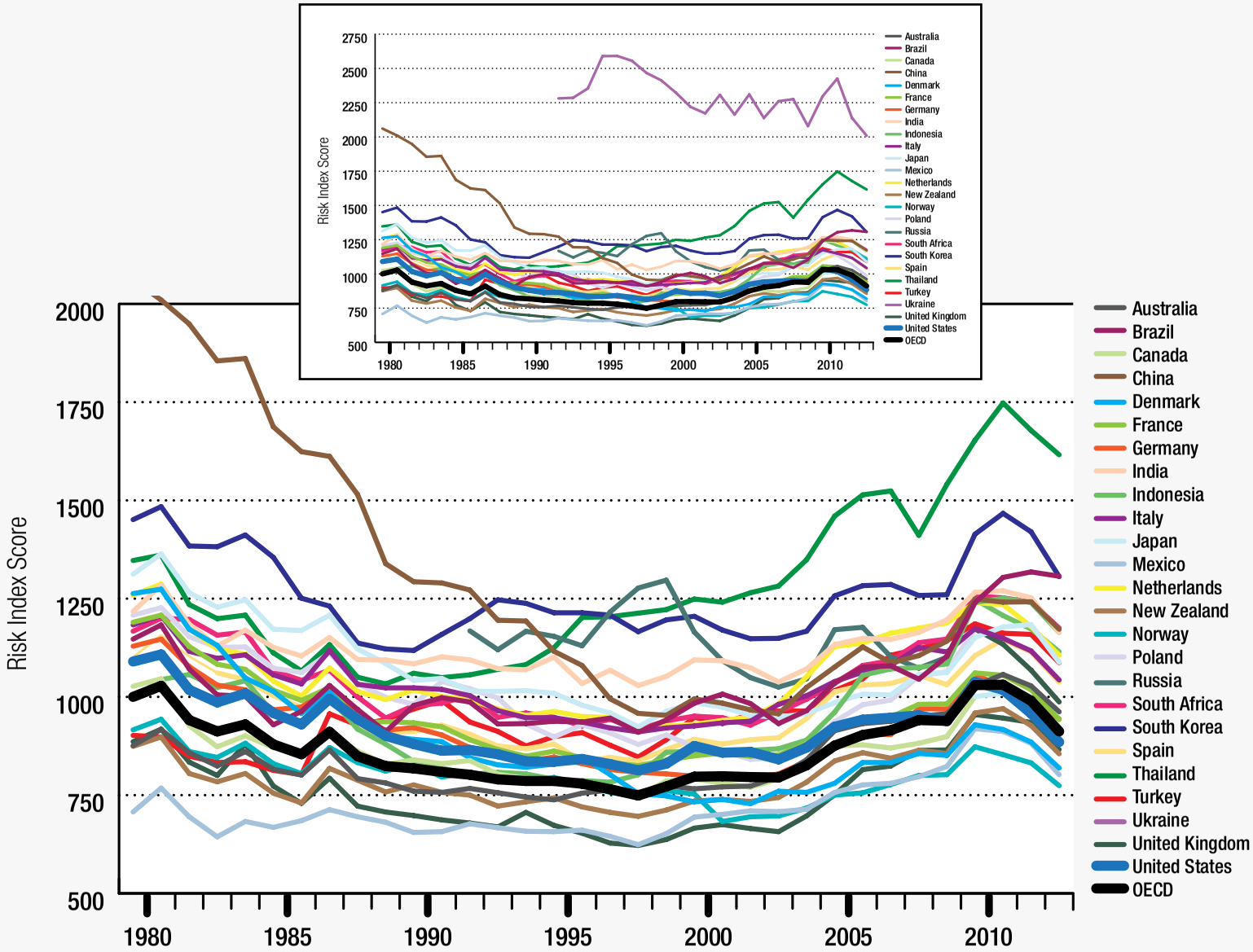
From a score of 1,000 in 1980, average OECD energy security risks fell steadily throughout the 1980s and most of the 1990s, settling at 750 in 1998, after which risk scores rose steadily, reaching their highest level of 1,057 in 2011 before retreating to 912 in 2013. The declining risk from 1980 to the late 1990s reflected lower risk scores in 20 of the 29 individual risk metrics. Rising risk scores from 1998 to 2011 were almost as broad-based, with 16 metrics getting worse and only 12 showing improvement (with one being neutral). Risks associated with import exposure, the reliability and diversity of fossil energy supplies worldwide, and energy prices, volatility, and expenditures all contributed to rising risks over this period. Metrics measuring energy intensity, petroleum intensity, GDP per capita, and transport energy intensity risks improved consistently throughout the entire 34-year period.

The retreat in overall energy security risk in 2013 was the second consecutive year of declining risks for most countries in the large energy user group. Of the 23 countries in the large energy user group in existence since 1980, 16 (including the United States) have lower total energy security risks in 2013 than they did in 1980, a year of extraordinarily high risk.[5] Of the seven countries with higher risks in 2013 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 user group in existence in 1980, 17 had their best risk score somewhere between 1990 and 1999. For the United States, it was 1998,[6] as it was for the OECD average.

A large energy resource base does not guarantee a high energy security ranking, and a small resource base does not guarantee a low ranking. Table H-2 ranks energy security risks from the most secure to the least secure—that is, from best to worst—revealing a broad range of energy security risks among the countries in the large energy user group. 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. Some countries, such as Ukraine, Mexico, South Korea, New Zealand, Canada, France, and the United States have shown the least variation in total risk ranking for the entire period since 1980. Other countries, such as Denmark, Brazil, Norway, Indonesia, and Turkey, have shown a great deal of variation in ranking over the years, in some cases moving

Figure H-3. Energy Security Risk Index Scores for Large Energy User Group: 1980-2013



sharply up the table (e.g., Denmark in 1984), up and then down the table (e.g., Brazil in 2003 and 2011), and down (South Africa in 1982). While the overall variability in the total ranking for the United States since 1980 has been in a relatively narrow range (eight to 12), since 2005, it has jumped four places up the table to number six.

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

Table H-2. Energy Security Rankings for Large Energy User Group: 1980-2013

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

"country-specific." Scores for these 20 country-specific metrics for 2013 were ranked (Table H-3). The table shows than even the top-ranked country, Norway, with 11 of 20 metric scores ranked in the top five, also has four metric scores ranked in the bottom five, and three categories in which it ranked dead last—energy intensity, energy consumption per capita and electricity capacity diversity. On average, the five top ranked countries in 2013 for overall energy security have 7.4 individual metrics scores ranked in the top five and 1.6 metrics scores ranked in the bottom five. (Sixth-ranked United States had six metric scores ranked in the top five and four scores ranked in the bottom five.) At the other end of the table, the five countries with the worst overall scores in 2013 had an average of only 1.6 metric scores ranked in the top five and 6.2 metric scores ranked in the bottom five. For many countries that score well, reversing or offsetting negative trends while maintaining positive trends is common.

Countries, even those with a large and varied amount of energy resources, tend to lose ground if the investment environment is poor. Mexico and Indonesia, for example, are both countries with large reserves of energy that have seen their position relative the OECD average deteriorate over time. In 1980, Mexico's risk score was 29% better than the comparable OECD score; in 2013, it was just 12% better, still good enough for a second place ranking but a warning sign nonetheless. In the mid-1990s, Indonesia's total risk score was on par with the OECD average, while in 2013 it was 28% higher. These shifts occurred in no small part because they have not been attractive countries in which to invest, and as a result, their domestic energy industries are unable to keep up with growing domestic demand. Both countries have recognized this and recently have instituted reforms—in the case of Mexico, a constitutional change allowing for the first time in decades foreign investment in its energy sector—to attract increasing investment.

Rapid moves up or down the large energy group ranking are uncommon, but when a number of are factors 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 economic development, population density, climate, and others; (3) technology innovation and adoption; and (4) energy policies. Policies shutting out or permitting certain energy extraction or production technologies, primarily hydraulic fracturing, nuclear power, and coal, could have a big impact on energy security risks going forward. Although the International Index does not have a forecast component, the recent jockeying of positions within the rankings suggests that either adopting or foregoing certain technologies can have a big impact. We have seen both with the widespread application of hydraulic fracturing in the United States and the shutdown of nuclear reactors in Japan after the Fukushima nuclear incident—which may just be temporary but nonetheless led to a large jump in energy imports—leading these countries to move rapidly up (the United States) and down (Japan) the large energy user group rankings.

Table H-3. Energy Security Metric Rankings for Large Energy User Group: 2013

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

Table H-3. Energy Security Metric Rankings for Large Energy User Group: 2013

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

Table H-3. Energy Security Metric Rankings for Large Energy User Group: 2013

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

Table H-3. Energy Security Metric Rankings for Large Energy User Group: 2013

Energy Use Intensity Metrics	Electric Power Sector Metrics		Transportation Sector Metrics
Petroleum Intensity	Electricity Capacity Diversity	Non Carbon Generation	Transport Energy Per Capita
1. Denmark	1. Spain	1. Norway	1. India
2. United Kingdom	2. Germany	2. France	2. Indonesia
3. Norway	3. Italy	3. Brazil	3. China
4. Italy	4. New Zealand	4. Canada	4. Ukraine
5. France	5. Japan	5. New Zealand	5. Turkey
6. Germany	6. Canada	6. Ukraine	6. Thailand
7. Japan	7. United Kingdom	7. Spain	7. South Africa
8. Spain	8. Turkey	8. Denmark	8. Brazil
9. Turkey	9. United States	9. Germany	9. Russia
10. New Zealand	10. South Korea	10. United Kingdom	10. Mexico
11. Poland	11. Ukraine	11. United States	11. Poland
12. United States	12. France	12. Italy	12. South Korea
13. Australia	13. Russia	13. Russia	13. Japan
14. Netherlands	14. Denmark	14. South Korea	14. France
15. Canada	15. Mexico	15. Mexico	15. Germany
16. South Korea	16. India	16. Turkey	16. United Kingdom
17. South Africa	17. Indonesia	17. Australia	17. Italy
18. Mexico	18. Netherlands	18. India	18. Spain
19. China	19. Australia	19. Netherlands	19. Denmark
20. India	20. China	20. Thailand	20. Norway
21. Brazil	21. Brazil	21. Poland	21. Netherlands
22. Ukraine	22. Thailand	22. Japan	22. Australia
23. Russia	23. Poland	23. South Africa	23. New Zealand
24. Indonesia	24. South Africa	24. China	24. Canada
25. Thailand	25. Norway	25. Indonesia	25. United States

Table H-3. Energy Security Metric Rankings for Large Energy User Group: 2013

Transportation Sector Metrics	Environmental Metrics		
Transport Energy Intensity	CO2 Emissions	CO2 Per Capita	CO2 GDP Intensity
1. Norway	1. Germany	1. India	1. Norway
2. Germany	2. Poland	2. Indonesia	2. France
3. Japan	3. Denmark	3. Brazil	3. Denmark
4. United Kingdom	4. France	4. Mexico	4. United Kingdom
5. France	5. United Kingdom	5. Turkey	5. Italy
6. Denmark	6. Italy	6. Thailand	6. Germany
7. Turkey	7. United States	7. France	7. Japan
8. Italy	8. Russia	8. China	8. Spain
9. Netherlands	8. Ukraine	9. Ukraine	9. New Zealand
10. South Korea	10. Canada	10. Italy	10. Netherlands
11. India	11. Japan	11. Spain	11. United States
12. Australia	12. Netherlands	12. United Kingdom	12. Brazil
13. Spain	13. Norway	13. Poland	13. Canada
14. China	14. Spain	14. Denmark	14. Mexico
15. New Zealand	15. New Zealand	15. New Zealand	15. Australia
16. United States	16. Mexico	16. South Africa	16. Turkey
17. Poland	17. South Africa	17. Norway	17. South Korea
18. Canada	18. Australia	18. Japan	18. Poland
19. Indonesia	19. Brazil	19. Germany	19. Indonesia
20. South Africa	20. Turkey	20. South Korea	20. Thailand
21. Mexico	21. South Korea	21. Russia	21. India
22. Russia	22. Indonesia	22. Netherlands	22. South Africa
23. Brazil	23. India	23. Canada	23. China
24. Thailand	24. China	24. Australia	24. Russia
25. Ukraine	25. Thailand	25. United States	25. Ukraine

Large Energy User Group Country Summaries

The summaries that follow provide brief snapshots of the energy security risks for each country in the large energy user group, including a description of how it compares to the OECD average and those factors that have had the greatest impact, both positively and negatively, on their energy security. The countries are listed in alphabetical order.

Accompanying each country summary are:

1. A table showing current year and previous year total risk scores and those years with historically high and low risk scores both absolutely and relative to the OECD baseline average. (More detailed data on the energy security risks for each country are presented in Appendix 3.).

2. A chart showing that country's energy security absolute risk trend and the OECD average trend since 1980.

3. A chart showing that country's risk trend relative to the OECD average (measured as percent variance) since 1980. This provides an indication or progress or deterioration in energy security risks compared to an international baseline

4. A chart showing trends in that country's risk ranking since 1980.

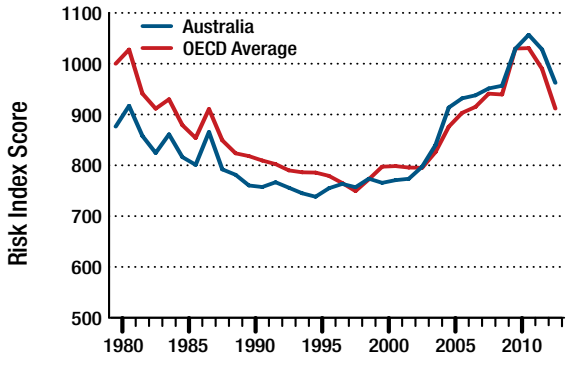
As a word of caution, because the data for many countries are not as robust or as detailed as U.S. data, readers should place less emphasis on precise values or changes in metrics from one year to the next and more emphasis on broader trends within and across countries.

AUSTRALIA

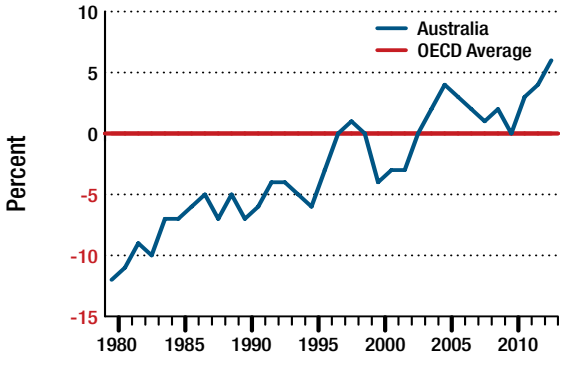
Energy Security Risk Summary: Australia

Risk Scores:	
2013 Energy Security Risk Score	962
2013 Large Energy User Group Rank	10
Score in Previous Year	1,028
Rank in Previous Year	10
Score in 1980	876
Average Score: 1980-2012	843
Best Energy Security Risk Score	738 (1995)
Worst Energy Security Risk Score	1,057 (2011)
Risk Scores Relative to OECD Average:	
Average Annual Difference 1980-2013	-3%
Best Relative Score	-12% (1980)
Worst Relative Score	6% (2013)
Country-Specific Metric Ranking—2013:	
Number in Top Five	2
Number in Bottom Five	5

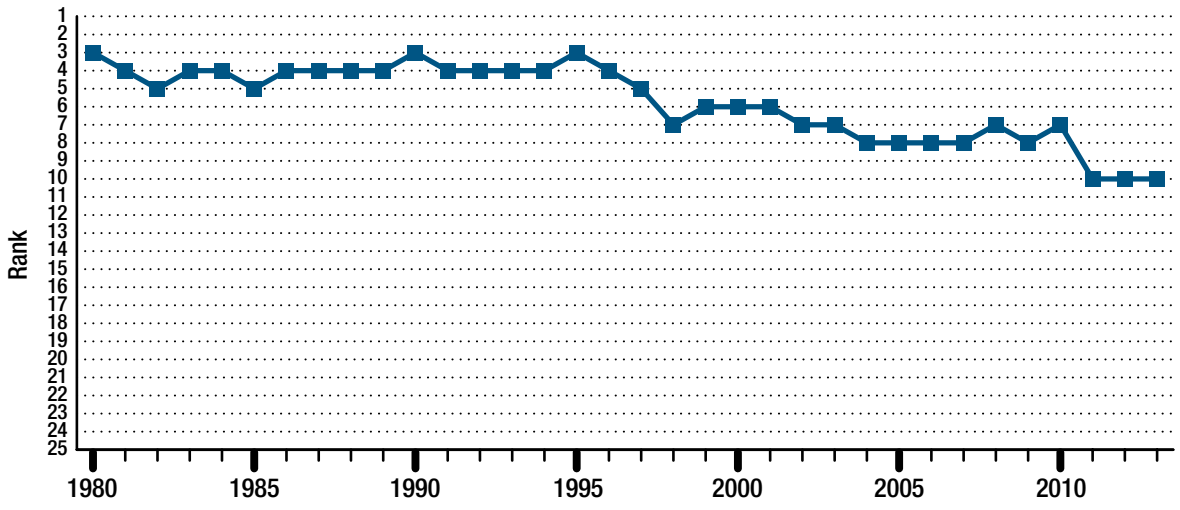
Australia vs. OECD: Risk Index Scores



Australia: Risk Variance from OECD



Australia: Risk Ranking



Australia's overall energy security risk score for 2013 was 970, good enough for a ranking of 10, the same position it held for the previous two years. With an average rank of six, Australia's has consistently ranked in the top 10, but since 1995, it has slipped seven places. Of the 20 country-specific metrics used in the International Index, Australia ranks in the top five for two of them and in the bottom five for five of them.

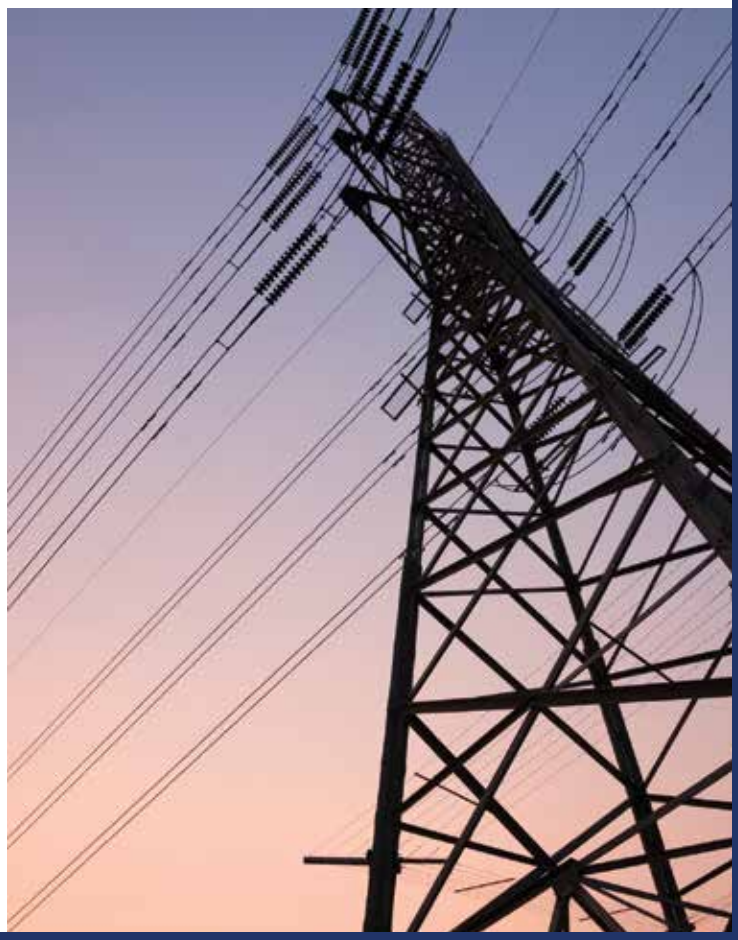
Australia is rich in coal and natural gas resources, and it exports large quantities of these fuels, primarily to Asia. It is the world's second largest exporter of coal and third largest exporter of LNG. As a result, its import exposure risks are well below the OECD average for coal and natural gas. Because Australia is a large a reliable supplier of these two fuels to global markets, it contributes to a lowering of the supply risks associated with both. The country depends, however, on oil imports for a large share of its demand, but its exposure to oil imports is about par with the OECD average. Most if the country's oil production takes place offshore and output peaked in 2000. As a result, imports are expected to make up a growing portion of oil demand.

Australia is home to potentially large unconventional resources to go along with its conventional resources. According to estimates developed by EIA, Australia could have as much as 17.5 billion barrels of crude oil (versus proved reserves of just 1.4 billion barrels) and 443 trillion cubic feet of natural gas (about 10 times its proved reserves).[7] The country also has a large amount of coal bed methane that it is beginning to exploit in earnest.

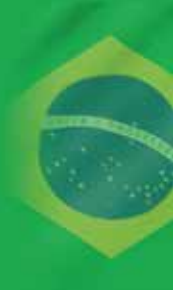
In the power sector, coal and natural gas are the main fuels, with renewables (primarily hydropower) playing a lesser role. A prohibition on nuclear power means it pays no role at all, despite Australia possessing large uranium resources. This large dependence on just two fuels, coal (about 65% in 2013) and natural gas (20%), for the lion's share of its power generation contributes to Australia's relatively poor showing in the metric measuring electric power sector diversity (it ranked number 19 in 2013). Nevertheless, because low-cost coal is the dominant fuel used in power production, Australia enjoys comparatively low electricity prices.

Australia has been losing ground to the OECD for a number of years. Australia's economy, however, is relatively energy intensive, with mining being a major contributor. Both Australia's energy intensity and especially its energy use per capita scores trend higher than the comparable scores. It ranks 14 and 22, respectively, in these two measures. Although the country has shown some improvement in these areas recent years, it has been at a slower rate than that occurring in other countries in the large energy user group. The country also is a relatively large emitter of carbon dioxide.

While Australia has outperformed most other countries in our group, many metrics are moving in the wrong direction. The gap between Australia and the OECD average for risks related to oil imports has disappeared in recent years while risks related to energy intensity, energy per capita, and carbon dioxide emissions continue to move higher relative to the OECD baseline. As a result, at the beginning of the Index in 1980, Australia enjoyed an overall score 12% below the OECD average while in 2013, its score was 6% above.



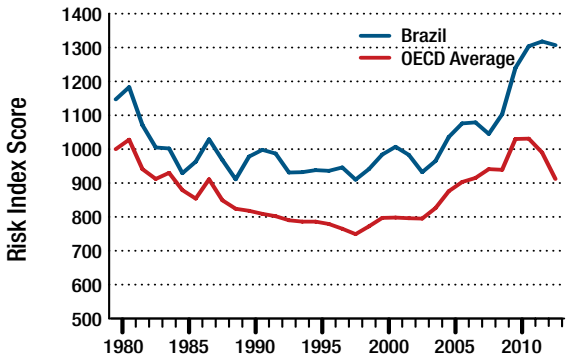
BRAZIL



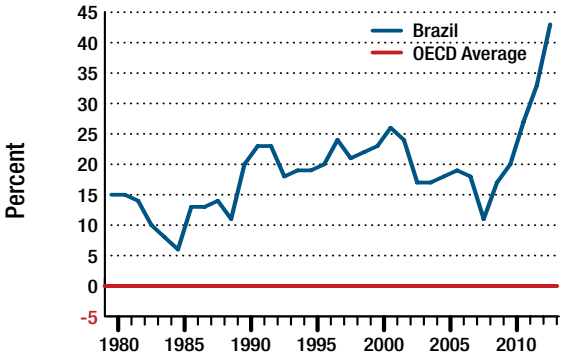
Energy Security Risk Summary: Brazil

Risk Scores:	
2013 Energy Security Risk Score	1,307
2013 Large Energy User Group Rank	23
Score in Previous Year	1,318
Rank in Previous Year	22
Score in 1980	1,147
Average Score: 1980-2012	1,032
Best Energy Security Risk Score	910 (1998)
Worst Energy Security Risk Score	1,318 (2012)
Risk Scores Relative to OECD Average:	
Average Annual Difference 1980-2013	19%
Best Relative Score	6% (1985)
Worst Relative Score	43% (2013)
Country-Specific Metric Ranking—2013:	
Number in Top Five	4
Number in Bottom Five	5

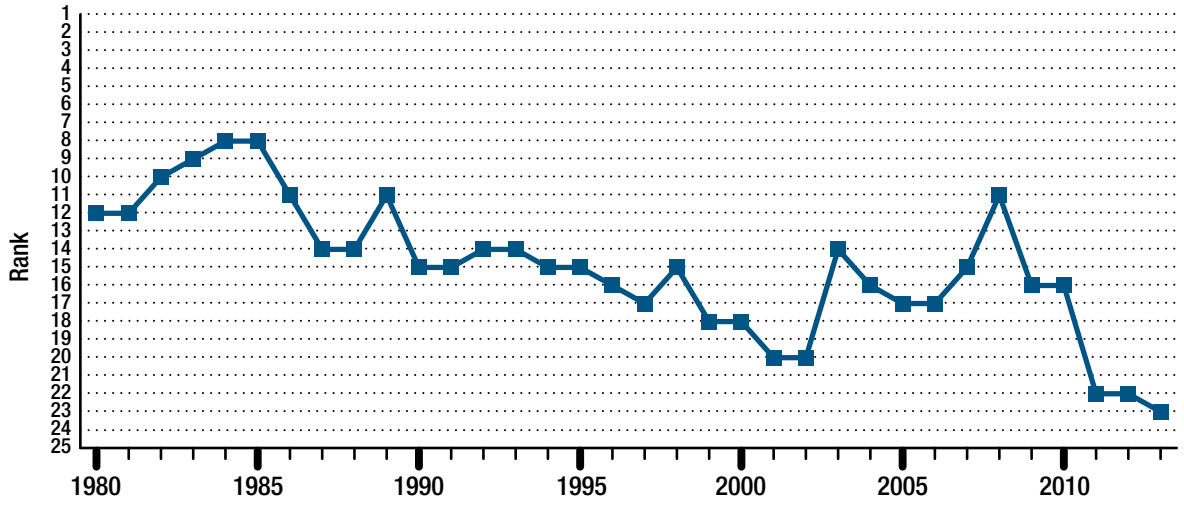
Brazil vs. OECD: Risk Index Scores



Brazil: Risk Variance from OECD



Brazil: Risk Ranking



With a 2013 score of 1,307—43% higher than the OECD average—Brazil's energy security risk was just shy of its record high recorded in 2012. In 2010, the country's score breached the previous record set in 1981, and scores since then have been about as high. As a result, its rank among the large energy user group has slipped from 16 in 2010 to 23 in 2013. Its average rank over 1980-2013 is 15.0. Brazil has more country-specific metric scores in the bottom five (five) than in the top five (four).

Brazil is among the top 10 of countries both for energy consumption (10th) and production (eighth). Brazil is a net exporter of crude oil, but also is a small net importer of petroleum products, so it scores much better than the OECD average in the oil import metric. The country's large sugar cane-based ethanol industry, which the government encouraged in 1970, has contributed to this good showing by displacing some of the demand for petroleum-based liquid fuels. Brazil is a net importer of natural gas (since 1999) and coal, and risks associated with the import of both fuels remain above the OECD average.

With some of the world's largest oil discoveries in recent years occurring in offshore "pre-salt" basins that could hold as much a 50 billion barrels of oil, Brazil is poised to become a large producer and exporter of crude oil, and this should improve its energy security picture going forward. In 2013, Brazil awarded a consortium made up of state-owned Petroleo Brasileiro SA and firms from Europe and China rights to explore an offshore area called Libra, which holds an estimated 12 billion barrels of oil. Production in Libra could reach 1.3 million barrels per day by 2030. Overall, Brazil expects that by the early 2020s, it will be producing 4.0 million barrels per day of crude oil by, with anywhere from one-third to one-half of that amount being exported. Brazil's pre-salt formations also are thought to contain large amounts of natural gas. In addition, an examination of three shale formations by EIA estimates finds technically recoverable resources of 5.4 billion barrels of oil and 245 trillion cubic feet of natural gas.

Virtually all of Brazil's population now has access to at least some electricity. Brazil's electricity generating sector is dominated by hydropower, which accounts for about four-fifths of total electricity production. This reliance on hydroelectric power means that Brazil's electric capacity diversity risks generally are worse than others in the large energy user group—it ranked 21 in 2013 for this metric—though new gas-fired and renewable capacity is being installed, which will increase the diversity of its power generation sources.

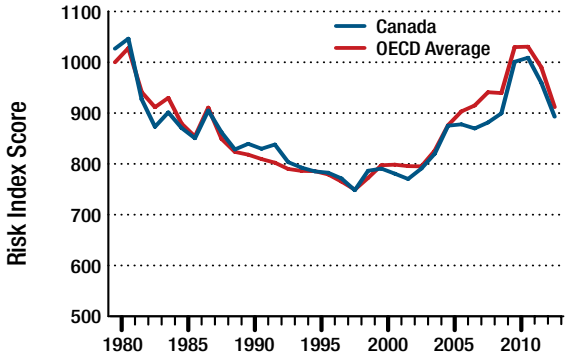
Brazil uses more energy and emits more carbon dioxide to produce a unit of GDP than the OECD average, not untypical of an emerging economy. Nor is it unusual for a country at this stage of it development to score relatively poorly on energy use metrics. For example, in 2013 it ranked 18 on overall energy intensity and 23 on transport energy intensity metrics in the large energy user group. In contrast, its energy per capita and transport energy use per capita are highly ranked at number three and eight, respectively. So while Brazilians tend to use less energy than people in other countries in the large energy user group, they also tend to use that energy far less efficiently.

CANADA

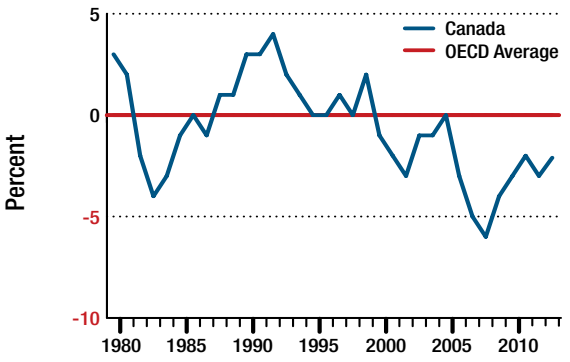
Energy Security Risk Summary: Canada

Risk Scores:	
2013 Energy Security Risk Score	893
2013 Large Energy User Group Rank	7
Score in Previous Year	960
Rank in Previous Year	7
Score in 1980	1,027
Average Score: 1980-2013	861
Best Energy Security Risk Score	748 (1998)
Worst Energy Security Risk Score	1,046 (1981)
Risk Scores Relative to OECD Average:	
Average Annual Difference 1980-2013	-1%
Best Relative Score	-6% (2008)
Worst Relative Score	4% (1992)
Country-Specific Metric Ranking—2013:	
Number in Top Five	6
Number in Bottom Five	5

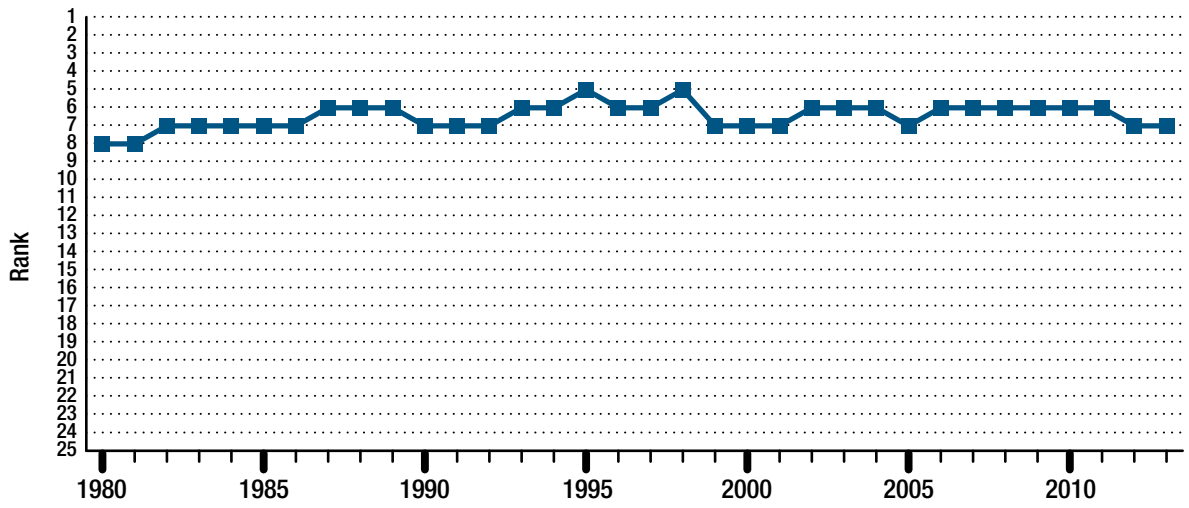
Canada vs. OECD: Risk Index Scores



Canada: Risk Variance from OECD



Canada: Risk Ranking



Since 1980, Canada's energy security risk scores have tracked fairly closely to the OECD average, and with a score of 893, 2% below the OECD figure, 2013 was no exception. Since the early 1990s, Canada's risk scores relative to the OECD baseline have generally improved, though even its worst scores were never far from the OECD average. Over the entire 34-year period from 1980 to 2013, Canada's overall ranking has not moved out of the top eight and in 2013 came in at number seven. Of the 20 country-specific metrics in the database, Canada has six scores in the top five and five in the bottom five.

Canada has very large energy resources. It is the world's sixth largest producer of natural gas, fifth largest producer of crude oil, and thirteenth largest producer of coal. Canada also is the single largest supplier of energy to the United States. Nearly all of its oil and natural gas exports are to the United States via pipeline. Only a small portion of its coal output is for domestic consumption, so much of it is exported.

It is no surprise that Canada scores very well in those metrics measuring oil, natural gas, and coal import exposure risks. In 2003, 175 billion barrels of Canada's oil sands resource were categorized as proved reserves, pushing the country's liquids reserve total to third in the world (behind Venezuela and Saudi Arabia). The addition of these reserves was the single most important factor in the large drop in the risk index for global crude oil reserves measured in 2003. As production from these reserves increases, we can also expect the diversity and reliability measures of world oil production to improve, too. Canada potentially also has very large reserves of shale gas. EIA estimates recoverable resources of 573 trillion cubic feet.[7]

Production from Canada's Alberta oil sands could rise from the current 1.4 million barrels per day to more than 3.5 billion barrels per day by 2025, and some estimates are higher still. To help move this output, TransCanada is proposing construction of the Keystone XL pipeline, a $7 billion pipeline expansion project. This project would increase the existing Keystone Pipeline system connecting Canada's oil sands resource to U.S. refining centers from a capacity of 591,000 barrels per day to more than 1.1 million barrels per day. (As of this writing, the president has failed to grant a needed construction permit for this pipeline.) Cross-border trade between the United States and Canada already is quite large. Keystone XL would be an addition to an existing network of pipelines than can carry around 3.6 million barrels per day of crude oil.

Nearly all of Canada's oil exports are to the United States (97% in 2013), primarily by pipeline. Recently, Canada has recognized the need to diversify its oil export outlets and is working on alternate routes to move some of its output to Asian and other markets. Two pipeline projects with a combined capacity of about 1.4 million barrels per day are under consideration that would carry Albertan oil to Canada's West Coast, both of which could be commissioned sometime in 2017. In addition, an Energy East line could carry 1.1 million barrels per day of oil to refineries and ports on Canada's East Coast. Canada also has plans to export natural gas through LNG export terminals.

Canada's power sector is diverse compared to other countries in the large energy user group (it ranked sixth in 2013). It is among the world's largest producers of hydroelectric power, which accounts for about 60% of its electricity generation. Coal and natural gas each account for 10% of output, and nuclear 15%. Non-hydro renewable sources also have grown in recent years and now generate about 5% of Canada's electricity. The country's electricity prices compare very favorably against the OECD average and rank sixth in the large energy user group.

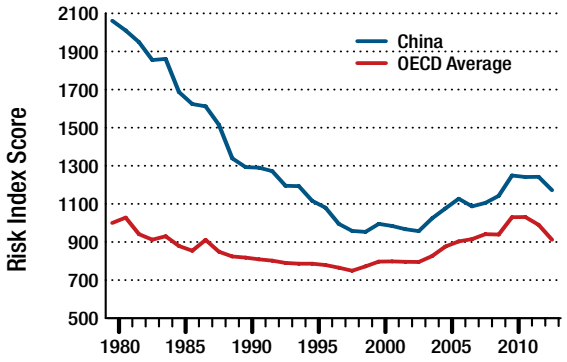
Canada would rank higher in the table except for its relatively poor scores in energy intensity and energy use per capita, especially in the transportation sector. Canada is a large country with a cold climate, a relatively low population density, and a lot of mining and other energy intensive activity. It is not surprising, therefore, that Canada's energy use per capita and transport energy use per capita scores are very high, with both ranking second from the bottom in 2013. Except for emissions per capita, which is high, Canada's carbon dioxide-related measures score at about the OECD average.

CHINA

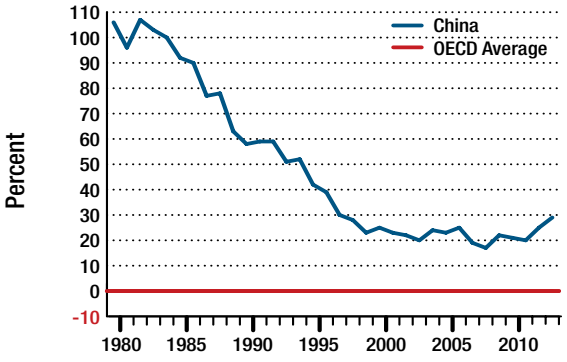
Energy Security Risk Summary: China

Risk Scores:	
2013 Energy Security Risk Score	1,172
2013 Large Energy User Group Rank	20
Score in Previous Year	1,242
Rank in Previous Year	20
Score in 1980	2,061
Average Score: 1980-2013	1,301
Best Energy Security Risk Score	953 (1999)
Worst Energy Security Risk Score	2,061 (1980)
Risk Scores Relative to OECD Average:	
Average Annual Difference 1980-2013	49%
Best Relative Score	17% (2008)
Worst Relative Score	107% (1980)
Country-Specific Metric Ranking—2013:	
Number in Top Five	3
Number in Bottom Five	4

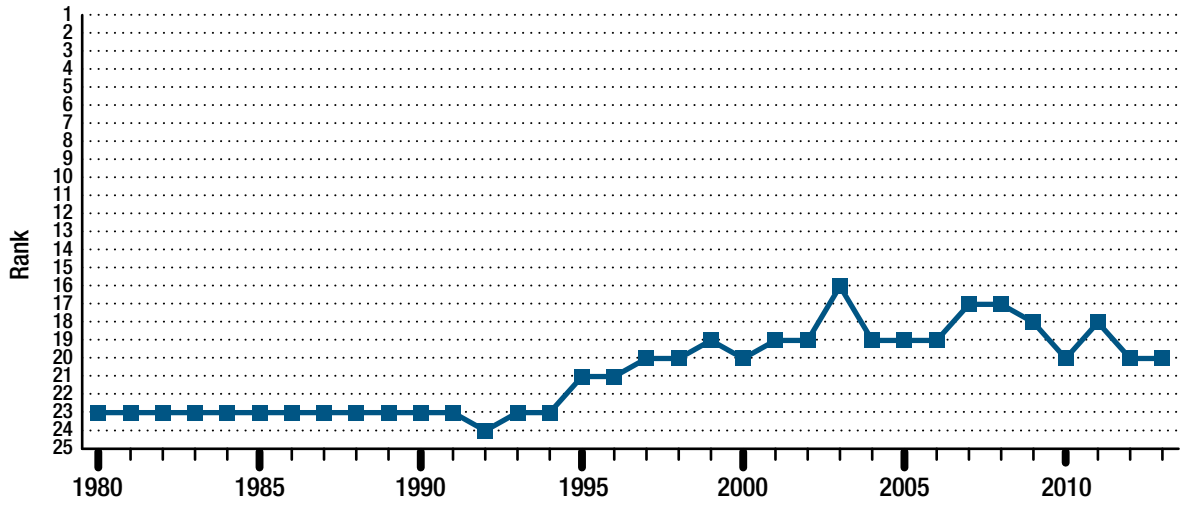
China vs. OECD: Risk Index Scores



China: Risk Variance from OECD



China: Risk Ranking



China has made tremendous progress in reducing its energy security risks since 1980, both absolutely and in relation to the OECD baseline average. From 2,061 in 1980, China's 2013 score of 1,172 was 43% lower. Despite this improvement, China's scores place it in the bottom half of the ranking table, coming in at number 20. In 2013, three of its country-specific metric scores were in the top five and four in the bottom five of the large energy user group.

China is the world's largest energy consumer, a position it has held since 2010. Increases in Chinese energy production have not been able to keep pace with demand, and it imports a growing portion of the fuels it uses. In 1993, China became a net importer of oil in 1993, and although the country is the fourth largest producer of crude oil in the world, its demand has been growing much faster than its domestic supply. In 2013, it was the world's second largest oil importer.

China is the world's largest coal producer and consumer. It produced nearly four times the amount of coal produced in the United States, the world's second largest coal producer. Over 70% of China's energy is derived from coal. The central projection of IEA's World Energy Outlook 2014 (WEO2014), for example, estimates that in the 2020s, China's GDP growth will slow appreciably and its industrial output and coal use will flatten.[8]

Natural gas supplies only about 4% of China's energy demand, but both demand and production are growing rapidly. Since 2000, China's production of this fuel has more than tripled while its consumption has more than quadrupled, creating a growing need for imported supplies. China gets a large portion of its imported natural gas via pipeline from Central Asia. In September 2013, Russia's Gazprom and China's National Petroleum Corporation signed a framework for a long-term agreement under which Russia will supply at least 38 billion cubic meters of gas per year to China. In addition, about 20 LNG import terminals are online or in various stages of development. China is the world's third biggest LNG importer (behind Japan and Spain), and projections suggest it will be the biggest by 2020.

EIA's recent shale gas study suggests that China has potentially huge technically recoverable resources of shale oil and gas[9] on the order of, respectively, 32 billion barrels and 1.1 quadrillion cubic feet. China is beginning to explore some of its shale formatioNatural gas imports exceeded exports in 2007 and coal imports exceeded exports in 2009. As a result, all of China's fuel import-related risk measures and its import expenditure risk measures have been growing much higher in recent years (though they still remain below the corresponding OECD averages). China's national oil companies have been investing since 2008 in foreign oil and gas assets to secure more oil and gas supplies and gain technical expertise.

China's electricity generating sector is one of the least diverse in the large energy user group, with a 2013 rank of 20, but its average electricity price is among the lowest in the group. Coal dominates China's power sector, firing nearly 80% of total generation. At 15%, hydropower accounts for the second largest source of power generation. Wind capacity has grown rapidly in recent years, but a shortage of transmission infrastructure means much of it is unconnected to the grid. Plans also call for more natural gas-fired and nuclear generating plants, which should improve the diversity of its electricity supply. China now operates 17 nuclear reactors with a total capacity of just below 15 gigawatts that provide about 2% of total generation. The government plans to increase its nuclear generating capacity to 58 gigawatts by 2020. To achieve this, 31 nuclear plants totaling 35 gigawatts are being built, representing about half of global nuclear capacity under construction.

China's energy intensity has improved steadily, but it is still well above the OECD average. In 2013, its overall energy intensity was the third worst in the large energy user group behind only Ukraine and Russia. Since 2000, as its middle class has grown and vehicle ownership has become more common, China's transport energy intensity has gotten worse relative to the OECD average, a trend that is expected to continue. Even in its per capita energy use and emissions measures, where China presently scores considerably better than the OECD average, the trends are moving in a relatively riskier direction.

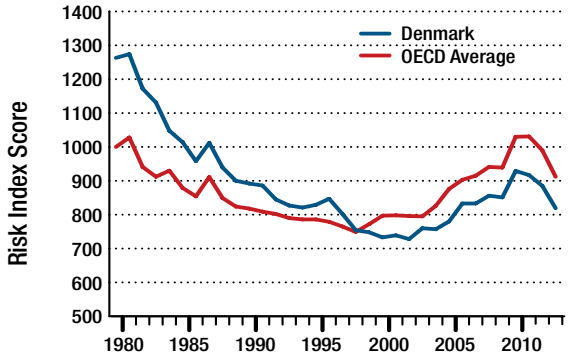
China's energy-related carbon dioxide emissions also are the highest in the world, and these, too, continue to grow rapidly. Since about 2000, China's economy generally has been carbonizing rather than decarbonizing, though the addition of some new hydro and nuclear capacity have lowered the carbon intensity of energy supplies in recent years.

DENMARK

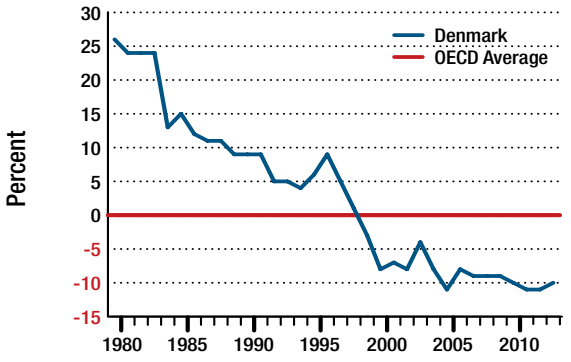
Energy Security Risk Summary: Denmark

Risk Scores:	
2013 Energy Security Risk Score	819
2013 Large Energy User Group Rank	3
Score in Previous Year	885
Rank in Previous Year	3
Score in 1980	1,263
Average Score: 1980-2013	894
Best Energy Security Risk Score	728 (2002)
Worst Energy Security Risk Score	1,274 (1981)
Risk Scores Relative to OECD Average:	
Average Annual Difference 1980-2013	3%
Best Relative Score	-11% (2005)
Worst Relative Score	26% (1980)
Country-Specific Metric Ranking—2013:	
Number in Top Five	8
Number in Bottom Five	2

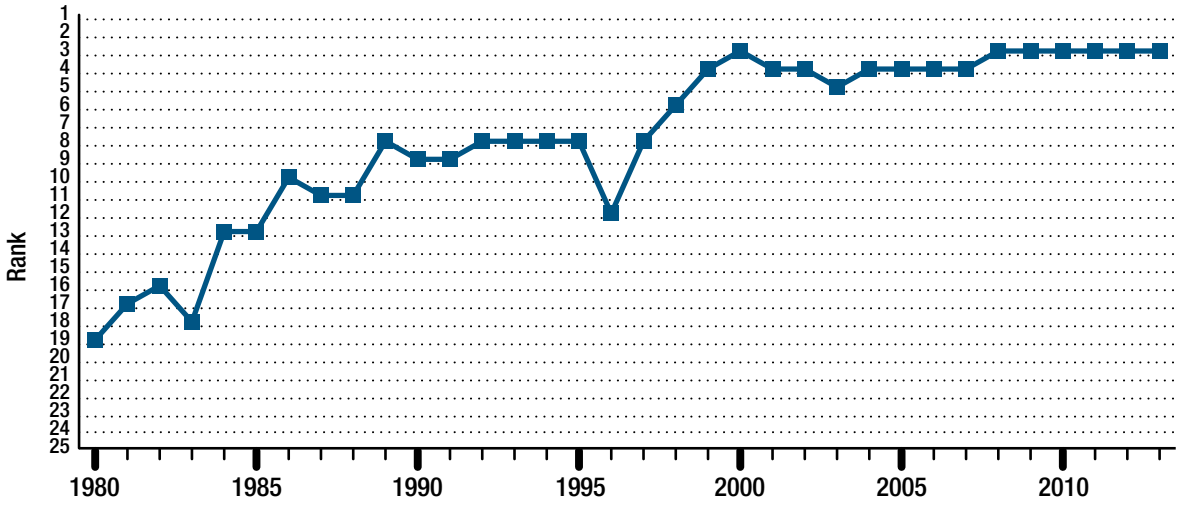
Denmark vs. OECD: Risk Index Scores



Denmark: Risk Variance from OECD



Denmark: Risk Ranking



Denmark is one of the most energy secure countries in the large energy user group. With an overall risk score of 819 in 2013, it occupied the number three spot for the sixth consecutive year. From 1980 to the early 2000s, the country's energy security passed below the OECD average, and since 2000 it has averaged 9% below that benchmark. Denmark scores very well in a number metrics measuring import, energy use, and emission risks. Of the 20 country-specific metrics, it scores in the top five for eight of them and in the bottom five for two of them.

Denmark has many advantages over its large energy user group peers. It produces enough oil and natural gas almost entirely from fields located in the North Sea to make the country a net exporter of both, beginning in 1996 for oil and 1984 for natural gas. A major source of import risk is coal, which the country must import. Nevertheless, when all of these fuels are taken into account, Denmark's total imports exposure and import expenditure risks rank very well, coming in at number five and four, respectively, in 2013.

Denmark's power sector diversity is not all that different from the OECD average, with generation being about evenly divided between coal and renewables, and a significant and growing amount of natural gas. Since about 1997, Denmark has installed a relatively large amount of renewable capacity, mostly wind and biomass/waste. More natural gas also is being used. Each of these factors has helped reduce the need for coal imports, which has lowered the country's coal-related import risks.

This shift towards more expensive sources of energy from renewables, however, has raised the risk associated with retail electricity prices: Denmark has the third highest electricity prices among the large energy user group, and its 2013 risk score for this metric is about 40% higher than the comparable OECD average score.

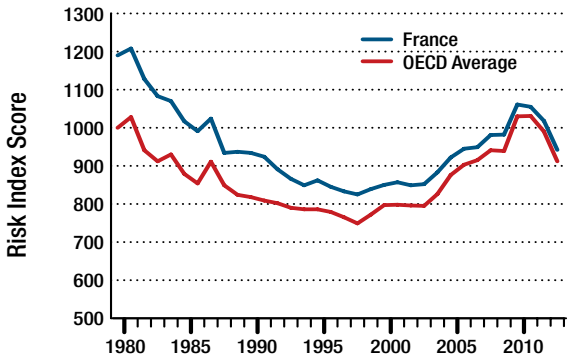
Moderating the risks from increasing energy prices is the country's efficient use of energy. Denmark has one of the most energy efficient economies in the world, and its energy intensity and petroleum intensity in 2013 were both first among the large energy user group. Denmark's carbon dioxide emission trends generally slightly better than the OECD average.

FRANCE

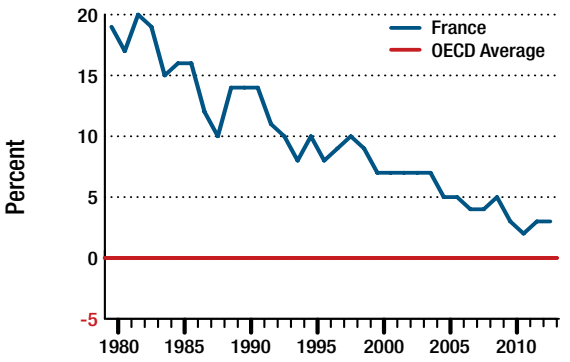
Energy Security Risk Summary: France

Risk Scores:	
2013 Energy Security Risk Score	942
2013 Large Energy User Group Rank	8
Score in Previous Year	1,018
Rank in Previous Year	9
Score in 1980	1,190
Average Score: 1980-2013	953
Best Energy Security Risk Score	825 (1998)
Worst Energy Security Risk Score	1,208 (1981)
Risk Scores Relative to OECD Average:	
Average Annual Difference 1980-2013	10%
Best Relative Score	2% (2011)
Worst Relative Score	20% (1982)
Country-Specific Metric Ranking—2013:	
Number in Top Five	6
Number in Bottom Five	3

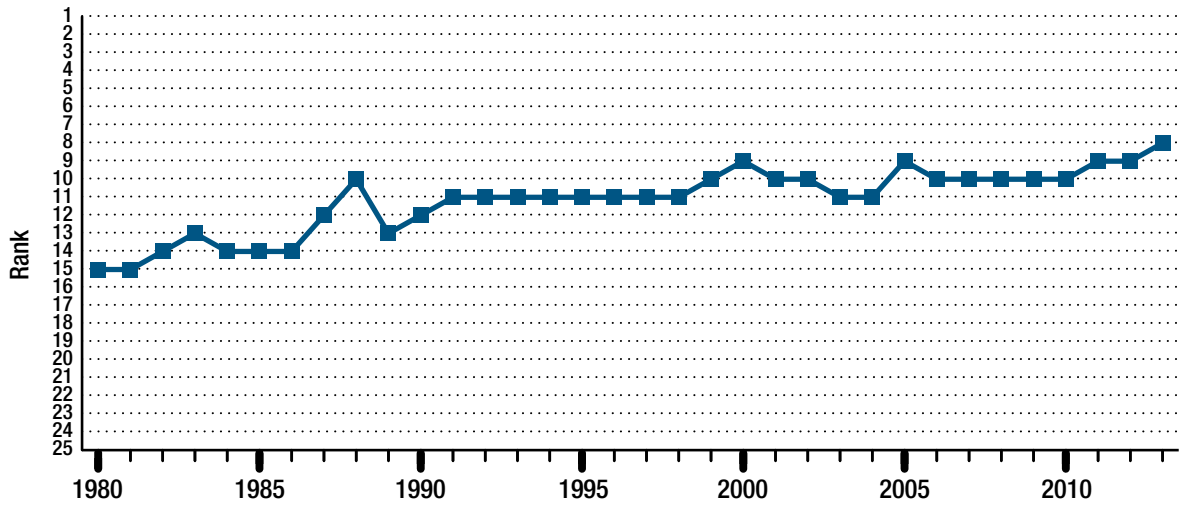
France vs. OECD: Risk Index Scores



France: Risk Variance from OECD



France: Risk Ranking



France has made progress improving its energy security picture, both in absolute and relative terms. Although its overall risk has grown since 2000, its 2013 score of 942 was well below (20%) its 1980 score. Since 1980, France also has steadily closed the gap with the OECD, moving from 19% higher in 1980 to just 3% higher in 2013. Over the same period its rank has improved by seven places to number eight. France has six metrics that rank in the top five of the large energy user group, mostly related to energy use and emissions, and three in the bottom five related to imports.

With the second largest economy in Europe, France is a large consumer of energy. It has the second largest demand from oil, fourth largest for natural gas, and seventh largest for coal in Europe. It produces very little crude oil and natural gas domestically, and no coal. It must, therefore, rely on imports for much of its energy supply, and import risks are therefore a big factor influencing France's energy security risk scores.

EIA has identified two fairly large shale basins in France that contain 137 trillion cubic feet of natural gas, a larger resource than any other country except Poland (though recent industry experience suggests its resource base is lower than originally thought). Despite this potentially large resource, the French government has placed this shale resource off limits to exploration and production.

After the Arab oil embargo of 1973, the country made a strategic decision to make nuclear power a substantial part of its electricity generation mix. Today, France's 58 reactors totaling about 63 gigawatts account for nearly half of France's installed capacity and about four-fifths of Frances total electricity production. EIA reports that France is the third largest exporter of electricity in the world (only Germany and Canada export more). Hydropower also contributes a fair amount of generation. These two technologies combined account for four-fifths of generation. As a result, France ranks second in the large energy user group for non-emitting generation.

In addition, the decision to pursue nuclear power has kept France from importing even more oil, natural gas, or coal for electricity generation. France also has benefits from one of the lowest average electricity rates in Western Europe. Thus, nuclear power has been a decidedly positive factor in France's energy security. Its electricity capacity diversity score, however, is slightly above the OECD average, and it is ranked in the middle of the pack for this metric at number 12. Nuclear policy in France undergoing review, however, with the French Senate considering legislation passed by the lower house of parliament in October 2014 that would cut the country's reliance on nuclear energy by half before 2025 and provide incentives to renewable energy development.

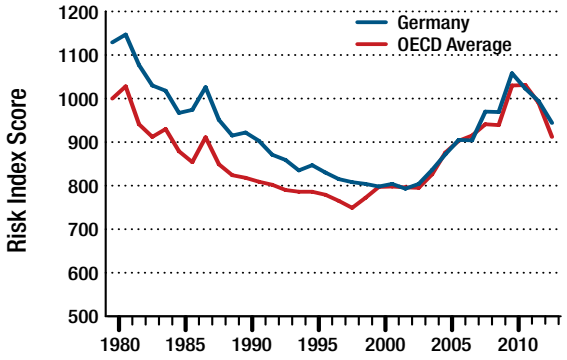
France shows a relatively high degree of energy efficiency which also helps moderate a variety of risks. Its transport energy intensity score is particularly good compared to its peers. Its three carbon dioxide emission metrics also are quite good, with its carbon dioxide intensity metric ranked second in the large energy user group.

GERMANY

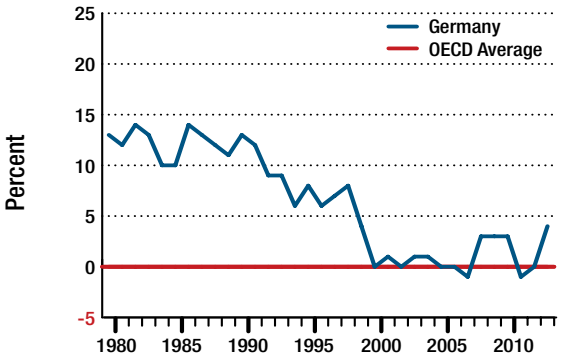
Energy Security Risk Summary: Germany

Risk Scores:	
2013 Energy Security Risk Score	944
2013 Large Energy User Group Rank	9
Score in Previous Year	994
Rank in Previous Year	8
Score in 1980	1,129
Average Score: 1980-2013	924
Best Energy Security Risk Score	793 (2002)
Worst Energy Security Risk Score	1,147 (1981)
Risk Scores Relative to OECD Average:	
Average Annual Difference 1980-2013	6%
Best Relative Score	-1% (2007)
Worst Relative Score	14% (1982)
Country-Specific Metric Ranking—2013:	
Number in Top Five	6
Number in Bottom Five	1

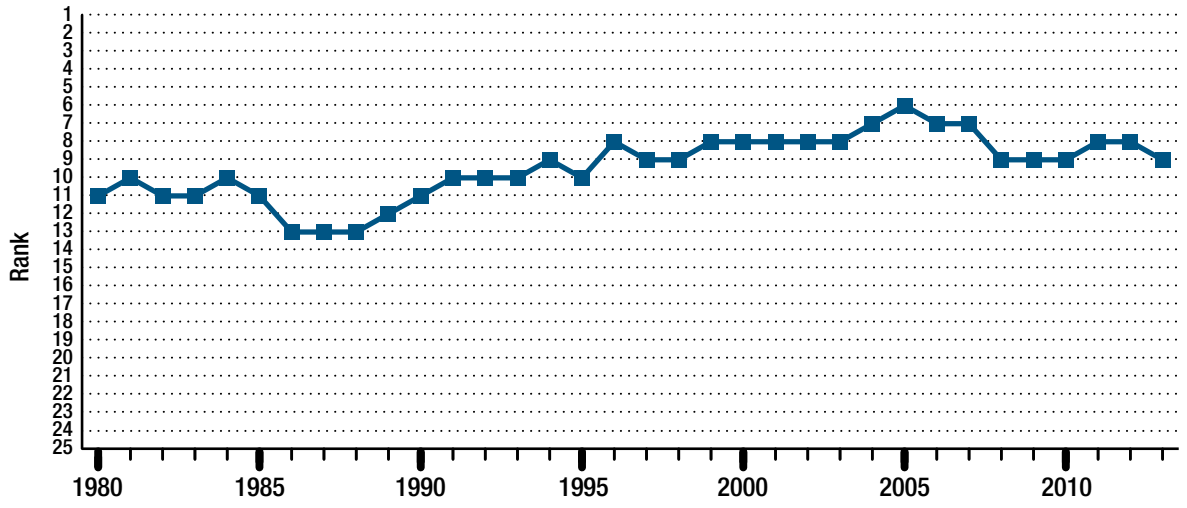
Germany vs. OECD: Risk Index Scores



Germany: Risk Variance from OECD



Germany: Risk Ranking



Note: For consistency, East German data and West German data have been combined to yield "German" data from 1980 to 1990. These data should not be considered as reliable as the data after 1990.

Germany's energy security risk score of 944 for 2013 put it at number nine in the large energy user group ranking, a drop of one place from the previous year. From 1980 to 2000, Germany's energy security risks declined steadily, both in absolute terms and relative to the OECD baseline, and its score subsequently moved below that baseline for the first time in 2002. Over the same period, its rank improved from 12 to four. The steepest declines in risk occurred shortly after reunification, indicating the impact of market forces on inefficient energy use, especially in the eastern part of the country. Since 2000, however, Germany's overall risk score has moved largely in tandem with the OECD average, with its scores averaging about 1% more. In 2013, Germany had six metrics scores in the top five of the large energy user group and one score in the bottom five.

Germany produces very little crude oil, but it is the fourth largest producer of natural gas and the largest producer of coal in Europe. It is also Europe's top consumer of all of these fuels, and it relies on imports to meet a large share of its needs for these fuels. As a result, its import risks for oil, natural gas, and total energy are higher than the OECD average.

The consumption of natural gas is declining in Germany because of greater energy efficiency and because the high cost of this fuel has made it increasingly difficult to operate natural gas-fired generating plants profitably. Nevertheless, Germany still imports large volumes of natural gas, with Russia, the Netherlands, and Norway supplying nearly all of Germany's imported needs. While conventional domestic production of natural gas is expected to continue to decline, Germany has a large shale resource that could hold 17 trillion cubic feet of recoverable natural gas. Although hydraulic fracturing has been used to get more gas from conventional wells since the 1960s, it is not permit in new wells tapped into shale formations. The government has drafted a hydraulic fracturing law that it will submit to the Bundestag after public comment and review, probably in the spring of 2015.

Coal remains the lowest-cost generating option in Germany, and presently coal plants account for nearly half of the country's power generation. Although production of hard coal is being phased out, lignite production is expected to increase to meet the needs of new lignite generating capacity, 2 gigawatts of which came on line in 2012 and 3 gigawatts of which are planned. In addition, 8 gigawatts of hard coal-fired generating capacity are expected to come on line over the next few years. These new coal stations will replace some of the lost nuclear generating capacity.

The diversity of Germany's power sector in 2013 was ranked second among the large energy user group. Coal-fired plants are the largest generating source (47%), with nuclear, natural gas, and renewables each contributing 10% to 20% of electricity output. In response to the Fukushima Daiichi nuclear accident, however, the German government made the decision to close its nine nuclear reactors by 2022. Indeed, the combination of the nuclear shutdown, the very high cost of natural gas, and the low costs of a carbon credit in the European Union's Emissions Trading System has led to greater coal use in the power sector, and some of that increased demand is being met with U.S. coal. Under the country's "Energiewende" policy, ambitious renewable targets also have been set, including an offshore capacity target of 6.5 gigawatts of offshore wind by 2020 rising to 15 gigawatts by 2030.[10]

German electricity rates are very high, and in the large energy user group, only Italy's are higher. Since 2000, electricity rates have grown at a much faster rate than the OECD average. In addition to subsidies for renewable generation, Germany also subsidizes natural gas- and coal-fired capacity so that these sources are available during times when renewables are not generating enough power. Energy-intensive industries purchase electricity on the wholesale market, which helps shield them from these high prices.

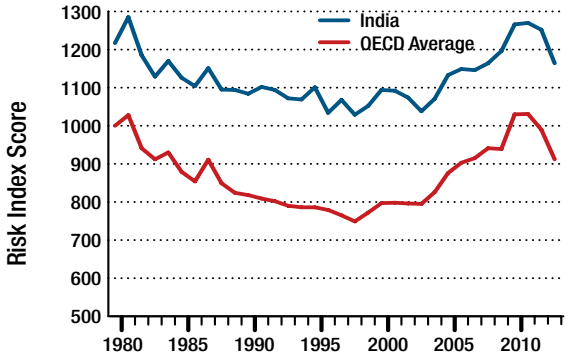
Germany is among the most efficient in the large energy user group. It uses less energy per person and dollar of GDP than most other countries in the large energy user group, especially in the transport sector, where Germany ranks number two. Its carbon dioxide emissions score is the best (lowest) in the group. Improvement in all of these metrics is occurring roughly at the same pace as the OECD average.

INDIA

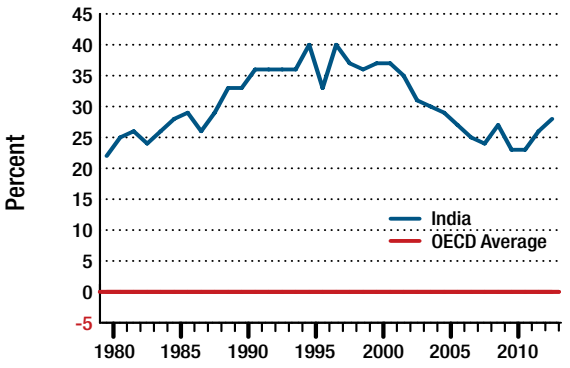
Energy Security Risk Summary: India

Risk Scores:	
2013 Energy Security Risk Score	1,164
2013 Large Energy User Group Rank	18 (tie)
Score in Previous Year	1,252
Rank in Previous Year	21
Score in 1980	1,217
Average Score: 1980-2013	1,129
Best Energy Security Risk Score	1,029 (1998)
Worst Energy Security Risk Score	1,285 (1981)
Risk Scores Relative to OECD Average:	
Average Annual Difference 1980-2013	30%
Best Relative Score	22% (1980)
Worst Relative Score	40% (1995)
Country-Specific Metric Ranking—2013:	
Number in Top Five	6
Number in Bottom Five	4

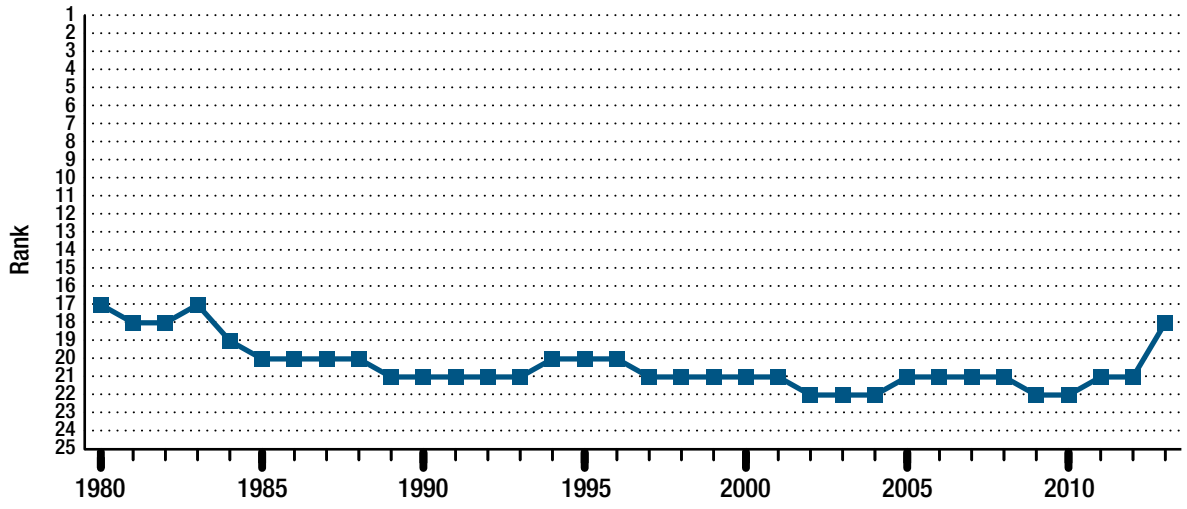
India vs. OECD: Risk Index Scores



India: Risk Variance from OECD



India: Risk Ranking



India's total energy security risk score for 2013 of 1,164 placed it in 18th position (tied with Indonesia), an improvement of three places over 2012. From 1980, India's energy security risks generally improved in absolute terms, but not at the same pace as the OECD average. Its overall score, rose from 22% above the OECD average in 1980 to 40% above in the mid-1990s. Since then, the gap with the OECD has closed to within 28%, a bit higher than it was in 1980. Of the 20 country-specific metrics, India has six scores in the top five and the four in the bottom five of the large energy user group.

India is the world's third largest economy and the fourth largest energy consumer. India's GDP per capita is the lowest in the large energy user group. Moreover, with hundreds of millions of people lacking access to electricity, its total energy and transport energy consumption per capita and its energy expenditures per capita are the lowest in the group, giving India the lowest risk score for these three metrics. As it develops economically, scores for these metrics can be expected to increase.

Imports are needed to meet India's growing domestic demand for oil, natural gas, and coal. India has been a net importer of oil and natural gas for decades, and it is the third largest coal producer in the world (after China, the United States and Russia). Transportation infrastructure and other issues, however, hinder production. Imports of coal have been increasing steadily for many years, and the country became a net importer in 2004.

India produces very little oil indigenously and is heavily reliant on imports for its growing needs. With the fifth largest coal reserves in the world, it is no wonder that coal is the dominant fuel in India's economy, supplying more than 45% of primary energy demand. About 70% of coal consumption is used to produce electricity. IEA's WEO2014 projects that coal use will continue to rise, and by 2020, India will overtake the United States as the world's second-largest consumer (after China) and the world's largest importer of coal. India also has plans to double the amount of coal it produces domestically over the next five years.

Natural gas is a relatively small player in India's energy economy, accounting for less than 10% of demand, and most of it is imported. India has an estimated 47 trillion cubic feet of conventional natural gas reserves, mostly located offshore. In addition, EIA estimates the country has shale resources that could hold 96 trillion cubic feet of natural gas, which if proven would more than double India's current reserve estimate.

About 300 million Indians do not have access to electricity, and the national power grid was only just completed in 2014. Since 1980, India has added about 90 gigawatts of thermal generating capacity, most of which was coal-fired. Coal-fired capacity accounts for about 60% of the total capacity and generates about 70% of the country's power. India's hydroelectric capacity is the sixth largest capacity in the world and provides about 15% of total generation. India also has added about 4 gigawatts of nuclear power since 1980, and additional nuclear facilities are being planned. Additional renewable capacity also is in the works, with India planning 1 gigawatt of solar capacity and about 55,000 megawatts of wind capacity.

India's retail electricity rates are very low compared to the OECD average, which reflects a number of factors, including government policy. The inadequacy of fuel supplies, however, means the country's electricity generation often is insufficient to meet demand, and power deficits still plague the country. Some industrial customers rely on dedicated off grid power sources to avoid blackouts.

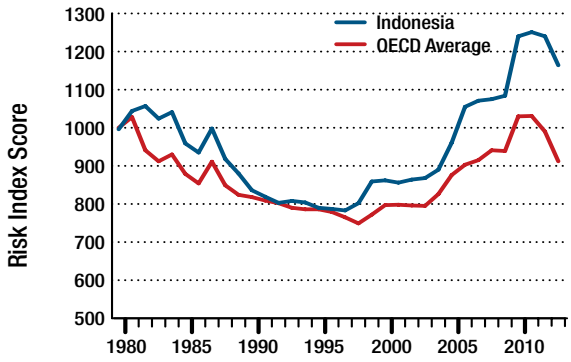
Like many emerging economies, India's per capita energy consumption is quite low, but its energy use is very inefficient. As a result, its energy intensity across the economy and in the transport sector compare unfavorably with the OECD average. These measures, however, have been showing improvement, as GDP grows faster than energy use. India also is a major emitter of carbon dioxide, but again due more to its large population rather than its per capita emissions, which are quite small (but growing). India's economy over the entire period since 1980 has been carbonizing consistently rather than decarbonizing as it pushes to increase energy access to its populace. In the large energy user group, India's energy use, energy expenditure, and emissions per capita and intensity scores are ranked number one. As India develops further, we would expect its scores for these metrics to slip down the ranks eventually.

INDONESIA

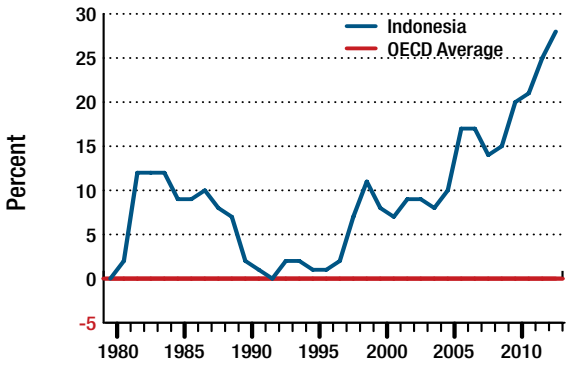
Energy Security Risk Summary: Indonesia

Risk Scores:	
2013 Energy Security Risk Score	1,164
2013 Large Energy User Group Rank	18 (tie)
Score in Previous Year	1,240
Rank in Previous Year	18
Score in 1980	996
Average Score: 1980-2013	954
Best Energy Security Risk Score	783 (1997)
Worst Energy Security Risk Score	1,251 (2011)
Risk Scores Relative to OECD Average:	
Average Annual Difference 1980-2013	9%
Best Relative Score	0% (1980)
Worst Relative Score	28% (2013)
Country-Specific Metric Ranking—2013:	
Number in Top Five	8
Number in Bottom Five	6

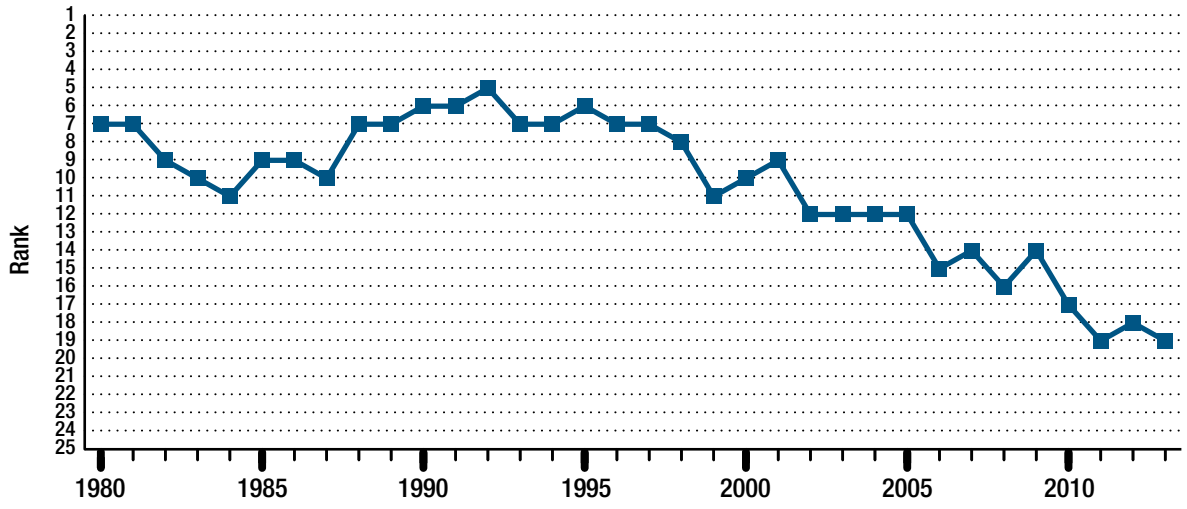
Indonesia vs. OECD: Risk Index Scores



Indonesia: Risk Variance from OECD



Indonesia: Risk Ranking



Indonesia is an example of a country whose energy security risk scores do not reflect the richness of the indigenous energy resources available to it. In the 21 years from 1980 to 2000, Indonesia's energy security was ranked in the top 10 of the large energy use group 19 times, reaching as high as number five. Since 2000, however, its scores have trended higher, both absolutely and relative to the OECD average. Its 2013 score of 1,164 is 28% higher than the OECD average, resulting in a rank of 18 in the large energy user group (tied with India), one place worse than in 2012. Considering the 20 country-specific metrics, Indonesia has a very creditable eight scores in the top five but six scores in the bottom five.

Indonesia is rich in energy resources, producing large amounts of oil, natural gas, and, especially, coal. It is a large exporter of natural gas and coal. Once focused primarily on exports, energy policy is now focused on meeting national energy demand.

In last year's International Index, it was noted that Indonesia has had difficulty attracting private investment, affecting its ability to meet rapidly growing demand (driven in part by fuel subsidies) through indigenous energy production. The country was for many years a large exporter of oil, but because of a combination of increasing demand and declining production linked to aging infrastructure and low investment, in 2004 it became a net importer of oil, and in January 2009 it left OPEC. As a result, Indonesia's oil import risk, while still favorable compared to the OECD average, is moving higher. In addition, the country's scores for import energy expenditures as a share of GDP have worsened considerably over the last five years, moving from well below the OECD average to well above it.

The story is considerably brighter for natural gas, which has seen an increase in production of about a quarter over the last decade. Indonesia is the fourth largest exporter of LNG after Qatar, Malaysia, and Australia. In addition to these conventional resources, EIA estimates that Indonesia could have large quantities of shale oil and natural gas, which if tapped would contribute to lower import supply risks and expenditure risks.

Coal production is also increasing and is the primary fuel used in power production, about three-quarters of which is exported, making it the largest exporter of this fuel in the world. Most of the coal used domestically is for power production, and its use in power generation is encouraged because it is abundant supply and costs comparatively less than fuel oil.

Electrification of the country is a top priority of the government, which has set a goal of providing power to 90% of the population by 2020 from about 75% today. In 1980, more than 80% of its power production came from oil-fired power plants and none from coal- or natural gas-fired plants. Today, oil is used to generate only about 20% of the country's electricity while coal generates about 45% and natural gas 20%. IEA expects that by 2035, coal plants will provide 66% of Indonesia's electricity generation.[11] Indonesia also is the world's third largest producer of electricity from geothermal sources, and a new 330 megawatt geothermal power plant will come online no later than 2018. Feed-in tariffs support geothermal and other renewable electricity production. Its electricity rates are the lowest in the large energy user group, with prices set by the government below market rates.

Indonesia's energy use per capita measures are much lower than the OECD average. One reason for this is that, according to an IEA estimate, 27% of the population lacks access to electricity. Energy is a key factor in economic growth, so this lack of energy access is reflected in Indonesia's GDP per capita metric, which is the second worst in the large energy user group, behind only India's.

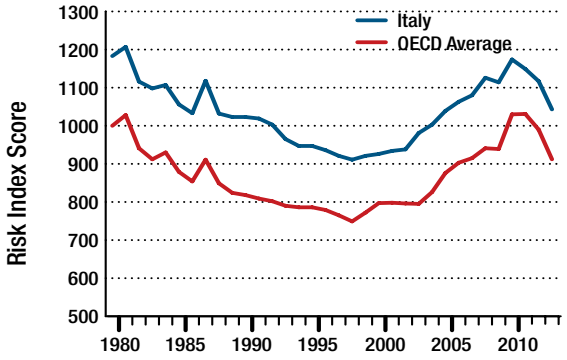
Like most other large emerging economies, emissions of carbon dioxide from energy pose an increasing risk relative to the OECD baseline.[12] Perhaps the largest risks are those connected to energy use overall and in the transportation sector. The amount of energy used to produce a unit of GDP in Indonesia is about the same as it was in 1980, but IEA expects this will improve by 2.3% per year out to 2035, the fastest pace of any country in Southeast Asia.

ITALY

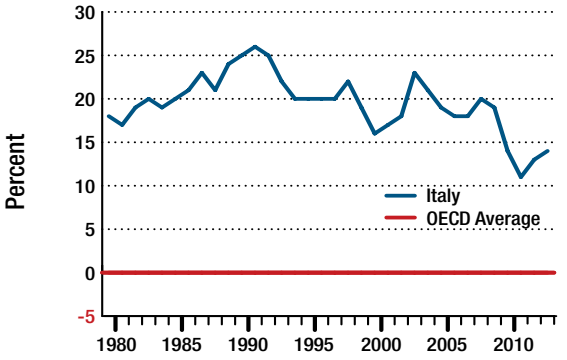
Energy Security Risk Summary: Italy

Risk Scores:	
2013 Energy Security Risk Score	1,043
2013 Large Energy User Group Rank	13
Score in Previous Year	1,117
Rank in Previous Year	13
Score in 1980	1,183
Average Score: 1980-2013	1,037
Best Energy Security Risk Score	911 (1998)
Worst Energy Security Risk Score	1,207 (1981)
Risk Scores Relative to OECD Average:	
Average Annual Difference 1980-2013	20%
Best Relative Score	11% (2011)
Worst Relative Score	26% (1991)
Country-Specific Metric Ranking—2013:	
Number in Top Five	3
Number in Bottom Five	3

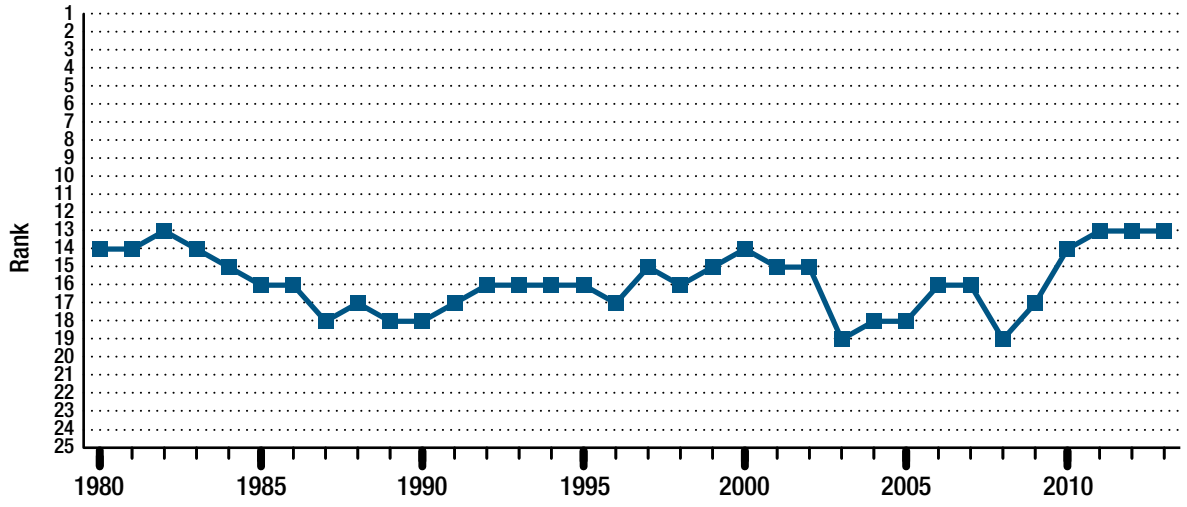
Italy vs. OECD: Risk Index Scores



Italy: Risk Variance from OECD



Italy: Risk Ranking



Since 2008, Italy's overall energy security risk ranking vis-à-vis its large energy user group peers has improved, climbing from a rank of 19 to a rank of 13 in 2013. Nevertheless, its scores have been consistently higher than the OECD average, and its 2013 score of 1,043 was about 14% higher. Three of its metric scores, mostly related to energy usage, are in the top five, and three are in the bottom five.

Italy produces very little of its own energy, and like many Western European countries, it relies largely on imports to fuel its economy. As a consequence, its import supply and expenditure risks, especially those related to coal and natural gas, are much greater than the OECD average (ranked 21 and 20, respectively, in the large energy user group ranking for 2013). The oil import risk metric, however, is not all that far off from the OECD average. Over the last decade, Italy's natural gas production has been declining, increasing the country's reliance upon gas imports, most of which arrive through pipelines and is supplied from Algeria and Russia. It is these import-related factors that, along with high retail electricity prices, are the main driver of Italy's mid-table showing.

Italy has a diverse power sector. Since the mid-1990s, Italy has been moving away from oil—which once supplied over half the country's electricity output—towards natural gas, which is now the most widely used fuel for producing electricity. Natural gas prices in Italy, however, are extraordinarily high. Coal use also has been growing. Non-emitting capacity is about evenly split between hydroelectric and other renewables. Italy's small nuclear capacity has not produced any power after passage of an anti-nuclear power referendum in 1987 following the Chernobyl nuclear accident in 1986.

Because of its reliance on expensive natural gas and its increased use of renewables for electricity generation, Italy's electricity prices are the highest in the large energy user group. According to IEA, its rates for industrial users are two to four times higher than in other OECD countries. As a result, its index score for this metric was at the bottom of the list in 2013.

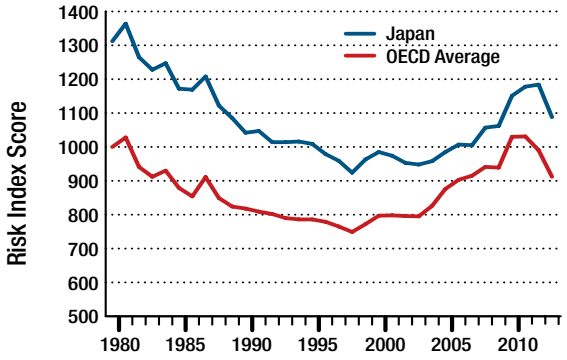
Italy does comparatively well in the metrics for energy use. Italy's energy use metrics, especially its energy use per capita metrics, are better than the norm for the OECD countries. Both its energy intensity and petroleum intensity measures are ranked in the top five. Its carbon dioxide emissions trend also is somewhat better than the OECD trend.

JAPAN

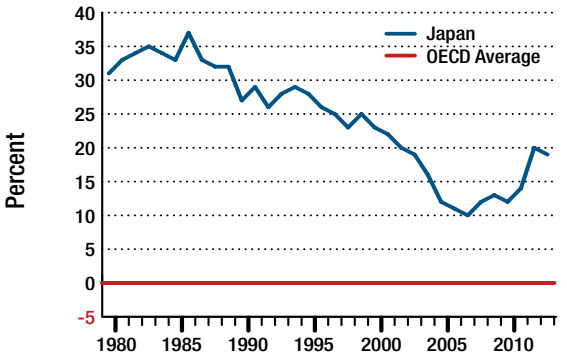
Energy Security Risk Summary: Japan

Risk Scores:	
2013 Energy Security Risk Score	1,088
2013 Large Energy User Group Rank	15
Score in Previous Year	1,184
Rank in Previous Year	17
Score in 1980	1,312
Average Score: 1980-2013	1,079
Best Energy Security Risk Score	924 (1998)
Worst Energy Security Risk Score	1,364 (1981)
Risk Scores Relative to OECD Average:	
Average Annual Difference 1980-2013	24%
Best Relative Score	10% (2007)
Worst Relative Score	37% (1986)
Country-Specific Metric Ranking—2013:	
Number in Top Five	2
Number in Bottom Five	6

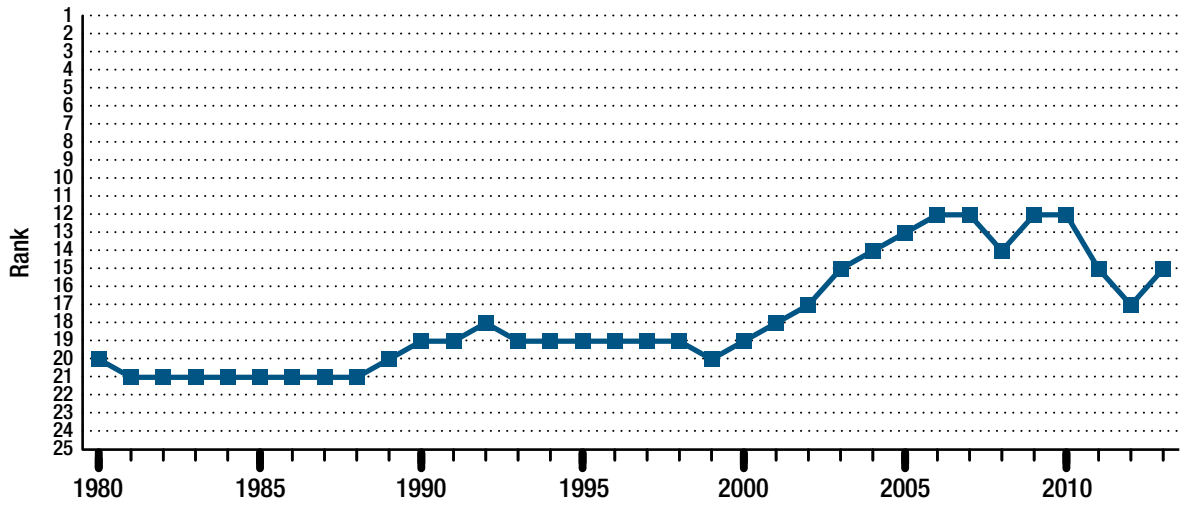
Japan vs. OECD: Risk Index Scores



Japan: Risk Variance from OECD



Japan: Risk Ranking



Japan has virtually no domestic fossil energy resources. As a result it faces many energy security challenges, and it has the highest energy security risk scores of any of OECD country in the large energy users group except the Netherlands. Its average energy security rank over the years has been 18. In 2013, its total energy security risk score was 1,088, putting it at number 15 in the large energy user group, two places higher than in 2012. Since the mid-1980s, Japan has improved its energy security posture in relation to the OECD baseline, closing the gap from 37% in 1986 to as little as 10% in 2007. The closing of nearly all of Japan's nuclear plants after the Fukushima Daiichi incident has caused Japan to lose considerable ground against the OECD, and the country's 2013 score was 19% above the OECD average.

Japan produces very small quantities of crude oil and natural gas, and it 2001, it stopped producing coal altogether. As a consequence, Japan is among the world's largest importers of oil (third), LNG (first), and coal (second). Its import exposure risks for all of these commodities are well above the OECD average, as are its import expenditures as a share of GDP. Japan's decision to close its nuclear plants further increased the demand for imported fuel, exacerbating these risks. It is not surprising, therefore, that of the six country-specific metrics of Japan's that are in the bottom five of the large energy user group, five are related to imports and energy expenditures.

Shale gas does not appear to be an alternative for Japan, though it does have a large methane hydrate resource. In March 2013, a Japanese energy exploration company successfully extracted natural gas from methane hydrate deposits of the coast of Japan. Estimates suggest a 100-year supply of natural gas off Japan's coast, and if techniques can be developed to produce economically methane gas from hydrates in commercial quantities, it would be a tremendous step forward in Japan's energy security.

The diversity of generating capacity and the share of non-carbon emitting generation in Japan's power sector has been one of Japan's strengths, but not as much as it was a few years ago before Fukushima. Japan invested heavily in nuclear power as a bulwark against unreliable supplies of imported fossil fuels.

From 1980 to 2010, Japan added nearly 30 gigawatts of nuclear capacity (to 45 gigawatts total), and in 2013, its 54 reactors accounted for roughly 17% of installed capacity and 26% of generated electricity. Only the United States and France produced more electricity from nuclear plants.

By the end of 2013, however, virtually all of Japan's nuclear plants were offline. Not only has the increase in fossil fuel imports needed to fill the gap created by the closure of nuclear facilities increased the country's import risks, it also has led to higher electricity costs and energy expenditures, greater carbon dioxide emissions, and a loss of generating capacity diversity. With additional safety measures now in place, the Japanese government is moving to restart many nuclear facilities, with more than half of the plants expected to enter back into service over the next couple of years. This should help Japan improve its energy security profile in a number of areas and lower its overall risk score.

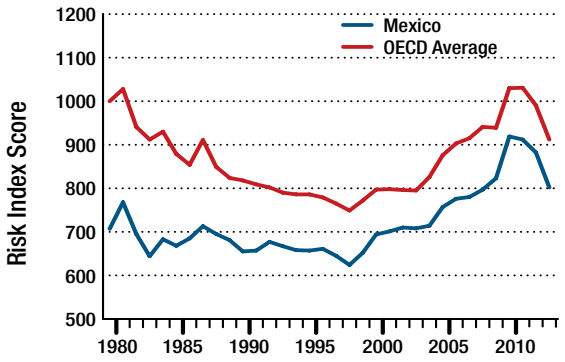
Japan's high level of energy efficiency acts to moderate and offset some of the unavoidable risks of importing so much energy, a great advantage. For example, the country's import expenditures as a share of GDP and per person would be much higher if its economy were not as efficient as it is, and the country's energy use measures compare quite favorably with the OECD average. Japan's scores in country-specific metrics measuring energy intensity both economy-wide and in the transport sector are in the top five of the large energy user group. Moreover, its per capita energy use scores are better than the corresponding scores for its OECD peers, and its emission scores are about average.

MEXICO

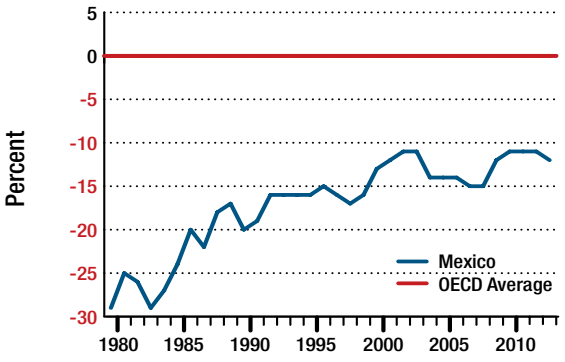
Energy Security Risk Summary: Mexico

Risk Scores:	
2013 Energy Security Risk Score	802
2013 Large Energy User Group Rank	2
Score in Previous Year	882
Rank in Previous Year	2
Score in 1980	707
Average Score: 1980-2013	720
Best Energy Security Risk Score	624 (1998)
Worst Energy Security Risk Score	919 (2010)
Risk Scores Relative to OECD Average:	
Average Annual Difference 1980-2013	-17%
Best Relative Score	-29% (1983)
Worst Relative Score	-11% (2002)
Country-Specific Metric Ranking—2013:	
Number in Top Five	8
Number in Bottom Five	1

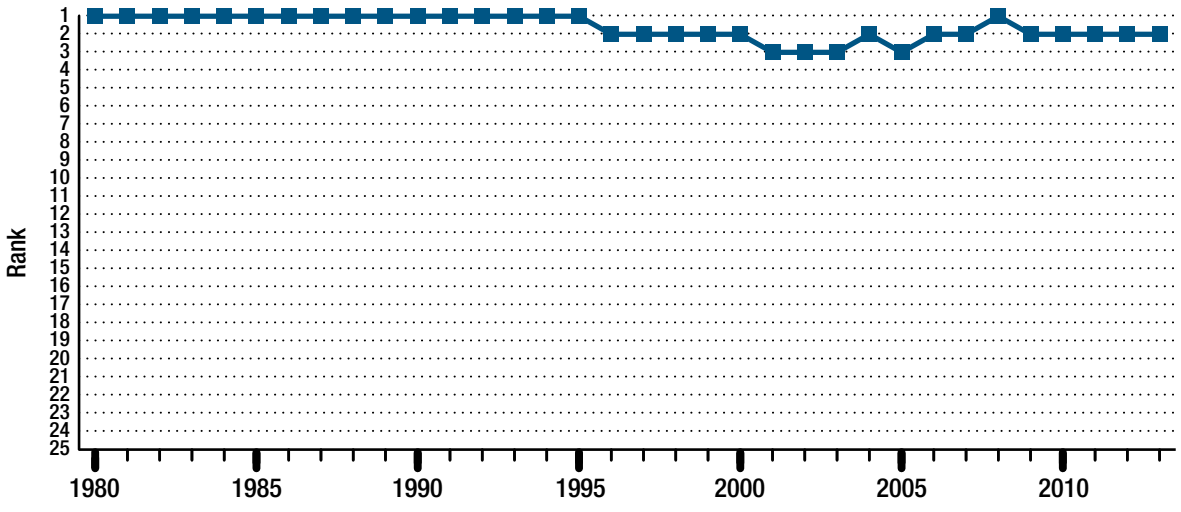
Mexico vs. OECD: Risk Index Scores



Mexico: Risk Variance from OECD



Mexico: Risk Ranking



Except for a few years in the early 2000s when it slipped to third, Mexico's energy security has since 1980 ranked first or second in the large energy user group. Its total risk score of 802 in 2013 put it in second place for the fifth consecutive year. While the country's risk in 2013 remains well below the OECD average, however, the gap has been shrinking over time, from 30% in 1980 to 13% in 2000, which means its risks were increasing at a faster rate than for the OECD as a whole during that period. Since 2000, Mexico's scores in relation to the OECD average have stabilized at about 13% lower. The country has eight country-specific metric scores in the top five and only one in the bottom five.

Mexico has a large domestic energy sector, focused primarily on oil. It is the world's 10th largest producer of crude oil. Oil production levels are declining, however, especially from Cantarell, Mexico's largest oil field located off Mexico's southeastern coast, which has seen output fall sharply in recent years. As a result, output has slipped by about 1 million barrels per day from its 2004 peak of 3.5 million barrels per day. Increases from other fields have not been enough to offset this decline.

To combat declining production, the Mexican government instituted constitutional reforms to put an end to the monopoly enjoyed by state-owned oil company Petroleos Mexicanos (Pemex, nationalized in 1938) and to open up its hydrocarbon sector to competition. Once limited to signing service contracts only, under these reforms foreign companies will be able to share in profits from production. The move is designed to attract investment in shale oil deposits, which EIA estimates are about 30% higher than its proven oil reserves, and ultra-deep water basins in the Gulf of Mexico. The United States and Mexico also completed the Transboundary Hydrocarbons Agreement. This agreement settled a decade-long dispute in an offshore area straddling the two borders and will open up more than 1.5 million acres of the Gulf to joint oil and gas development by Pemex and U.S. oil companies.

Mexico has very large reserves of natural gas, but many reserves remain untapped. Since 1989, natural gas imports have had to supplement domestic supplies and meet demand. Mexican imports of U.S. natural gas have nearly doubled since 2008 and could conceivably take 10% of U.S. production. Mexico is reportedly planning about 5,450 miles of new gas pipelines across the country, most of which will be focused on accessing U.S. shale gas. Moreover, with LNG terminals on both the Gulf and Pacific coasts, Mexico now imports LNG from as far afield as Indonesia, Nigeria, Peru, Yemen, and elsewhere. Mexico also produces modest amounts of coal, but has long been a net importer of this fuel.

EIA estimates that Mexico has 545 trillion cubic feet of technically recoverable shale gas resources. This is a very large shale gas resource—the fifth largest of the countries examined by EIA—and more than 30 times proved reserves of 17.2 trillion cubic feet. The constitutional reforms described earlier were passed in part by a desire to bring into the country the expertise needed to tap these resources.

Mexico's power sector has become increasingly diverse. Oil-fired plants once dominated Mexico's power sector, producing over 60% of its electricity. Over the past decade or so, Mexico has been backing out oil-fired power stations and replacing them mainly with natural gas stations, which accounted for a little over half of generation in 2013, and to a lesser extent coal-fired stations. Hydroelectric power provides around 10% of output, and the country has a single nuclear reactor in Veracruz that is undergoing modernization.

Mexico enjoys a clear comparative advantage in those metrics measuring the costs of energy. The amount it spends on fuel imports per dollar of GDP generated is well below the OECD average. Moreover, its energy expenditures per dollar of GDP and per capita are lower, as are its costs for electricity.

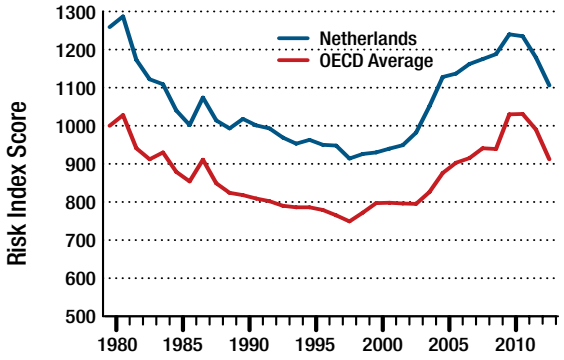
The amount of energy each person uses, both overall and in the transport sector, and the amount of carbon dioxide each person emits also is less than the OECD average. Mexico scores comparatively worse than its peers in those aspects related to energy intensity and emissions intensity, with its 2013 score for the metric measuring transport energy intensity settling in the bottom five of the large energy user group. As Mexico continues to grow and develop and its middle class expands, these metrics should begin to converge closer to the OECD average. Because some oil capacity is being replaced by natural gas capacity in the power sector, Mexico's petroleum intensity metric should continue to improve at a faster rate than the OECD average.

NETHERLANDS

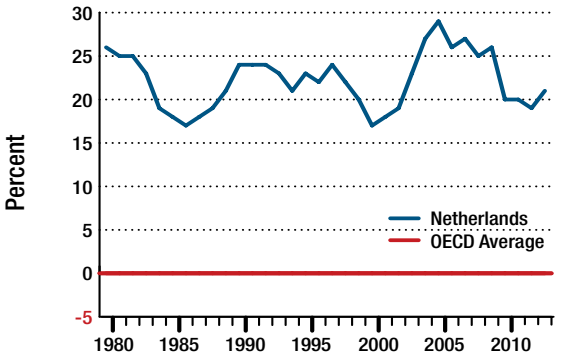
Energy Security Risk Summary: Netherlands

Risk Scores:	
2013 Energy Security Risk Score	1,106
2013 Large Energy User Group Rank	16
Score in Previous Year	1,179
Rank in Previous Year	16
Score in 1980	1,259
Average Score: 1980-2013	1,062
Best Energy Security Risk Score	914 (1998)
Worst Energy Security Risk Score	1,287 (1981)
Risk Scores Relative to OECD Average:	
Average Annual Difference 1980-2013	22%
Best Relative Score	17% (2000)
Worst Relative Score	29% (2005)
Country-Specific Metric Ranking—2013:	
Number in Top Five	2
Number in Bottom Five	7

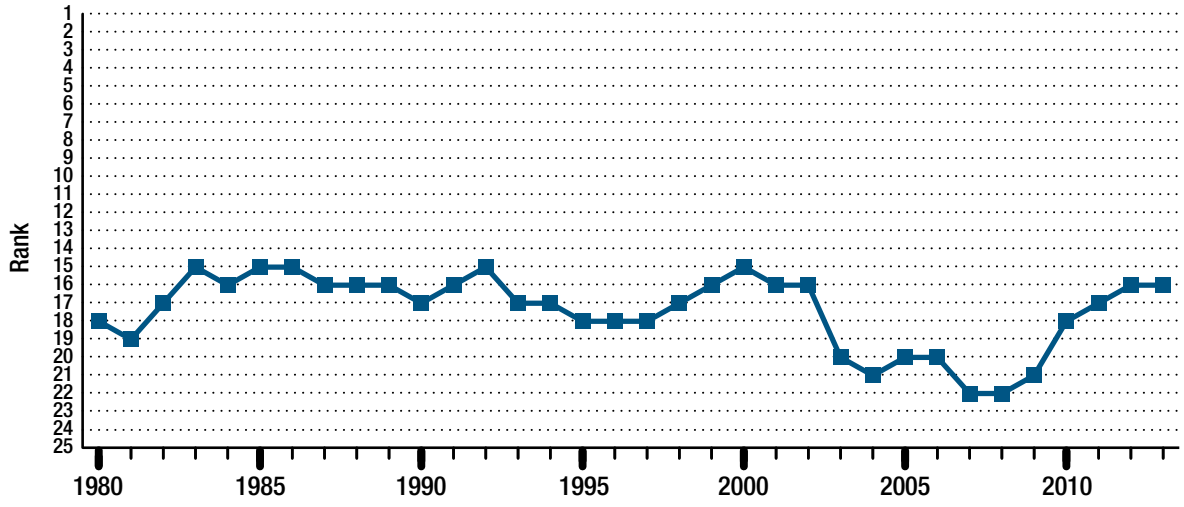
Netherlands vs. OECD: Risk Index Scores



Netherlands: Risk Variance from OECD



Netherlands: Risk Ranking



The Netherlands ranked number 20 in 2013 with a total energy security score of 1,106. At number 16, it is the least secure of the European countries in the large energy user group and has been for many years. From 1980 to 2013, its overall risks averaged 22% above the OECD average. While relatively high, its risks have moved largely in tandem with the OECD average. The Netherlands has two country-specific metric scores in the topo five seven in the bottom five.

The Netherlands has a very large oil and gas sector for a country of it size, and it plays a key role as a processing, storage, and distribution center for the rest of Europe. It has a large refining center in and around the port city of Rotterdam, but it produces very little crude oil of its own. It therefore imports large volumes of crude oil, both for re-export and refining. It is, however, among the world's largest net exporters of refined petroleum, which has helped keep its overall oil import risk lower than it would be otherwise.

The Netherlands is a large producer (10th in the world) of natural gas, most of which is produced onshore. As a net exporter of gas, its natural gas import risk is much better than the OECD average. It is the only country-specific import-related metric that ranks in the top five of the large energy user group. The Netherlands is also taking steps to tap into its relatively large (at least by European standards) shale resources of oil and natural gas, which could lower future risks. Although it produces coal, the country depends on imports of this fuel to satisfy domestic demand.

About 80% of the Netherland's electricity generation capacity is thermal. Gas-fired plants generate well more than half of total electricity production, coal-fired plants about one quarter. Renewables now make up about 10% to 15% of generation. This heavy concentration of natural gas facilities, however, means that the Netherlands' power sector is less diverse than the OECD average. Its retail electricity prices are quite a bit higher than the OECD average, not surprising given the reliance on relatively expensive natural gas to produce electricity.

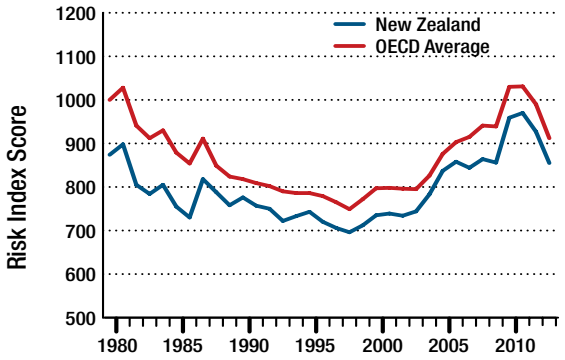
Overall energy usage is something of a mixed bag. While its energy intensity score is about in the middle of the pack of the large energy user group, its per capita energy use, carbon dioxide emissions per capita, and energy expenditures per capita scores are all ranked in the bottom five, with the latter metric being ranked last in the large energy user group for 2013. Both are less a reflection of inefficient energy use and more a reflection of the country's unusually large oil and gas sector, which is a large energy consumer.

NEW ZEALAND

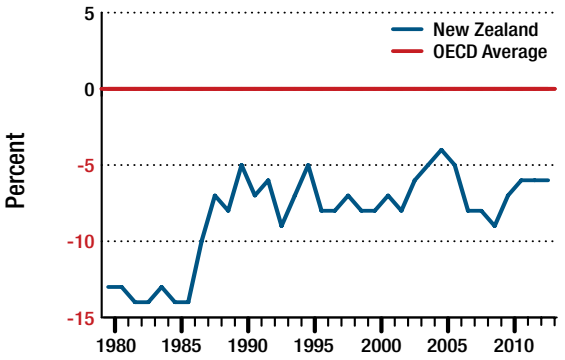
Energy Security Risk Summary: New Zealand

Risk Scores:	
2013 Energy Security Risk Score	855
2013 Large Energy User Group Rank	4
Score in Previous Year	927
Rank in Previous Year	4
Score in 1980	874
Average Score: 1980-2013	795
Best Energy Security Risk Score	696 (1998)
Worst Energy Security Risk Score	970 (2011)
Risk Scores Relative to OECD Average:	
Average Annual Difference 1980-2013	-8%
Best Relative Score	-14% (1986)
Worst Relative Score	-4% (2005)
Country-Specific Metric Ranking—2013:	
Number in Top Five	4
Number in Bottom Five	1

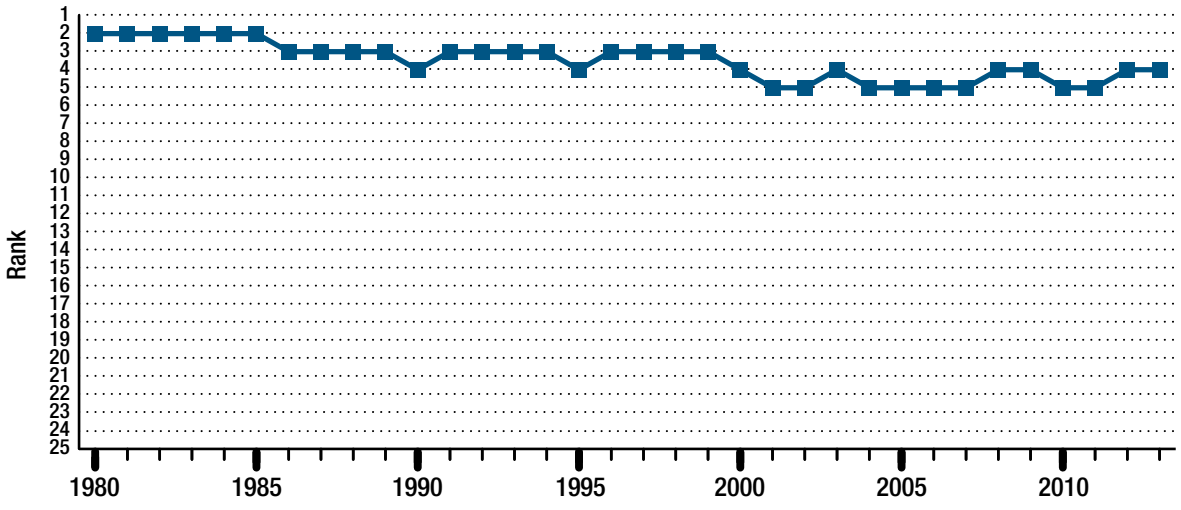
New Zealand vs. OECD: Risk Index Scores



New Zealand: Risk Variance from OECD



New Zealand: Risk Ranking

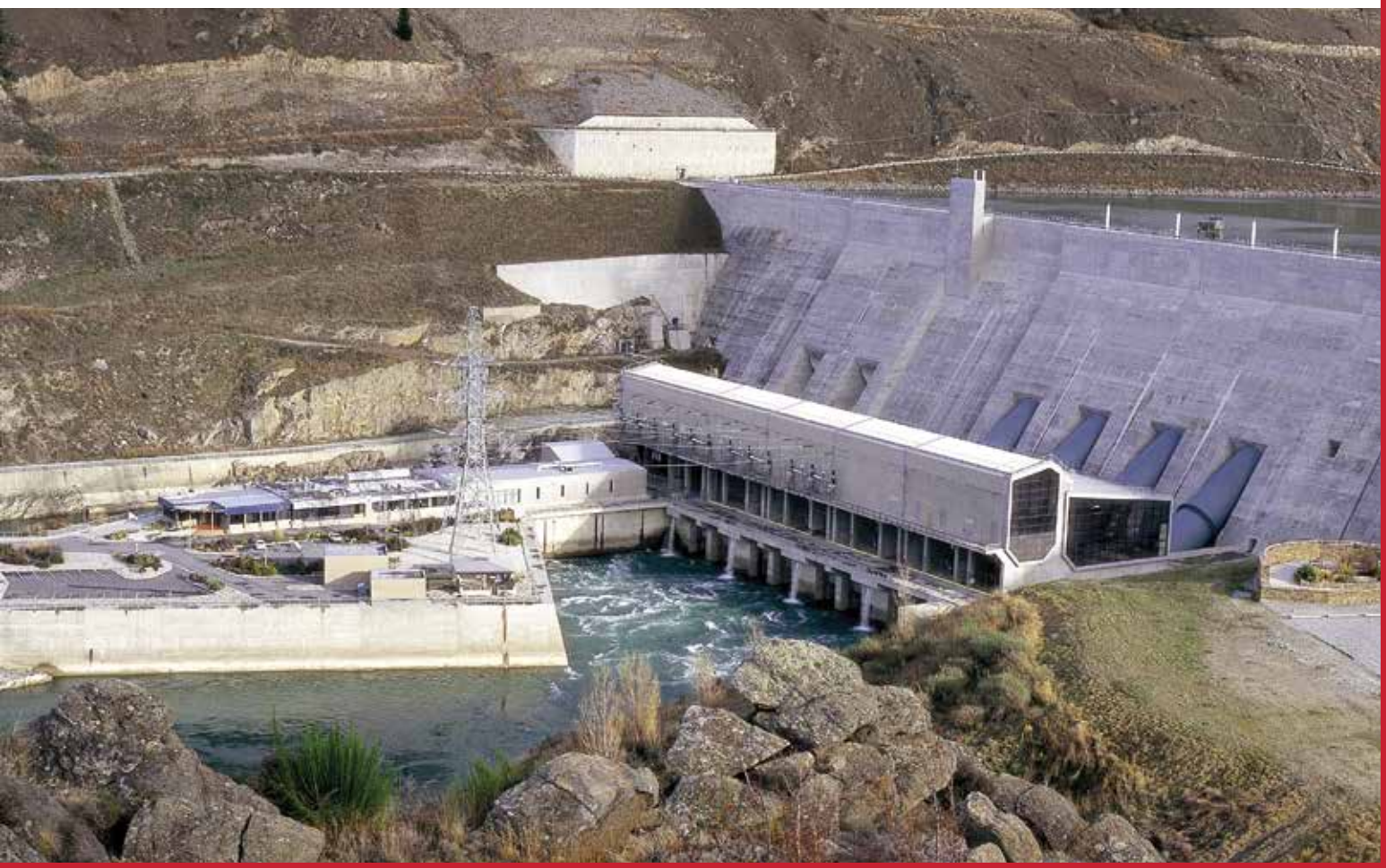


New Zealand's total energy security risk scores have consistently ranked in the top five of the large energy user group. Its 2013 score of 855 earned it the fourth spot in the ranking. Since about 1990, New Zealand's overall scores have moved within a band of about 5% to 10% below the OECD average. It has four country-specific metrics in the top five of the large energy user group, and just one in the bottom five.

New Zealand is not a large producer of oil, natural gas, or coal, but because its demand for these products is relatively low compared to other countries in the large energy user group, it does not have to be. It does not produce what would be considered large amounts of oil, and it relies on imports for this fuel, all of which must come in by tanker. It produces enough natural gas and coal to satisfy domestic demand and, in the case of coal, to support an export trade. New Zealand's import-related risk metrics, therefore, are much better than the OECD average for natural gas and coal and not appreciably different for oil. Its expenditures on energy imports as a share of GDP also are in line with the OECD average.

When it comes to the power sector, New Zealand has one of the most diverse in the large energy user group, its score for this metric being ranked number four in 2013. New Zealand is dominated by hydroelectric power, which in 2013 accounted for more than half of generation, with natural gas and non-hydro renewables each accounting for nearly 20%, and coal a little less than 10%. Over most of the period since 1980, New Zealand has benefited from relatively low electricity rates. But since 2001, when its score for this metric was ranked number five in the large energy user group, rising prices have seen the country fall down in the table for this metric, reaching a middling rank of 12 in 2013.

New Zealand also uses slightly more energy, both overall and in the transport sector, to generate a dollar's worth of GDP than the baseline of OECD countries. Its carbon dioxide emissions trend is also somewhat worse than the OECD average, but its emissions intensity and emissions per capita generally track OECD figures.

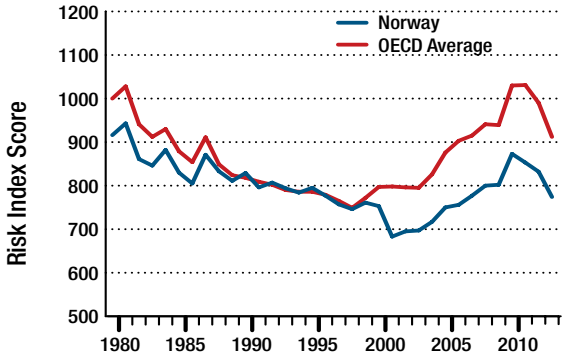


NORWAY

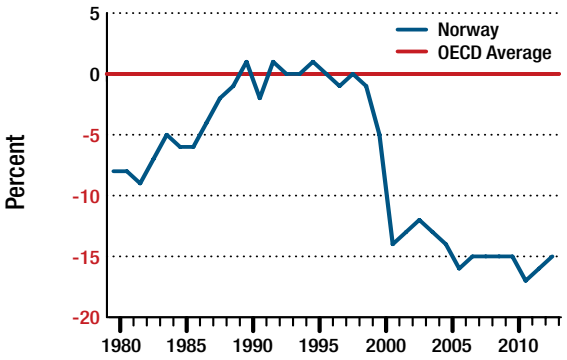
Energy Security Risk Summary: Norway

Risk Scores:	
2012 Energy Security Risk Score	774
2012 Large Energy User Group Rank	1
Score in Previous Year	832
Rank in Previous Year	1
Score in 1980	916
Average Score: 1980-2012	800
Best Energy Security Risk Score	683 (2001)
Worst Energy Security Risk Score	943 (1981)
Risk Scores Relative to OECD Average:	
Average Annual Difference 1980-2012	-8%
Best Relative Score	-17% (2011)
Worst Relative Score	1% (1990)
Country-Specific Metric Ranking—2013:	
Number in Top Five	11
Number in Bottom Five	4

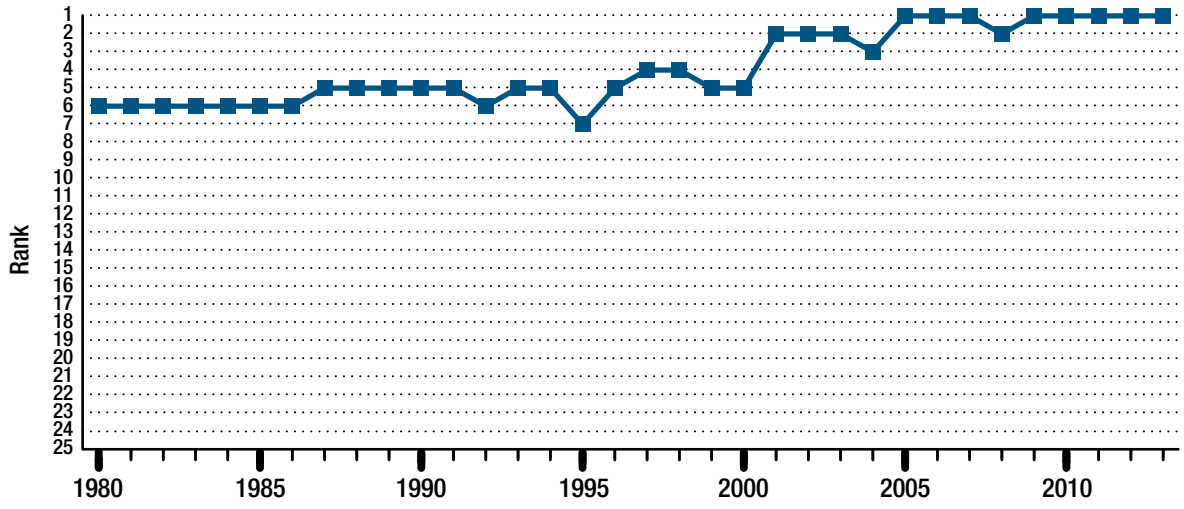
Norway vs. OECD: Risk Index Scores



Norway: Risk Variance from OECD



Norway: Risk Ranking



Norway held onto its number one ranking in 2013, besting second place Mexico by 28 points. From 2000 to 2001, Norway's energy security ranking rose from five to two—a shift related largely to greater domestic coal production that reduced its coal import risk to "0." In 2005, it rose to the top spot, a position it has retained since. Norway's 2013 score of 774 was 15% below the OECD average, and since 2001, its overall score has averaged 15% below the OECD. Of the 20 country-specific metrics in the database, Norway has 11 scores in the top five and four in the bottom five.

Norway is rich in energy resources and is a net exporter of all types of fossil fuels and electricity. Norway became an oil exporter in 1975 as production from the North Sea began in earnest. Production has been in decline for many years, however, with production in 2013 of 1.5 million barrels per day being about half of its peak in 2001 (but still nearly seven times domestic consumption). In addition, Norway is the sixth largest producer of natural gas in the world, and more than 95% of its output is exported, mostly by pipeline to Europe. It is the second largest supplier of natural gas to Europe after Russia. Unlike crude oil production, natural gas production has increased in recent years and reached its highest level in 2012.

Coal is used primarily for industrial purposes. With the opening of the Svea Norda mine on the island of Spitsbergen in the Svalbard archipelago in 2001, Norway became a net exporter of coal. Shipments from Spitsbergen are largely seasonal because winter ice blocks shipping routes. This means that Norwegian industries, which need a steady supply of coal for their operations, import coal from its European neighbors Poland, Russia, the United Kingdom, and Germany.

Given all of this, Norway scores very well in the fuel import measures compared to the OECD baseline. Stable and democratic, Norway also is a reliable supplier of fossil fuels to regional and global markets, and its production adds to the volume and diversity of fuel supplies. Both of these contribute to improving the energy security of all countries. Moreover, thanks in large part to its robust energy sector, Norway has the best per capita GDP score of the 25 countries in the major energy user group.

Norway's electricity sector is the least diverse in the group, with more than 95% of its generation coming from hydroelectric facilities, which makes its electricity supply susceptible to drought-related interruptions. (Its score for non-carbon dioxide emitting generation is comparatively quite good, however.) Norway exports between about 10% and 15% of the power it generates to neighboring Denmark, Finland, the Netherlands, and Sweden. Its electricity rates are a bit better than the OECD average.

Where Norway scores poorest compared to its peers in the large energy user group is in per capita energy expenditures (ranked 23 in 2013), per capita energy use (ranked last), and electricity capacity diversity (ranked last). For a country of just around 5 million people, Norway has large-scale industrial and oil and gas facilities that use a lot of energy, including two refineries that produce enough refined products to make Norway a net exporter of refined products. Indeed, other countries with small populations and large energy facilities, such as Trinidad & Tobago, also show very high energy use per capita. Also, Norway has one of the coldest climates of any country in the large energy user group, so it is not surprising that its per capita energy use—like Canada's and Russia's—is high, with large amounts of energy being needed for residential and commercial space heating. These risks are moderated somewhat by Norway's relatively good energy intensity score.

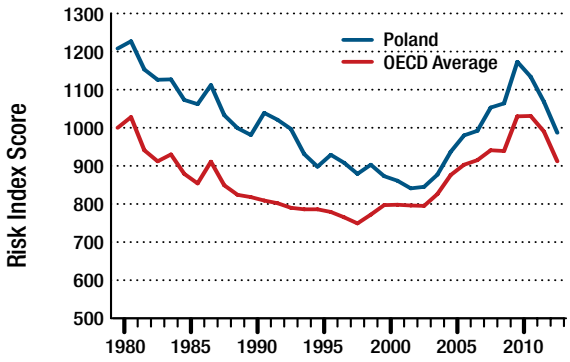
In the other areas, Norway scores modestly better than, or about as good as, the comparable OECD average score. The country's very high ranking in 12 categories and its good or average ranking in five others has been more than enough to offset its poor showing in three categories and propel it comfortably into the top spot.

POLAND

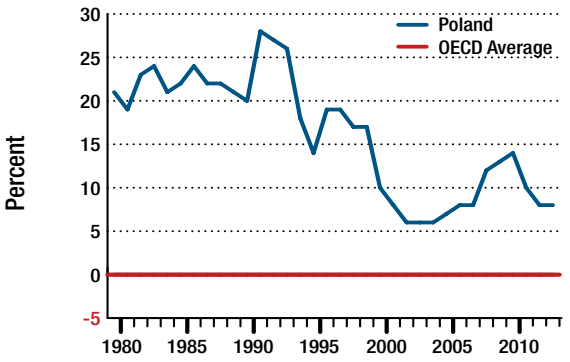
Energy Security Risk Summary: Poland

Risk Scores:	
2013 Energy Security Risk Score	987
2013 Large Energy User Group Rank	11
Score in Previous Year	1,068
Rank in Previous Year	11
Score in 1980	1,208
Average Score: 1980-2013	1,009
Best Energy Security Risk Score	841 (2002)
Worst Energy Security Risk Score	1,227 (1981)
Risk Scores Relative to OECD Average:	
Average Annual Difference 1980-2013	16%
Best Relative Score	6% (2002)
Worst Relative Score	28% (1991)
Country-Specific Metric Ranking—2013:	
Number in Top Five	2
Number in Bottom Five	2

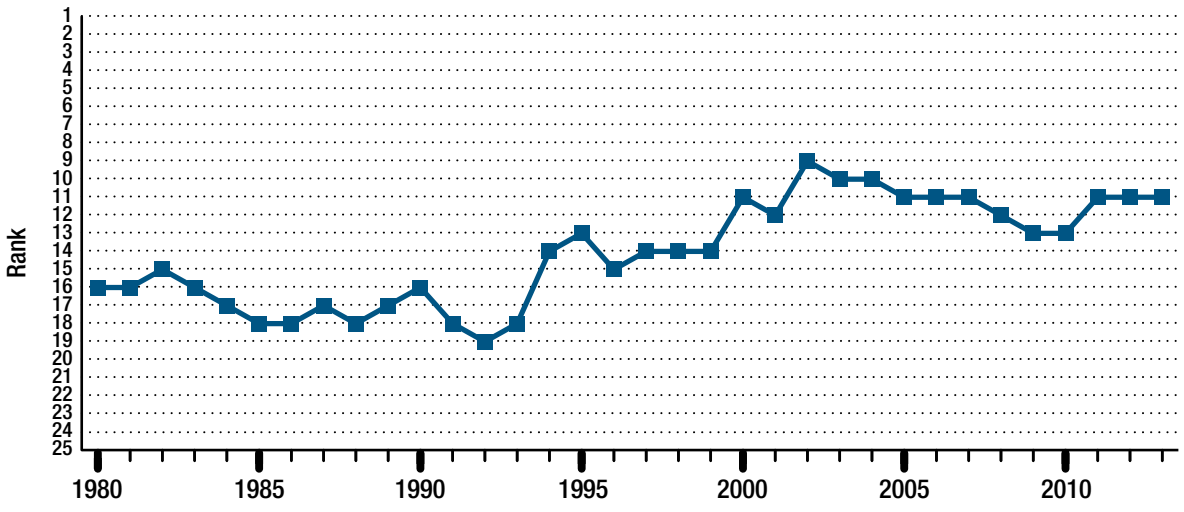
Poland vs. OECD: Risk Index Scores



Poland: Risk Variance from OECD



Poland: Risk Ranking



Poland's total risk score of 987 puts it in the number 11 position in the ranking for 2013, unchanged form 2012. Of the three economies in transition countries in the large energy user group, Poland has enjoyed the lowest energy security risk scores. From the early 1990s to the mid-2000s, the country greatly improved its position relative to the OECD average, from a total score 28% higher in 1991 to a score just 7% higher in 2005. While Poland's total score spiked to 14% higher than the OECD benchmark in 2010 (largely related to energy price volatility), in 2013 it was back down to 8% higher. When considering the group of 20 country specific metrics, most of Poland's scores are in the middle of the pack, with just two scores each in the top and bottom five of the large energy user group.

As an economy in transition, Poland faces significant energy challenges. Poland has a large coal resource and is the ninth largest coal producer in the world and second largest producer in Europe, behind only Germany. Domestic production has been sufficient to meet demand over almost all of the period since 1980. Coal provides more than half of the energy used in Poland. Most of that coal consumption is for electricity generation--between 80% and 90% of its electric power is produced at coal-fired power stations--though large volumes also are used in industry. Coal represents a secure domestic supply of very affordable energy, and it is a source of many jobs in the mining sector. Coal mining is still done largely by state-owned firms, but the government plans to privatize most if not all of its coal-mining assets. Coal supply and demand are in tight balance, and Poland could become a new importer of this fuel in the near future.

Poland produces only small amounts of natural gas and crude oil, in both cases not nearly enough to satisfy domestic demand, which means imports are needed to meet demand for these fuels. Russia is the main supplier (via pipeline) of both fuels, accounting for more than 90% of oil and 80% of natural gas of Poland's imports of these products. Norway and Germany also are important sources of natural gas. Poland is looking at diversifying its supplies of natural gas and is constructing an LNG facility in the Baltic city of Swinoujscie that would receive shipments of LNG from Qatar. Domestic shale gas offers another option.

According to EIA estimates, Poland—which has only 3 trillion cubic feet of recoverable natural gas reserves on the books—has potentially as much as 148 trillion cubic feet of shale gas (down from an initial estimate of 187 trillion cubic feet). So far, test wells in Poland have yielded disappointing test drilling results, with ExxonMobil and Marathon both pulling out of the country. In addition to its challenging geology, there are significant regulatory and infrastructure issues that the government is working to address to keep exploration of its shale resource moving forward.

The almost complete reliance on coal for generating electricity has kept Polish electricity prices well below the OECD average for most of the period, but since the mid-2000s, this advantage has dwindled. Given the large dominance of coal, it is not surprising that Poland's electricity diversity scores compare unfavorably to the OECD average. Indeed, it is one of only two metrics (the other being non-emitting generation) where Poland scores in the bottom five of the large energy user group. Poland's energy policy to 2030 proposes diversification of the electricity generation by introducing nuclear energy. Renewables also are being encouraged by setting up a feed-in tariff. The addition of nuclear and renewables also should improve Poland's share of non-carbon generation in the power sector.

Polish energy demand is expected to increase as its economy grows and develops. Its energy use measures are typical for a country undergoing a transition to a market-based economy. While its energy use per capita scores, overall and in the transport sector, are better than the OECD average for these, its energy intensity scores are worse, though the gap has been getting smaller.

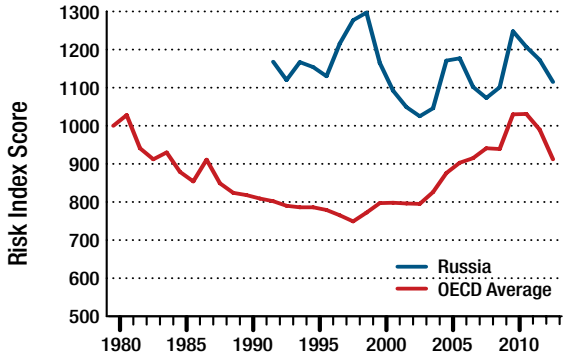
Poland's carbon dioxide emissions are still comparatively better than the OECD baseline, reflecting Poland's economic transition, though its carbon dioxide emissions intensity is high by OECD standards. The Polish government has taken a keen interest in carbon capture and storage technologies as a way to help reduce emissions from its power sector.

RUSSIAN FEDERATION

Energy Security Risk Summary: Russian Federation

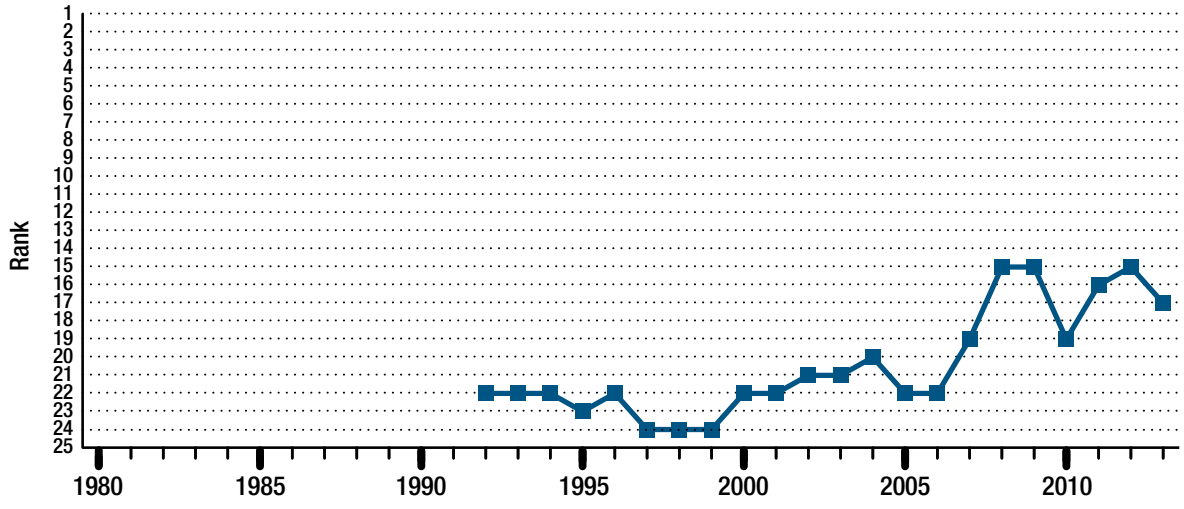
Risk Scores:	
2013 Energy Security Risk Score	1,115
2013 Large Energy User Group Rank	17
Score in Previous Year	1,173
Rank in Previous Year	15
Score in 1980	1,168
Average Score: 1980-2013	1,149
Best Energy Security Risk Score	1,025 (2003)
Worst Energy Security Risk Score	1,297 (1999)
Risk Scores Relative to OECD Average:	
Average Annual Difference 1980-2013	36%
Best Relative Score	14% (2008)
Worst Relative Score	70% (1998)
Country-Specific Metric Ranking—2013:	
Number in Top Five	5
Number in Bottom Five	5

Russian Federation vs. OECD: Risk Index Scores



Russian Federation: Risk Variance from OECD

Russian Federation: Risk Ranking



Despite very large energy resources, the Russian Federation's energy security risks have over the years been much higher than its peers in the large energy user group. In 1992 (the first year for which Russian data are available), the country's energy security was ranked fourth from the bottom. From 1998, when its risk score was 70% higher than the OECD average, Russia's scores relative to the OECD declined sharply, reaching 14% above the OECD average in 2008 and achieved its best rank of 15. Since then, however, Russia's score increased to 22% above the OECD in 2013, and its rank has climbed to 17. The country has five country-specific metric scores in the top five (all related to imports) and five in the bottom five (all related to energy usage).

Russian fossil fuel reserves, estimated by the Congressional Research Service (CRS) at 955 billion barrels of oil equivalent,[13] are second only to the United States, and it is a leading producer of all types of fossil energy. More than 60% of this is in coal, and about 30% in natural gas. Undiscovered oil and natural gas could add another 323 billion barrels of oil equivalent to Russia's total.

Energy exports contribute greatly to Russia's economy. In 2013, Russia was the world's largest producer of crude oil, second largest producer of natural gas, and the sixth largest producer of coal. Its production of these fuels was well in excess of domestic demand, and it is a large net exporter of all of them as well as refined petroleum products. Unsurprisingly, its import-related energy security risks are well below the OECD average. However, because energy exports account for about half of its budget, Russia is susceptible to swings in energy prices. While prices in 2013 were stable, the collapse in the price of crude oil in 2014 and early 2015 (along with international economic sanctions put in place after its incursion in Ukraine) is expected to have a severe impact on the Russian economy.

Russia also has very large unconventional resources. EIA estimates technically recoverable reserves of 287 trillion cubic feet of natural gas and 75.8 billion barrels of oil. Most of the oil resource is in Siberia's Bazhenov formation, which some analysts believe could contain as much as 100 billion barrels of recoverable oil, making it potentially one of the largest shale oil plays in the world.

Although Russia's large volume of fossil fuel exports boosts the diversity of global and regional fossil fuel supplies, its low scores for political and civil liberties make it a potentially unreliable trading partner. Indeed, with the largest proved natural gas reserves in the world, Russia has not been shy about using its clout to influence markets in Europe, which depends on Russia for about 30% of its gas supplies (with some countries in Eastern Europe dependent on Russia for 90% or more of supplies). Moreover, Russia, Iran, and Qatar began discussing forming an OPEC for gas-exporting countries. Today, however, it is unclear how influential this group might become, although its individual members still wield market power regionally. It is much more difficult to emulate an oil cartel with natural gas. A global natural gas cartel based on LNG, therefore, is unlikely to gain much traction, especially if new unconventional natural gas resources can be developed in countries where they are plentiful.

The score measuring the diversity of Russia's power sector ranks in the middle of the large energy user group. About half of its power generation capacity is fueled with natural gas. The remainder is pretty evenly split among hydropower, coal, and nuclear plants. To allow for greater exports of natural gas, Russia is planning to increase coal production and build more coal-fired power plants.

About the only other area where Russia is well ahead of the OECD average is in transportation energy use per person. This is not surprising given Russia's well developed public transportation system, but this edge is beginning to shrink and will probably continue to do so as Russia's economy develops further and more people purchase vehicles.

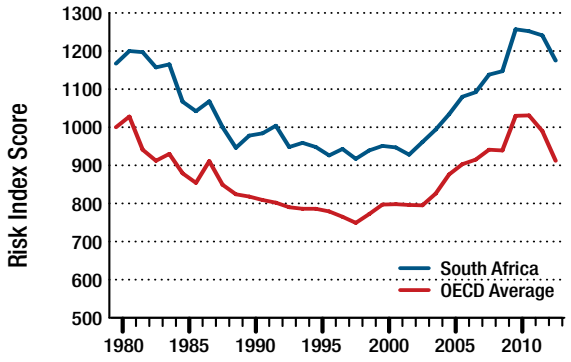
After decades of communist rule, Russia's economy remains very inefficient. All of the country's energy and carbon dioxide emissions intensity measures show higher, and in some cases much higher, risks compared to the OECD average. Russia's energy expenditure, petroleum, transport energy, and carbon dioxide intensity scores all rank in the bottom five of the large energy user group. Improvement in all of these metrics is evident, but at a rate not much different than that for the OECD.

SOUTH AFRICA

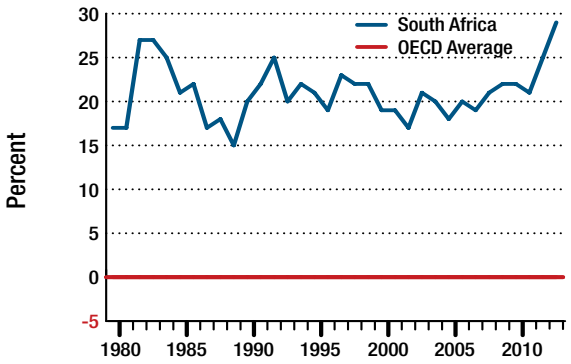
Energy Security Risk Summary: South Africa

Risk Scores:	
2013 Energy Security Risk Score	1,175
2013 Large Energy User Group Rank	21
Score in Previous Year	1,241
Rank in Previous Year	19
Score in 1980	1,167
Average Score: 1980-2013	1,052
Best Energy Security Risk Score	917 (1998)
Worst Energy Security Risk Score	1,257 (2010)
Risk Scores Relative to OECD Average:	
Average Annual Difference 1980-2013	21%
Best Relative Score	15% (1989)
Worst Relative Score	29% (2013)
Country-Specific Metric Ranking—2013:	
Number in Top Five	3
Number in Bottom Five	5

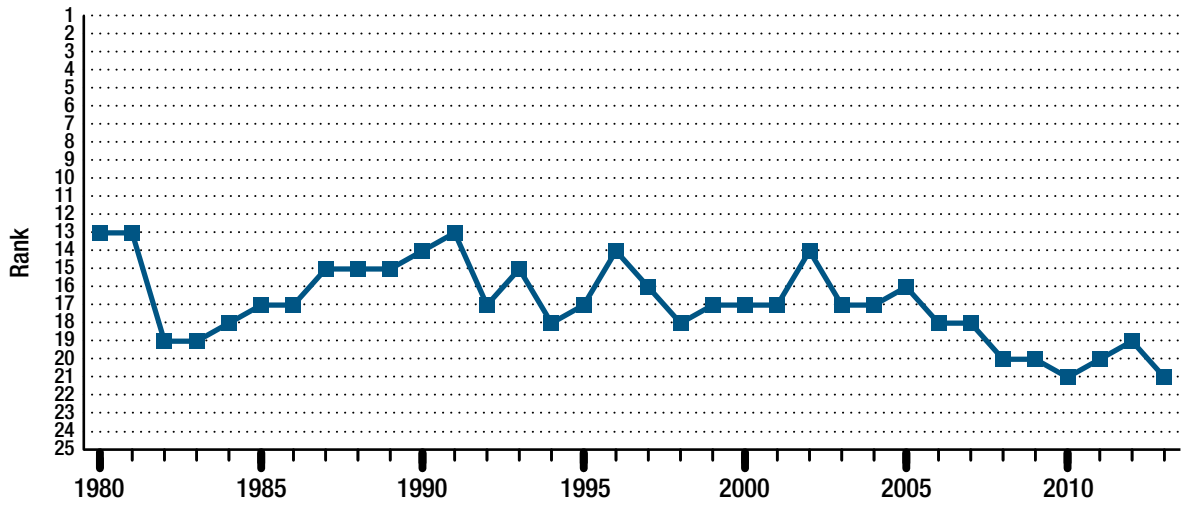
South Africa vs. OECD: Risk Index Scores



South Africa: Risk Variance from OECD



South Africa: Risk Ranking



South Africa's energy security risk score for 2013 was 1,175 for a ranking of 21, two places lower than in 2012. Since 2005, however, the country's risk score appear to be growing relative to the OECD baseline (from 18% above to 29% above). The country's scores for individual measures of risk exhibit many of the drawbacks one would expect to see in a large emerging economy, but it also has advantages some other emerging economies lack, such as large energy resources. Scores for three of the 20 country-specific metrics in 2013 were ranked in the top five while five were ranked in the bottom five.

The largest economy in Africa, South Africa is rich in coal. Its reserves and production are the ninth and sixth largest in the world, respectively. Coal provides nearly three-quarters of South Africa's energy. About one-quarter of its coal output is exported, and it is a major supplier to Europe, China, and India. The country also has the world's only commercial coal-to-liquids facility, and it produces about 150,000 barrels per day of liquids, a substantial portion of the nation's600,000 barrels per day demand. More coal-to-liquids capacity is being planned. As a net exporter of coal, its coal import risk is "0," which puts it in the top five ranking for this metric in the large energy user group. South Africa's coal-to-liquids capability has enhanced its energy security by lessening its oil import exposure risk, which is about a about equal to the OECD average.

The country has relatively small proved reserves of oil (located primarily offshore) and natural gas, so it relies on imports to meet demand for these products. In 2006, South Africa's natural gas import risk rose sharply as the country began importing that fuel by pipeline from neighboring Mozambique. The recent increase in natural gas imports was primarily responsible for the rise in the amount of money the country spends on fossil fuel imports as a share of GDP relative to the OECD baseline.

South Africa may have as much as 390 trillion cubic feet of technically recoverable shale gas (but apparently little if any shale oil). In 2012, the government reversed an earlier prohibition on hydraulic fracturing. It hopes shale gas can help diversify its energy mix and provide an alternative to coal. If developed successfully, shale gas could lower significantly the risks inherent in relying on imported natural gas.

About 75% of the population has access to electricity, and access is much higher (roughly 90%) in the cities. With such an abundance of coal, it is no surprise that coal dominates the power sector, accounting for about 95% of generation. A huge 4.8 gigawatt coal-fired power station at Medupi should come online in 2015, and a new 4.8 gigawatt plant in Kusile is expected to be completed by 2018. Most of the remaining electricity demand is supplied by nuclear power (a planned 3.5 gigawatt nuclear power plant has been delayed for financial reasons). Hydropower and pumped storage also contribute modestly. The predominance of one fuel in the power sector means that South Africa's 2013 risk score for capacity diversity is higher than for any other country in the large energy user group except Norway, and its score for non-emitting capacity metric was ranked 23. Its average retail electricity price in 2013, however, was fourth best in the group.

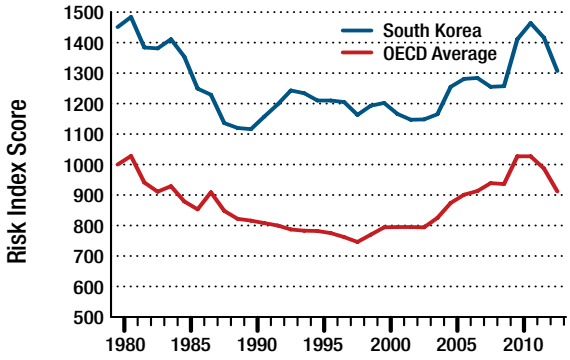
Most of the emerging economies in our large energy user group consume energy less efficiently than the OECD average and are increasing their carbon dioxide emissions rapidly, and South Africa is no exception. In addition to a growing middle class, the country has a large mining sector and other industries that use large amounts of energy. As a result, energy use and emission risk measures in South Africa have improved more slowly, if at all, against the OECD baseline.

SOUTH KOREA

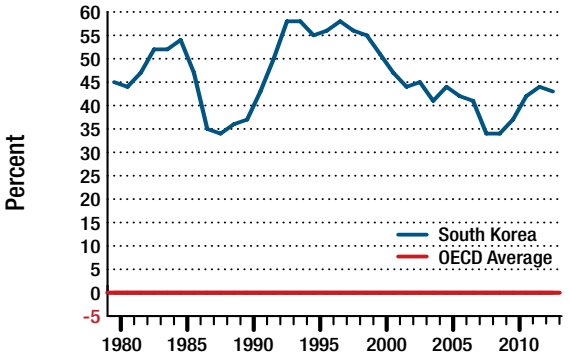
Energy Security Risk Summary: South Korea

Risk Scores:	
2013 Energy Security Risk Score	1,306
2013 Large Energy User Group Rank	22
Score in Previous Year	1,420
Rank in Previous Year	23
Score in 1980	1,451
Average Score: 1980-2013	1,263
Best Energy Security Risk Score	1,118 (1990)
Worst Energy Security Risk Score	1,484 (1981)
Risk Scores Relative to OECD Average:	
Average Annual Difference 1980-2013	46%
Best Relative Score	34% (2008)
Worst Relative Score	58% (1997)
Country-Specific Metric Ranking—2013:	
Number in Top Five	0
Number in Bottom Five	6

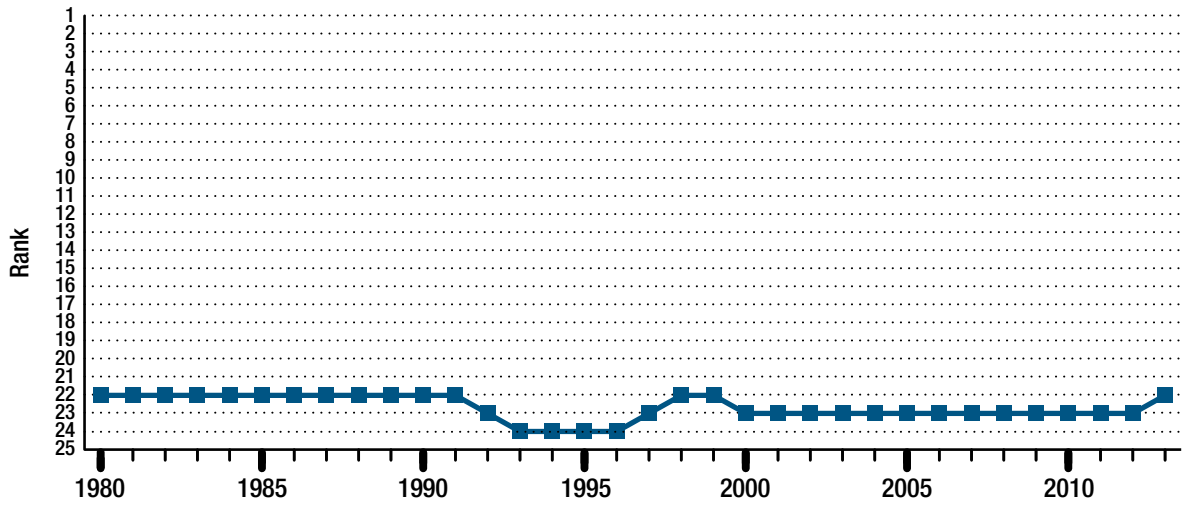
South Korea vs. OECD: Risk Index Scores



South Korea: Risk Variance from OECD



South Korea: Risk Ranking



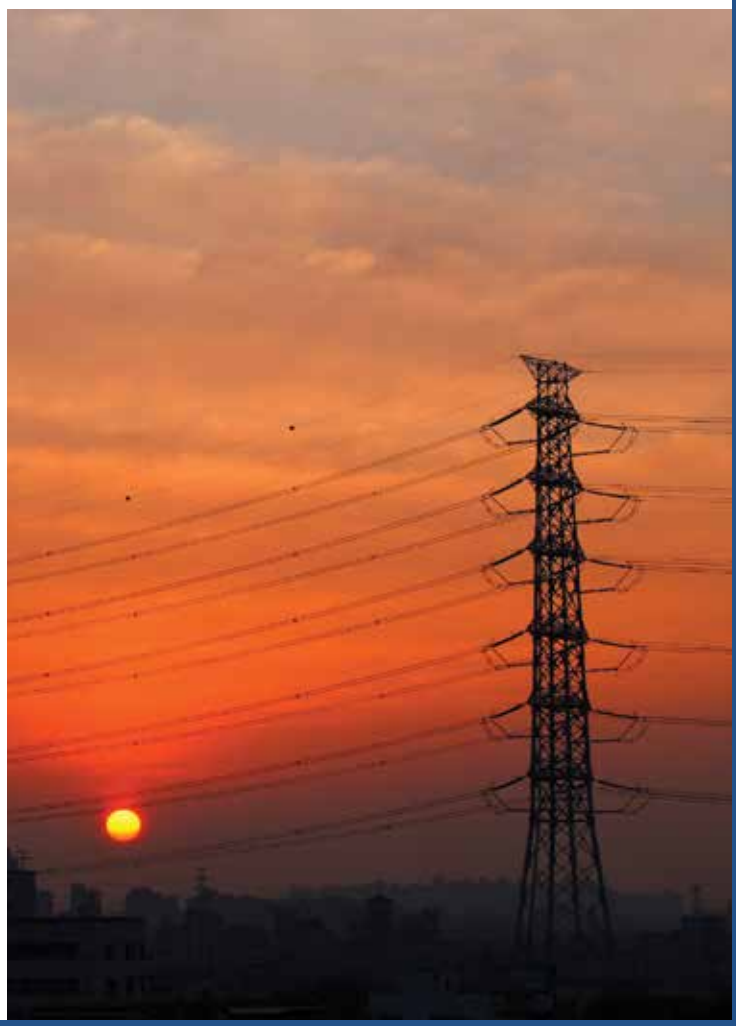
With few indigenous energy resources, South Korea has many energy security challenges. In 2013, its total energy security risk score was fourth from bottom at number 22, an uptick of one place. Its 2013 score of 1,307 was 43% higher than the OECD average. In 2013, it had no country-specific metric scores in the top five for the large energy user group and six in the bottom five, mostly related to import risks.

South Korea is one of the world's largest energy consumers (ninth), and because it has so few domestic energy resources, it is also one of the world's largest energy importers. It produces a negligible amounts of crude oil (a paltry 1,000 barrels per day) and small amounts of coal and natural gas (equivalent only to about 2% of domestic needs). It is the world's second largest importer of LNG behind Japan and third largest coal importer behind Japan and China.

As a result, all of Korea's import exposure metrics—for oil, natural gas, coal, and total energy—are comparatively quite high. Its 2013 scores for oil, natural gas, total energy imports and for fossil fuel import expenditures are all ranked in the bottom five for the large energy user group. Many South Korean energy companies, both state-owned and private, conduct exploration and production operations overseas to mitigate these risks.

Korea's power sector is fairly diverse, with risk measures of power sector diversity and non-carbon emitting generation being comparable to the OECD average. About 42% of electricity generation is from coal, 30% from nuclear, and 23% from natural gas. Since 1980, the country has added about 17 gigawatts of nuclear capacity, and its 20 nuclear reactors account for about one-fifth of total generating capacity. The replacement of large amounts of natural gas-fired capacity with nuclear capacity from 1985 to 1990 led to a sharp drop in Korea's natural gas exposure risk, which led to a large drop in overall risk. Greater imports of coal for power generation in the subsequent five years, however, offset much of the reduction in risk brought about by lower gas imports. Given the high level of imports, it is surprising that Korea's score for average retail electricity rate is better than for all but six countries in the large energy user group. The extensive use of coal and nuclear power generation, however, have help offset growing generation from high-priced natural gas.

South Korea's intensity measures—covering total energy, petroleum, transportation energy, and carbon dioxide emissions—are higher than their OECD averages, and the trends for many of these since 1980 indicate no improvement, and in some cases a worsening, relative to the OECD baseline. Many countries with little or no domestic resources have improved energy efficiency as a way to moderate import risks (Japan or Spain, for example). Korea still has great room for improvement in these areas and should do much better as its economy continues to develop. South Korea's per capita measures of energy use, transportation energy use, and carbon dioxide emissions, which once were quite a bit better than the OECD average, have worsened relative to the OECD baseline over the past decade or so. And as one would expect, carbon dioxide emissions are growing along with the economy.

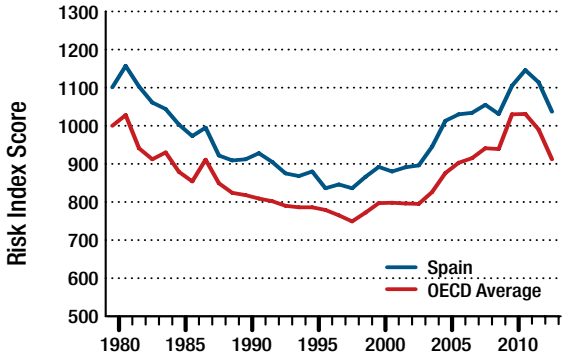


SPAIN

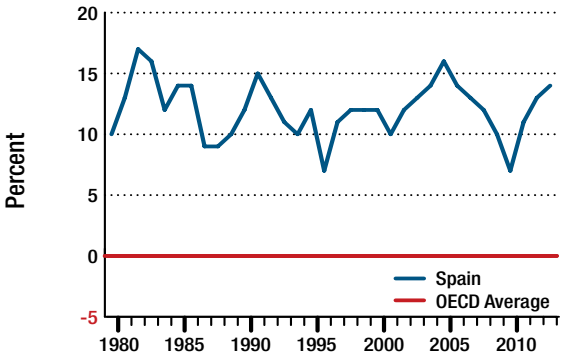
Energy Security Risk Summary: Spain

Risk Scores:	
2013 Energy Security Risk Score	1,037
2013 Large Energy User Group Rank	12
Score in Previous Year	1,114
Rank in Previous Year	12
Score in 1980	1,101
Average Score: 1980-2013	973
Best Energy Security Risk Score	836 (1996)
Worst Energy Security Risk Score	1,157 (1981)
Risk Scores Relative to OECD Average:	
Average Annual Difference 1980-2013	12%
Best Relative Score	7% (1996)
Worst Relative Score	17% (1982)
Country-Specific Metric Ranking—2013:	
Number in Top Five	1
Number in Bottom Five	4

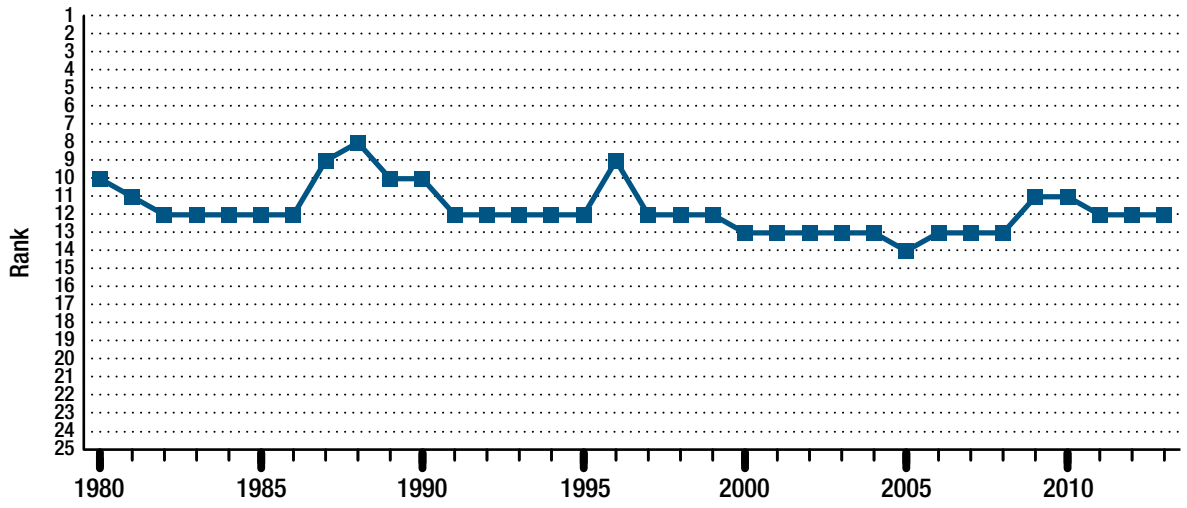
Spain vs. OECD: Risk Index Scores



Spain: Risk Variance from OECD



Spain: Risk Ranking



Spain's overall energy security risk score of 1,037 in 2013 placed it in 12th position in the large energy user group, the same spot it held in 2011 and 2012. Since 1980, Spanish scores have tended to move in lock step with the OECD average, moving within a band roughly 10% to 15% higher. Its 2013 total score is below its 1980 score, but not by much (6%). Spain has just one metric in the top five of the large energy user group in 2013 and four in the bottom five.

Spain produces almost no oil or natural gas and little coal, so it must import large quantities of these fuels to meet domestic demand, which has increased significantly since the early 1990s. Spanish law caps the share of oil or natural gas imported from any single source country as a way to maintain supply diversity. Natural gas imports are largely from Algeria, primarily but not exclusively by pipeline. In 2011, the 280 billion cubic feet capacity Medgaz natural gas pipeline from Beni Saf port in Algeria to Perdigal Beach in Spain was opened. A 425 billion cubic feet Maghreb-Europe pipeline also serves Spain. In addition, Spain has seven LNG facilities. It was once the third largest importer of LNG after Japan and South Korea, but now India, China, and Taiwan also import more.

Although Spain does have a particularly large shale gas resource (about 8 trillion cubic feet), the government is exploring with industry and local communities ways to allow access to this resource, which is located in the north of the country. The fact that Spain has no proved reserves of natural gas, and therefore no real experience regulating a domestic gas drilling, creates a particularly challenging environment.

As a result of its large imports, its fossil fuel import risks are comparatively large, as is the amount it pays for these imports as a share of GDP. Span's country-specific metrics measuring oil, gas, and total import exposure were in the bottom five of the large energy user group in 2013.

The diversity of Spain's electricity sector received the best cores in the large energy user group. In the early 1980s, its chief sources of power were from oil, coal, and hydro. In the mid-1980s, Spain began adding nuclear capacity, and by the end of the decade, it accounted for roughly 16% of capacity. The increasing availability of Algerian gas in the mid to late 1990s also led to construction of gas-fired capacity. Feed-in tariffs also have encouraged renewable builds. Since 2000 non-hydro renewable capacity has climbed from 5% to 25%, most of which is wind (Spain is second only to Germany in installed capacity) and solar. As a result of all this, in 2013, coal, nuclear, natural gas, and renewables each accounted for about 20% to 25% of electricity generation.

While the diversity of Spain's power sector is an asset, its electricity prices are quite high, with the risk score for this metric coming in at number 22 in 2013. Moreover, citing unsustainable cost, the government implemented cuts to renewable subsidies, which are expected to slow renewable capacity additions in the future and even affect existing capacity.

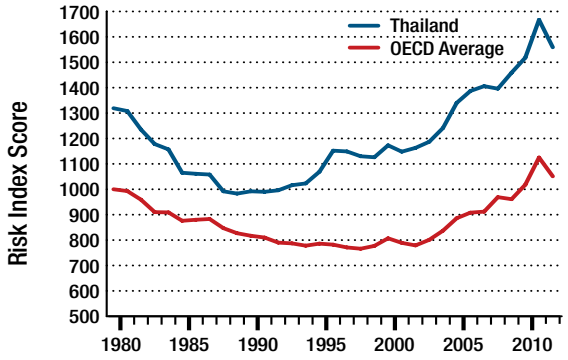
Spain scores relatively well in the energy use risk categories. It has a smaller energy intensity score than the OECD average, and this has helped moderate the impact of rising energy costs. These energy intensity metrics, however, are not improving at the same rate as the OECD average. Meanwhile, its carbon dioxide emissions have grown faster than the OECD average while its emissions intensity and emissions per capita metric scores a little better.

THAILAND

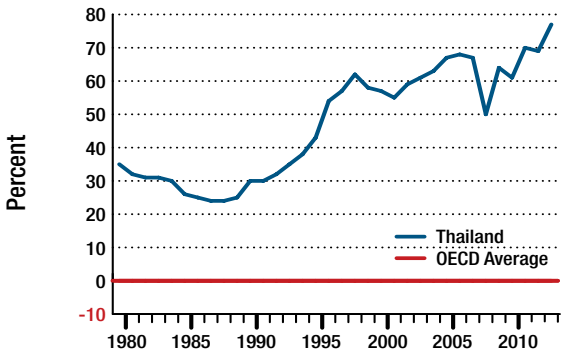
Energy Security Risk Summary: Thailand

Risk Scores:	
2013 Energy Security Risk Score	1,616
2013 Large Energy User Group Rank	24
Score in Previous Year	1,678
Rank in Previous Year	24
Score in 1980	1,347
Average Score: 1980-2013	1,281
Best Energy Security Risk Score	1,033 (1989)
Worst Energy Security Risk Score	1,748 (2011)
Risk Scores Relative to OECD Average:	
Average Annual Difference 1980-2013	47%
Best Relative Score	24% (1988)
Worst Relative Score	77% (2013)
Country-Specific Metric Ranking—2013:	
Number in Top Five	0
Number in Bottom Five	8

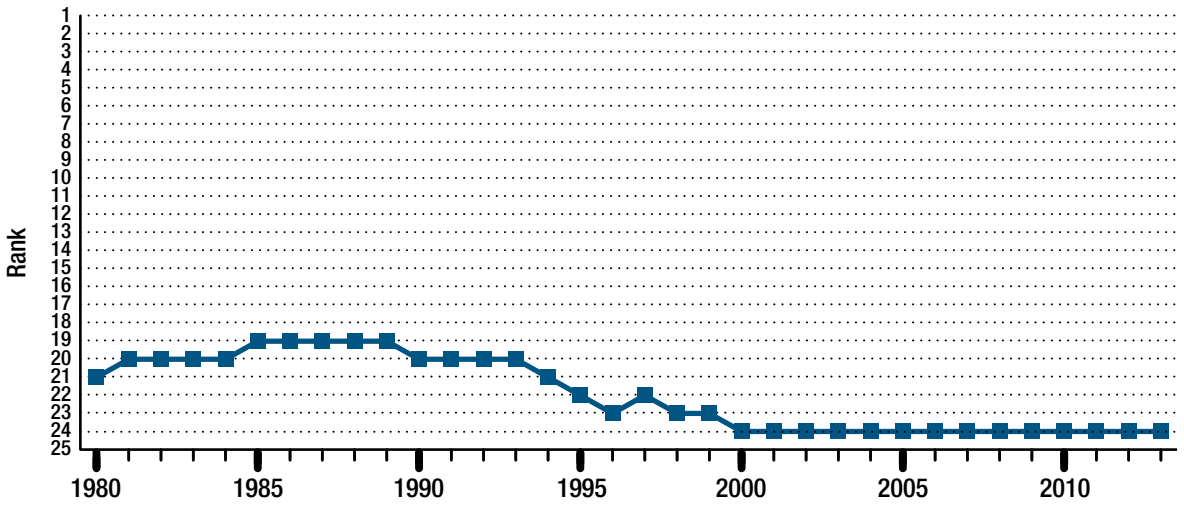
Thailand vs. OECD: Risk Index Scores



Thailand: Risk Variance from OECD



Thailand: Risk Ranking



Except for a five-year period in the second half of the 1980s, Thailand's risk scores consistently have ranked in the bottom five of the large energy user group. Its 2013 score of 1,616 places it second-from-bottom, the same as in the previous 13 years. The trend since late 1980s shows Thailand's energy security risks worsening compared to the OECD average, with its risk score rising from a low of 24% higher than the OECD average in 1988 to 77% higher in 2013. Absolute energy security risks also are moving higher and in 2013 were 269 points (20%) more than in 1980. Taking a look at Thailand's 20 country-specific metrics, it has no scores in the top five and eight in the bottom five, the worst showing of any country in the large energy user group.

Thailand produces around 250,000 barrels per day of crude oil, about one-quarter of the oil it consumes. It the second largest net importer of oil in Southeast Asia after Singapore. The country has eight refineries with a total throughput capacity of 1.2 million barrels per day—only Singapore has more—and it is a net exporter of refined products to other countries in the region, which reduces its overall oil import risk. Thailand also produces about 30,000 barrels per day of liquid biofuels, both ethanol from molasses and cassava feedstock and biodiesel from palm oil primarily.

The country is a relatively large producer of natural gas (21st in the world), almost all of which comes from fields in the Gulf of Thailand. Growing domestic production, however, has not been enough to meet the growth in demand, and in 2000, Thailand became a net importer of this fuel. EIA estimates that technically recoverable reserves of shale gas could add another 5 trillion cubic feet of gas to the country's proved reserves, presently estimated at 9 trillion cubic feet. If exploited successfully, this resource could add significantly to the country's production. Thailand also produces substantial amounts of coal—it is ranked second in Southeast Asia after Indonesia—but has since 2004 relied on imports to supplement domestic production, mainly for industrial purposes.

IEA's forecast for Southeast Asia suggests that imports of oil and natural gas could both approach, if not exceed, 90% of domestic demand by 2035, which would raise Thailand's import risks. The country also spends a much higher amount on imported fuels as a share of GDP than other countries in the large energy user group—it is ranked 24th for this metric—and this IEA forecast suggests this trend could be exacerbated further.

In 2013, about 90% of Thailand's electricity generating capacity was conventional thermal. Oil capacity has been largely replaced by natural gas-fired capacity, which is responsible for about 70% of the country's electricity generation. Coal-fired plants account for another 22% of generation, with the most of the remainder coming from hydroelectric capacity and biomass and biogas. Oil-fired plants, which decades ago accounted for nearly 70% of total generation, have been all but phased out.

Because the country's natural gas supplies are limited, IEA expects that coal's share of power production will rise to 36% by 2035. The government also is considering adding some nuclear capacity as a way to diversify its power sector, but after the Fukushima incident, plans have been scaled back, from 5 gigawatts to 2 gigawatts by the mid-2020s. Feed-in tariffs also are being used to promote renewables. The cost of electricity is one of the few areas where Thailand appears to compare favorably with its large energy user group peers, but the data are not as robust as one would like.

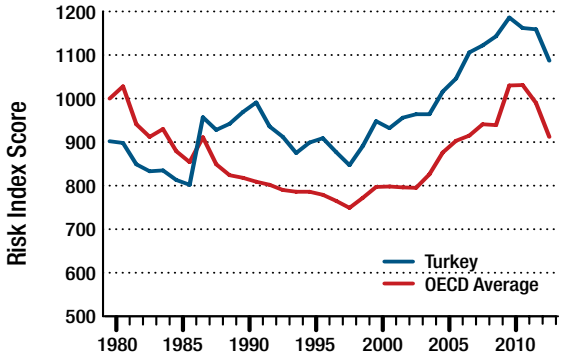
Thailand's 2013 scores for the three energy intensity risk metrics—total energy, oil, and transportation energy—are all ranked in the bottom five of the large energy user group, while its carbon dioxide intensity score is ranked sixth from the bottom. Although the metrics measuring energy use and emissions per person compare favorably to other countries in the group, this edge is sure to shrink as greater prosperity takes hold, a pattern other emerging economies show.

TURKEY

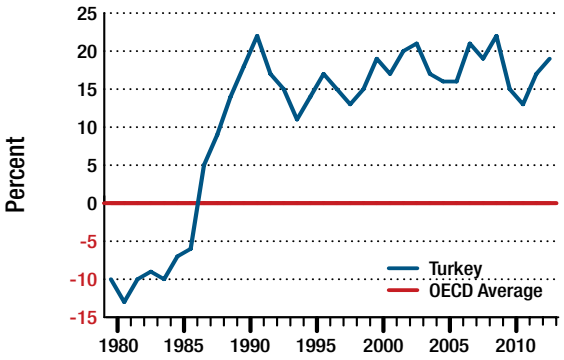
Energy Security Risk Summary: Turkey

Risk Scores:	
2013 Energy Security Risk Score	1,087
2013 Large Energy User Group Rank	14
Score in Previous Year	1,159
Rank in Previous Year	14
Score in 1980	902
Average Score: 1980-2013	961
Best Energy Security Risk Score	802 (1986)
Worst Energy Security Risk Score	1,186 (2010)
Risk Scores Relative to OECD Average:	
Average Annual Difference 1980-2013	11%
Best Relative Score	-13% (1981)
Worst Relative Score	22% (1991)
Country-Specific Metric Ranking—2013:	
Number in Top Five	4
Number in Bottom Five	2

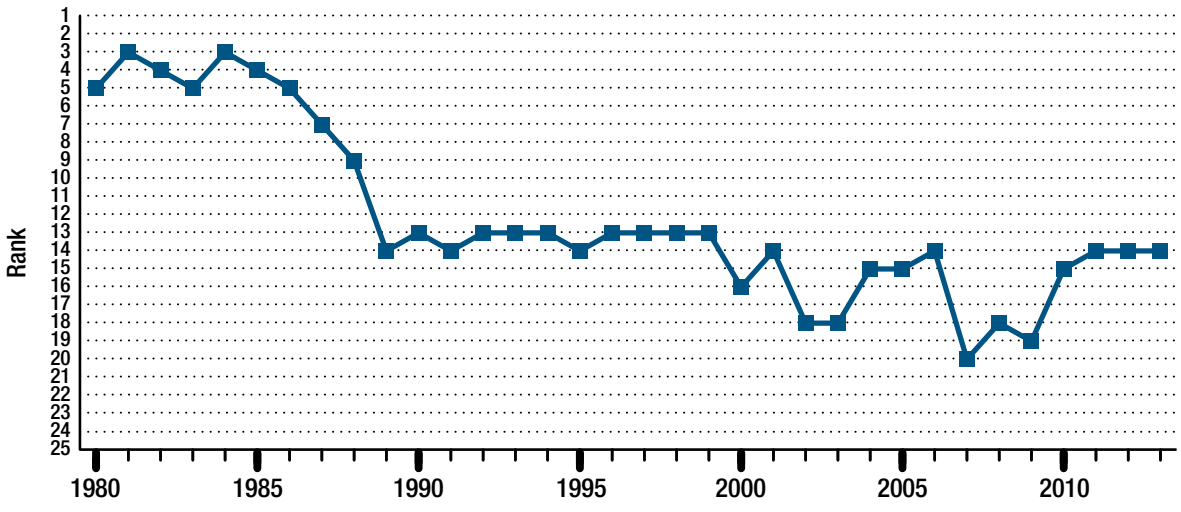
Turkey vs. OECD: Risk Index Scores



Turkey: Risk Variance from OECD



Turkey: Risk Ranking



Turkey's overall energy security risk score of 1,087 in 2013 puts it in the middle of the pack at number 14 in the large energy user group ranking, unmoved from 2012 and 2011. At the beginning of the time period the International Index covers, Turkey had some of the best scores in the group, with total energy security rankings that were in the top five and that averaged about 9% below the OECD average. In 1987, however, Turkey's score jumped 155 points, from 802 to 957 owing to a sharp increase in risk related to natural gas imports needed to supply new gas-fired power stations. Since then, its scores have stabilized somewhat against the OECD, averaging about 16% higher than this benchmark. Turkey's score in 2013 also was quite a bit more (20%) than its 1980 score, meaning its energy security has gotten worse both absolutely and relative to the OECD. Of the 20 country-specific metrics, Turkey has four scores in the top five and two scores in the bottom five of the large energy user group.

Turkey is positioned as a strategic crossroads for energy. It not only is a major transit point for the ocean-going oil trade, but the pipelines that crisscross the country are increasingly important in the movement of oil and natural gas from the Caspian region to Europe.

Turkey has only modest amounts of oil and natural gas, and it is the world's twelfth largest coal producer. Production of these fuels, however, is not enough to satisfy domestic demand. Turkey has been a net importer of oil and coal since before 1980. Since 1990, coal imports have increased significantly. The country became a net importer of natural gas in 1987, mainly for use in the power sector. In 2013, Turkish production provides about 10% of its crude oil supply, 1% of its natural gas supply, and 70% of its coal supply. It is not surprising, then, that Turkey's import exposure risks stack up poorly against the OECD averages for these fuels, especially for natural gas. Only Spain and France have higher risks associated with natural gas imports than Turkey.

EIA reports that Turkey could have as much as 24 trillion cubic feet of technically recoverable shale gas that if realized would represent a dramatic increase over the current and very small reserve estimate of about 0.2 trillion cubic feet. Turkey also is looking at potentially large reserves of natural gas offshore. In addition, EIA estimates Turkey holds 4.7 billion barrels of technically recoverable shale oil (compared to existing proved reserves of 270 million barrels).

Turkey has a fairly diverse electricity power sector compared to its peers in the large energy user group. Generating capacity in Turkey's power sector is divided between conventional thermal capacity (about two-thirds of the total) and hydroelectric capacity (about one-third). Natural gas-fired facilities account for about 45% of Turkey's electricity production, coal nearly 30%, and hydroelectric about 25%. Turkey has no nuclear reactors, but the government has said its goal is to build 20 reactors by 2030 to reduce Turkey's natural gas and oil imports. Once a big advantage, retail electricity prices in Turkey have been trending worse than the OECD average since the late 1990s.

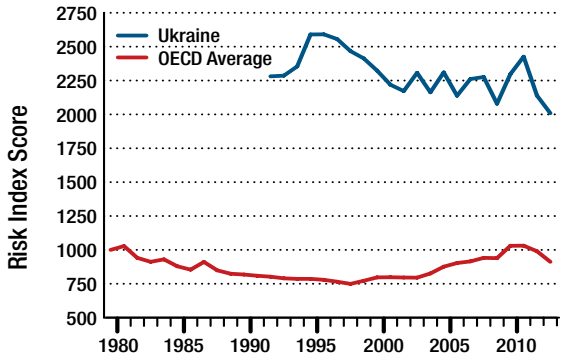
As one would expect to see in a rapidly growing emerging economy, the various energy intensity and carbon dioxide emissions measures also are worse than their corresponding OECD averages. Unlike a lot of other emerging economies, however, these metrics do not appear to be improving vis-à-vis the OECD baseline. Moreover, even those aspects of Turkey's energy security that are relatively better than the OECD average are moving in the wrong direction. Per capita energy and carbon dioxide emissions all have been below the OECD average for all, or a good portion of, the period since 1980, but over the years these advantages relative to the OECD baseline have eroded.

UKRAINE

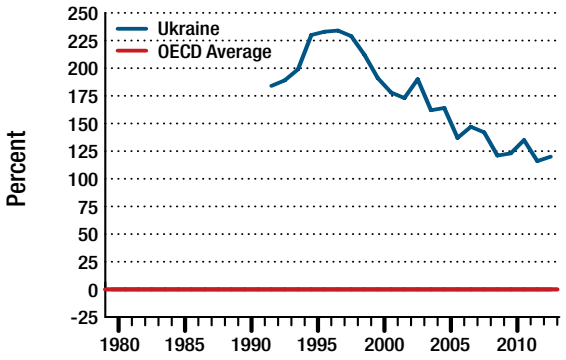
Energy Security Risk Summary: Ukraine

Risk Scores:	
2013 Energy Security Risk Score	2,009
2013 Large Energy User Group Rank	25
Score in Previous Year	2,139
Rank in Previous Year	25
Score in 1980	2,281
Average Score: 1980-2013	2,303
Best Energy Security Risk Score	2,009 (2013)
Worst Energy Security Risk Score	2,591 (1996)
Risk Scores Relative to OECD Average:	
Average Annual Difference 1980-2013	173%
Best Relative Score	116% (2012)
Worst Relative Score	234% (1997)
Country-Specific Metric Ranking—2013:	
Number in Top Five	1
Number in Bottom Five	7

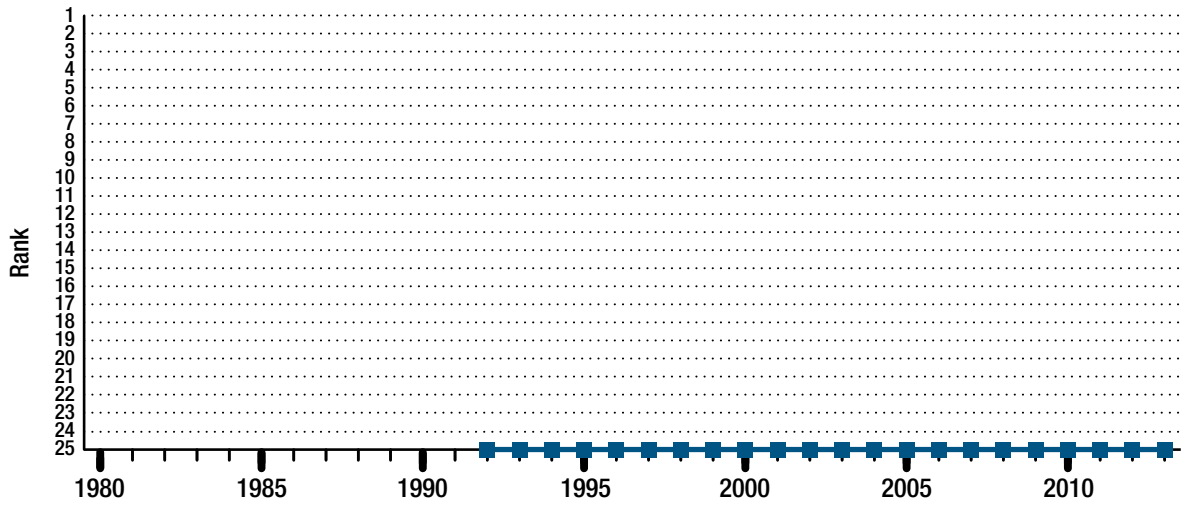
Ukraine vs. OECD: Risk Index Scores



Ukraine: Risk Variance from OECD



Ukraine: Risk Ranking



Data for the Ukraine begins in 1992. Since then, the country consistently has had the worst energy security index scores of any country in the large energy user group, and is currently facing major tumult. Its scores over the 1980-2013 period averaged 173% higher than those for the OECD. Unlike nearly all the other countries in the group, however, Ukraine's overall risk has been trending downward. From its 1996 peak of 2,591—233% above the OECD average—the country's total risk score fell to 2,009 in 2013. That is still 120% above the OECD average, but a considerable improvement nonetheless.

The Ukraine produces oil, natural gas, and coal, though not enough of any of these fuels to be self-sufficient, and its import risks for everything except coal have been higher than the OECD average for most of the period since 1992. As a result, the country's expenditure of fossil fuels imports as a share of GDP have over the years been much higher than the OECD average. Nevertheless, most of Ukraine's import metrics (again, except for coal), have shown improvement over the last 10 years.

Its position between Russia and Europe makes Ukraine an import transit country for natural gas and crude oil produced in Russia. Russia is also the main source of energy imported into Ukraine, so diversification of suppliers is an important goal for Ukraine.

Like many other countries in Eastern Europe, Ukraine uses a large amount of natural gas for residential heating and industrial purposes. Natural gas accounts for about 40% of total primary energy demand, but the country produces a little more than a third of what it needs. Whatever else is needed to meet demand comes from Russia. Oil plays a relatively small roll in Ukraine's energy mix.

The country has plentiful domestic supplies of coal, which is the second largest source of energy in the country. It ranks seventh in the world in reserves and 13th in production. While self-sufficient in thermal coal, it must import metallurgical coal. Coal mining in Ukraine, however, is very inefficient and largely unprofitable. Nearly 70% of mines are state-run. A 2012 law will open up the country's coal sector to private investors, and 45 coal mines are slated for privatization in hopes that coal production can be increased.

The Russian annexation of Crimea in 2014 and its support of anti-government rebels in eastern Ukraine, where there are large coal deposits, are sure to disrupt these plans and have a big impact on Ukraine's overall risk score in 2014 and possibly beyond. Several mines in the eastern section of the country were closed in 2014 because of the fighting. This has reportedly led to a steep drop in coal output and a jump in imports of thermal coal from South Africa and Russia. Moreover, so nuclear reactors also have been shut down. Ukraine's low rank underscores how energy vulnerabilities can create geopolitical vulnerabilities during a political crisis like it is now experiencing.

The Ukraine's power sector is quite diverse. It is one of the few countries with capacity diversity scores better than the OECD average (though only marginally). Roughly 70% of it generating capacity is thermal (coal, natural gas, and oil), and most of the remainder is nuclear with a little bit of hydroelectric. Nearly half of its power output is from its fleet of 15 nuclear reactors, about 40% from coal, and less than 10% from natural gas. To ease its natural gas supply crunch, Ukraine has been switching power stations from natural gas to coal. Retail electricity prices rank in the middle of the large energy user group.

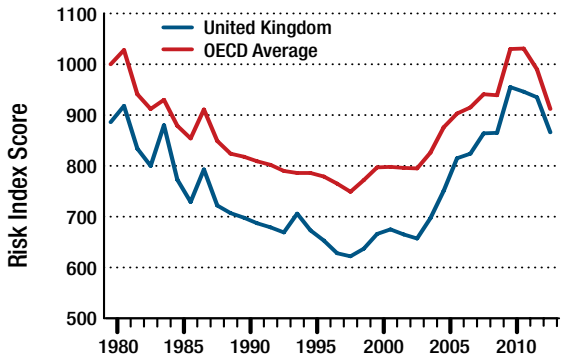
The Ukraine's energy, transportation energy, oil, and carbon intensity scores are the weakest among the large energy user group. It is obvious the country has a great deal of ground to make up in these areas. Nevertheless, even in these measures the country is making progress absolutely and against the OECD baseline. As an economy in transition, it is not surprising that its energy use and emissions per capita measures are better than the OECD's, and these appear to be changing at about the same rate as the OECD.

UNITED KINGDOM

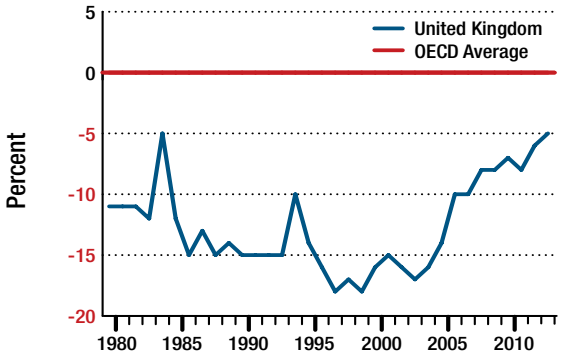
Energy Security Risk Summary: United Kingdom

Risk Scores:	
2013 Energy Security Risk Score	866
2013 Large Energy User Group Rank	5
Score in Previous Year	935
Rank in Previous Year	5
Score in 1980	886
Average Score: 1980-2013	761
Best Energy Security Risk Score	622 (1998)
Worst Energy Security Risk Score	955 (2010)
Risk Scores Relative to OECD Average:	
Average Annual Difference 1980-2013	-13%
Best Relative Score	-18% (1997)
Worst Relative Score	-5% (2013)
Country-Specific Metric Ranking—2013:	
Number in Top Five	6
Number in Bottom Five	0

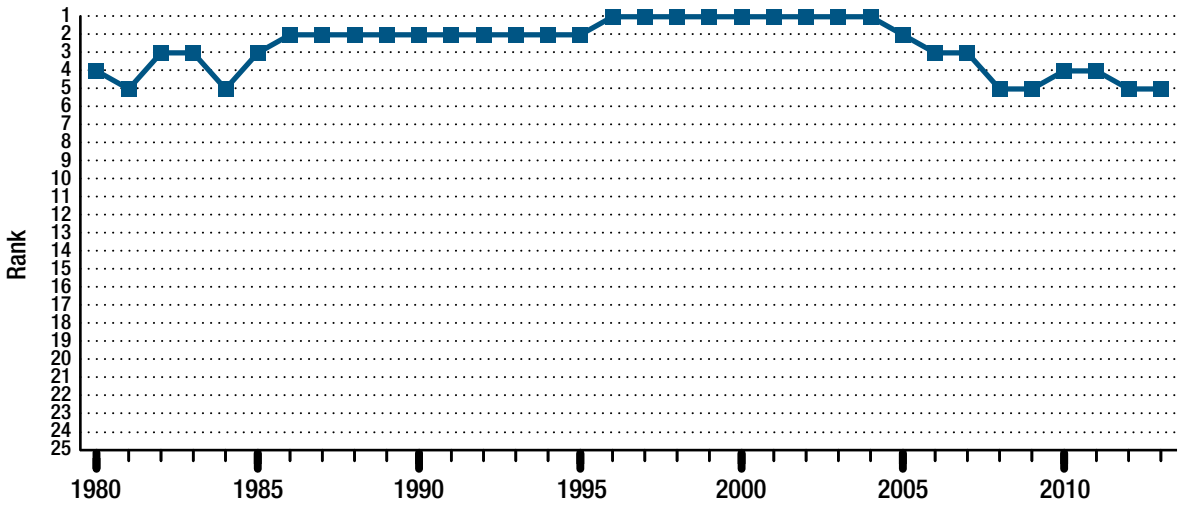
United Kingdom vs. OECD: Risk Index Scores



United Kingdom: Risk Variance from OECD



United Kingdom: Risk Ranking



The United Kingdom's total risk scores from 1980 to 2013 have all ranked in the top five of the large energy user group, even rising to the top spot from 1996 to 2004. Since the mid-2000s, however, the UK been losing ground, sliding from number one in 2004 to number five in 2013. Its 2013 score of 866 was 5% better than the OECD average score of 935. The UK still scores well in many areas. Its scores on seven of the 20 country-specific metrics are in the top five, and none in the bottom five.

The UK is Europe's second largest producer of crude oil, and third largest producer of natural gas. The UK also was at one time a major coal producer. Nevertheless, the UK. It has long been a net importer of gas, and started to import large quantities of coal in 1984 (the year of a major coal strike in the UK) and oil in 1994.

From 245,000 barrels per day in 1976, UK oil production peaked at nearly 2.7 million barrels per day in 1999. Beginning in 2006, the UK became a net importer of oil (crude oil plus refined products) because of declining North Sea output. In 2013, UK crude oil production was at just 30% of its 1999 peak. A net exporter of natural gas from 1997 to 2003, in 2004 it became a net importer and by 2020 is forecast to import more than two thirds of its supply, making the UK more susceptible to disruptions.

The UK is well poised to take advantage of a sizeable shale gas resource that EIA estimates may contain as much as 26 trillion cubic feet of natural gas, nearly three times the estimated proved figure of 9 trillion cubic feet. The British Geological Survey came up with an even larger assessment of the potential shale gas resource in central Britain, pegging it at between 882 to 2,281 trillion cubic feet. If, as industry estimates suggest, 10% of this resources could be tapped, that would provide the UK with enough gas to last 50 years at the current rate of consumption.

Hydraulic fracturing has been used to increase output from wells in the North Sea since the mid-1960s and in onshore wells. The national government supports hydraulic fracturing to develop England's large shale resource (the practice is banned in Scotland and Wales). The Infrastructure Bill passed in early 2015 will simplify rules for access onshore reserves greater than 300 meters underground.

One reason for the country's recent flip to a net importer of natural gas has been the UK's "dash to gas" in the power sector. From virtually none in the mid-1980s, natural gas produced about 45% of the UK's electric power in 2011, while coal's share plunged from roughly 70% to less than 30%. This trend has reversed over the past two years, however, as the very high price of natural gas and the availability of inexpensive coal from the United States and other countries caused utilities to switch back to coal. In 2013, natural gas fueled about 28% of electricity generation and coal about 40%. This move back to coal could continue if natural gas prices remain high.

Coal production in 2013 was just 12% the level in 1980, so to meet demand, UK imports large quantities of coal and has been doing so since 1984, the year of the UK coal miners trike. UK coal production from 1983 to 1984 dropped 57%—which shows up as a large upward spike in the UK's risk index in 1984—and production since has never reached pre-strike levels.

The UK has a fairly diverse electric power sector. Natural gas and coal accounted for nearly 70% of generation in 2013, in addition to which the UK's 22 megawatts of nuclear capacity contributed around 20% and renewables about 10%.The UK has a rich offshore wind resource, and wind accounts for most of the renewable capacity. The country also is converting three of six boilers at its largest coal-fired power station to biomass. The nearly 4 gigawatt Drax power plant switched over one boiler to wood pellets in 2013, with the second unit scheduled for conversion in 2014 and the third in 2017.

The shrinking of capacity margins caused by recent closures of large coal and older natural gas plants noted in last year's edition remains an issue. This concern is especially acute in the winter months, when the electricity system is expected to reach 95% capacity, a situation that could lead to blackouts. These developments have contributed to the country's very high electricity rates. This may become an even larger concern in the future as more and more affordable base load capacity is retired and more expensive power generation sources, such as offshore wind, are added to the system.

The UK uses energy very efficiently. Its scores for energy expenditure, energy use, transportation energy use, petroleum, and carbon dioxide emissions intensity are all ranked in the top five of the large energy user group.

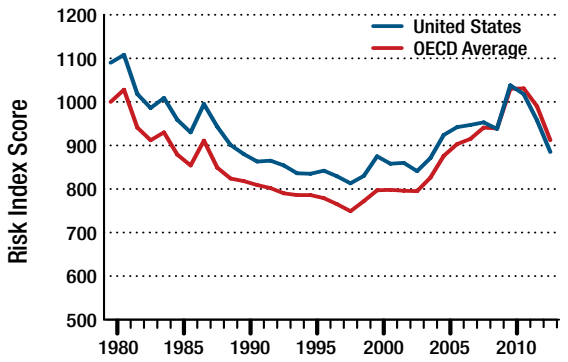
UNITED STATES

Energy Security Risk Summary: United States

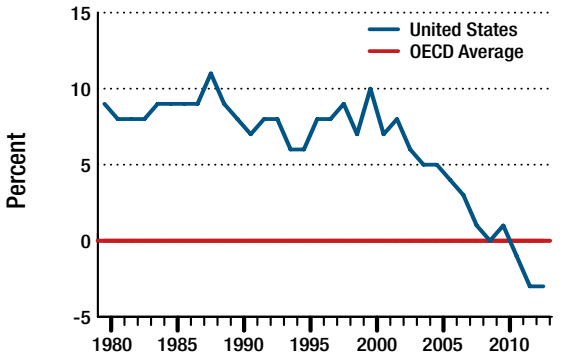
Risk Scores:	
2013 Energy Security Risk Score	885
2013 Large Energy User Group Rank	6
Score in Previous Year	958
Rank in Previous Year	6
Score in 1980	1,090
Average Score: 1980-2013	920
Best Energy Security Risk Score	813 (1998)
Worst Energy Security Risk Score	1,108 (1981)
Risk Scores Relative to OECD Average:	
Average Annual Difference 1980-2013	6%
Best Relative Score	-3% (2012)
Worst Relative Score	11% (1988)
Country-Specific Metric Ranking—2013:	
Number in Top Five	6
Number in Bottom Five	4

Note: It should be emphasized that the index data presented here and the index data presented in the Energy Institute's U.S. Index 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.

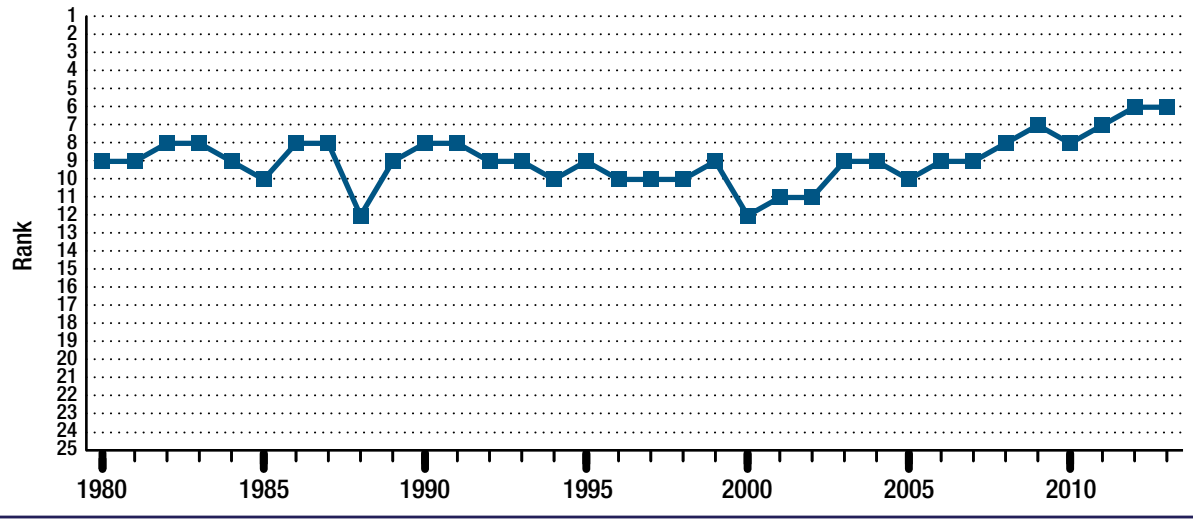
United States vs. OECD: Risk Index Scores



United States: Risk Variance from OECD



United States: Risk Ranking



Since 2000, the United States has improved its energy security relative to the OECD average, going from a total score 10% greater than to 3% less than the OECD average. Over the same period, its rank rose from 12 to 6. This vastly improved U.S. position in reference to its peers is due primarily to the huge increase in unconventional oil and natural gas production from shale formations. The United States is one of 16 countries with a 2013 risk score lower than its 1980 score (205 points, or 19%, lower). Of the 20 country-specific metrics, the U.S. ranks in the top five for six of them (related to import risks and energy expenditures and prices) and the bottom five for four of them (all related to per capita energy use).

The United States is the world's largest economy, third most populous country, and second largest energy consumer. In addition to being a very large energy user, it is also a very large energy producer, with an abundance of energy resources of all kinds. According to CRS, U.S. fossil fuel reserves of 971 billion barrels of oil equivalent are larger than the reserves in any other country—only Russia even comes close—accounting for 17% of the world's total. Coal is the dominant fuel, accounting for more than 90% of all U.S. reserves on an oil equivalent basis. CRS estimates, however, than an additional 396 billion barrels of oil equivalent of undiscovered cruel oil and natural gas also might be available in the future, the largest figure for any country in the world.

The United States is largely self-reliant in energy, with oil being the only real exception. In 2013, it was the world's third largest producer of crude oil (after Russia and Saudi Arabia), the largest producer of natural gas, and the second largest producer of coal (after China).

Even though the U.S. has been a net importer of natural gas for many years, its scores have tended to be quite low compared to other net importing countries in the large energy user group because it does produce large volumes domestically. With the widespread adoption of hydraulic fracturing, horizontal drilling, and advanced seismic imaging technologies to shale formations beginning in the mid-2000s, U.S. industry began unlocking large volumes of natural gas from shale formations that were more than enough to offset declines in conventional production. By 2013, marketed natural gas output was 36% higher than in 2005. Over the same period, U.S. import risks for this fuel decreased rapidly and now approach "0."

It did not take long e for these same technologies to be used to pry liquids from shale formations, too. Declining domestic oil production and rising imports as a share of demand were perennial concern in the United States, with the country being by far the world's largest importer of crude oil. Over the past few years, there has been a stunning reverse in the downward trend in domestic oil production. Since 2011, output has jumped 1.8 million barrels per day to 7.4 million barrels per day in 2013, with most of the increase coming from production in the Bakken Shale formation in North Dakota and the Eagle Ford Shale and Permian Basin in Texas. Moreover, since 2009 the United States has been a net exporter in refined petroleum products. Much of the oil being drawn from shale formations is light sweet crude, yet U.S. refineries, especially those along the Gulf coast, are geared to process heavy sour crude, creating a mismatch. Because of this, there is increasing support for the idea of allowing crude oil exports for the first time since a ban was put in place shortly after the Arab oil embargo of 1973.

In addition to these trends, the United States is self-sufficient in coal. With proved reserves enough to last more than 250 years at the current rate of consumption, coal is particularly important as a reliable fuel for base load power generation and contributes to low-cost electricity. The United States also is a net exporter of coal, and exports of coal also are expected to increase. It is important that regulators ensure that port facilities are able to accommodate higher coal exports, which contributes to lowering the global supply risks for this fuel.

These developments have improved U.S. energy security relative to its peers in the large energy user group. U.S. oil, gas, and coal import risks tend to be much lower than the OECD baseline average and are improving. Greater domestic production also has lowered the risks associated with energy import expenditures as a share of the economy.

The diversity of the U.S. power sector is about average for the OECD. Thermal capacity—mostly fired by coal (40%) and natural gas (55%), with very little oil—accounted for about 75% of total capacity in 2013, with

nuclear accounting for 10%, hydroelectric close to 8%, and non-hydro renewables about 5%.

Despite an avalanche of regulations and price pressure, coal was the top electricity producer in 2013, generating 38% of total electricity, followed by natural gas (30%) and nuclear (19%). This situation could change appreciably in the coming years. EPA's proposed greenhouse gas regulations for existing sources would replace substitute generation from coal plants with greater generation from natural gas-combined cycle plants and renewables, and its standards for new plants would essentially prevent any new coal plants from being built unless equipped with carbon capture and storage technology, a technology not commercially available yet (though this requirement may change in the final rule). These developments could have potentially devastating consequences for U.S. power sector diversity and energy security. Anticipated EPA rules covering existing power plants will compound these concerns.

Nuclear power also faces challenges. Domestically, five new reactors are under construction—one in Tennessee (construction was suspended in 1988 but revived in 2007) and two each in Georgia and South Carolina—with start-up planned for 2015. The outlook for additional new builds, however, is not auspicious, especially in deregulated markets. The recent natural gas glut has pushed prices for that fuel to sustained lows and has clearly impacted utilities' decisions to invest in new reactors. Many Public Utility Commissions are unable or unwilling to shoulder the tremendous front-loaded cost of financing new construction when costs benefits are not realized for years or decades down the road. Uncertainty about nuclear waste policy also hangs over the nuclear industry. As a result of renewable portfolio standards in many states, renewable capacity is expected to grow rapidly. Wind facilities will benefit from the recent extension of a production tax credit.

Set against its peers, the U.S. also has comparatively lower energy costs, both in terms of energy costs per dollar of GDP and retail electricity rates, and this advantage appears to be growing. Its energy expenditure intensity and retail electricity prices both score in the top five of the large energy user group for 2013. There are many reasons for this, but the shale gas revolution certainly has played a role. Surging output has caused the link between the price of crude oil and natural gas to be severed in the United States, and the price of natural gas, unlike in the rest of the world, is set entirely based on supply and demand fundamentals. As a result, the cost of natural gas in the United States is two to four times less than it is in many OECD countries. The availability of affordable, abundant coal supplies is another factor keeping costs low, though rules targeting coal plants could see the United States losing ground here.

The United States uses more energy per person than all but two countries—Canada and Norway—in the large energy user group, and its per capita emissions of carbon dioxide also are considerably higher than other countries in the group. These three metrics represent the largest source of risk for the United States compared to the OECD average. All three of these risks, however, have shown rapid improvement relative to the OECD baseline over the last decade.

The United States also uses generally more energy in the economy at large and in the transportation sector to produce a dollar of GDP, than the OCD average, but the differences are not all that large. The same goes for carbon dioxide intensity. Since 2000, each of these metrics has been improving at about the same rate as the OECD average. New efficiency standards for appliances and vehicles may accelerate the improvement seen in these areas.

Appendix 1: Methodology Used to Develop the Index of U.S. Energy Security Risk

Introduction

In an increasingly interconnected world, where the risks faced by other nations affect our risks as well, a well-designed index covering many countries can improve our understanding of global energy security risks. Many aspects of U.S. energy security are by their very nature global. Recent years have seen global energy markets facing unprecedented challenges as well as opportunities. In previous decades, when the U.S. comprised a bigger share of global energy production and consumption, our policies and actions had a bigger impact on global markets. Increasingly, however, geopolitical risks are imposed upon us rather than set by us.

Energy is a fundamental prerequisite of growth and development around the world, and despite the global financial crisis, energy demand has been steadily growing, especially in the large emerging economies of China, India, and Brazil. In large part, energy security is complicated because key energy resources are geopolitically concentrated. Most of the world's oil and gas reserves are found in a handful of countries, several of which are in political turmoil and/or not especially friendly to U.S. interests. Further, there is relatively little overlap between those countries that are the leading energy resource countries and those that are the major energy consuming countries. Reliance on international trade is large, growing, and vulnerable to disruptions. For these global commodities, events anywhere can affect supply and prices everywhere, even for self-sufficient countries. Energy security risks, therefore, pose challenges to all countries—some are common challenges while others are more country-specific.

An enhanced understanding of energy security in other countries can deepen our insight into that of the U.S. Through the development of these metrics, we can observe not only absolute trends of interest, but to also see relative movement among and across countries. In a global marketplace, both matter. Communicating these energy security risks to an international audience helps the U.S. as well. Many of the benefits of improved technologies, greater energy efficiency, or democratic reforms anywhere can create energy security benefits everywhere.

Basic Approach to the International Index

The International Index of Energy Security Risk is designed to allow comparisons of energy security risks across countries and country groups, and how these risks change over time. The International Index measures energy security risks in two ways: (1) in absolute terms; and (2) relative to a baseline average of the OECD countries.

The methods used to develop it build off much of the work and concepts used in developing the Energy Institute's Index of U.S. Energy Security Risk® (U.S. Index). The task of boiling down U.S. energy security risks to a single number posed many analytical challenges. The U.S. Index was constructed from a foundation of 37 metrics measuring broad aspects of energy security. The U.S. Index uses historical and forecast data from EIA.

The idea of extending the methodology used in the U.S. Index to other countries proved to be a difficult task, especially when it came to data availability. Accordingly, in developing the International Index, the measures and methodology developed for the U.S. Index had to be adapted.

The United States has a comparative wealth of richly detailed and comprehensive data covering long time spans. The available international databases, however, are something of a mixed bag, and even at their best, they are not as complete and consistent as those we have for the United States. The data typically do not have the historical coverage we have in the United States, and often there are gaps. Data on energy

prices and expenditures show gaps in coverage, particularly for non-OECD countries.

Further, whereas the United States has a detailed forecasting system extending decades into the future and dovetails well with historical data, the international forecasts necessarily entail aggregations that prevent the goal of country-by-country analysis.

Data Criteria and Sources

Data limitations make it necessary to strike a balance between the theoretically ideal and the realistically possible. Not every risk metric can be measured with solid data, but that does not mean that less-than-perfect data cannot be used provided its usefulness and limitations are well understood. Even data we commonly view as reliable—U.S. employment, inflation rates, GDP, etc.—are themselves developed from samples and extrapolations, and are best thought of as estimates rather than complete compilations. These issues are magnified when dealing with international data. The approach adopted to develop the International Index was, therefore, not to let the perfect be the enemy of the good.

One of the first tasks in developing the International Index was ensuring that the data being used were useful analytically and would be considered reliable by users of the Index. Before selecting the data, we established criteria to ensure the data used possessed several important characteristics. The criteria settled on are listed in table A1-1:

The primary data source for the International Index is the EIA's International Energy Statistics database, which is in turn compiled from hundreds of documents and data sources. Other key data come from organizations such as the World Bank, IEA, OECD, and others. EIA's database reflects its efforts to compile and curate many disparate sources of information.[13]

Where feasible, data from EIA were preferred over other those from other sources. This allowed for greater consistency in data collection, definitions, country names and changes, *etc.* Where circumstances warranted, EIA's source documents or other sources of information were employed. In particular, energy price data from IEA, transportation and power generation data from the World Bank, and refinery utilization data from British Petroleum were used.

Table A1-1. Data Criteria used for International Index

Sensible	The data must relate to commonsense expectations.
Credible	The data must be well-recognized and authoritative.
Accessible	The data must be readily available to the public.
Transparent	Data derivations and manipulations must be clear.
Complete	The data must have a record extending back in history for a reasonable amount of time (in this case back to 1980)
Updatable	The historical data must be revised each year so that changes over time can be measured.

Another important data series not presented in the EIA database but nonetheless conceptually vital to the International Index is a country-by-country measure of freedom over time. Several metrics related to global reserves and production and imports take into consideration the "freedom" and the diversity of global fuel supplies. Freedom House, an independent nongovernmental organization, has developed composite indices for political rights and civil liberties that when averaged comprise a measure freedom for over 190 countries. The presumption is that countries exhibiting the greatest degree of political rights and civil liberties are more likely to be politically stable and reliable trading partners and are less likely to join cartels or use oil supplies to achieve geopolitical aims. Hence, by weighting each country's reserves or production of oil, natural gas, and coal by its respective Freedom House weighting, we can develop an aggregate global Freedom-weighted metric that provides a proxy for reliability and that can be tracked over time.

Time Dimensions and Geographic Coverage of Metrics

The data limitations discussed above compelled a starting date of 1980, more than sufficient for the purposes of the International Index. Further, because forecast data are not available at the desired level of detail, the series ends in the most recent year for which data are available.

EIA, IEA, the World Bank, and other sources provide comprehensive, country-by-country information on many measures of energy production, energy consumption, population, GDP, carbon dioxide emissions, and other energy-related measures. Accordingly, for a wide range of energy security risk metrics, time series were developed for all individual countries as well as groups of countries such as the OECD nations. The International Index incorporates the risk index scores for all of the countries globally.

However, differences in geographic coverage also shape the limits of what is possible. Particularly for some of the smaller and/or developing nations, the data are less complete, and it became necessary to develop neutral proxy assumptions and methods for filling in gaps in the historical record. Because of these data limitations, as well as recognition that fewer than 25 of the major economies account for well over half of total world energy consumption, the focus of this published report is aimed at the countries listed below:

1. Australia
2. Brazil
3. Canada
4. China
5. Denmark
6. France
7. Germany
8. India
9. Indonesia
10. Italy
11. Japan
12. Mexico
13. Netherlands
14. New Zealand
15. Norway
16. Poland
17. Russian Federation
18. South Africa
19. South Korea
20. Spain
21. Thailand
22. Turkey
23. Ukraine
24. United Kingdom
25. United States

Metrics of Energy Security Risk

The individual energy security measures selected were organized around eight broad categories that represent and balance some key and often competing aspects of energy security. These are found in table A1-2. Using these categories as guides, 29 individual metrics were developed covering a wide range of energy supplies, energy end uses, generating capacity, operations, and emissions.

In assessing security and risk, the ultimate goal is an improved understanding of the likelihood of an energy shock of some kind and how that might impact a countries economy. However, the data currently available typically describes only what actually happened, not what nearly happened or could have happened. So in this sense, some of the metrics are proxies for things that cannot be measured directly.

As an example, this Index uses measures of political and civil liberties to gauge a country's political stability, and indirectly its reliability as an energy supplier and trading partner. This does not mean that countries that perform poorly in these metrics have been unreliable suppliers in the past or necessarily will be unreliable suppliers in the future. But it does mean the risks of a disruption are higher in countries that do not score well in this metric when compared to countries that do score well.

Recognizing that fuel imports and exports account for a higher share of supply in many countries than they do in the United States, new metrics were created. Coal is an example. The United States has long-term (over 250 years) and secure supplies of coal and risks to supply are largely regulatory in nature, so coal does not feature in the import metrics of the U.S. Index

while oil and natural gas do. This is not the case in many other countries that rely on imported coal to meet domestic needs. Therefore, a metric measuring the net import exposure of coal was created in addition to the metrics for oil and natural gas.

Table A1-2. Classification of Energy Security Metrics Used in the International Index

Metric Category	General Description of the Metrics
1. Global Fuels	Measure the reliability and diversity of global reserves and supplies of oil, natural gas, and coal. Higher reliability and diversity mean a lower risk to energy security.
2. Fuel Imports	Measure the exposure of the national economies to unreliable and concentrated supplies of oil and natural gas, and coal. Higher supply reliability and diversity and lower import levels mean a lower risk to energy security.
3. Energy Expenditures	Measure the magnitude of energy costs to national economies and the exposure of consumers to price shocks. Lower costs and exposure mean a lower risk to energy security.
4. Price & Market Volatility	Measure the susceptibility of national economies to large swings in energy prices. Lower volatility means a lower risk to energy security.
5. Energy Use Intensity	Measure energy use in relation to population and economic output. Lower use of energy by industry to produce goods and services means a lower risk to energy security.
6. Electric Power Sector	Measure indirectly the reliability of electricity generating capacity. Higher diversity means a lower risk to energy security.
7. Transportation Sector	Measure efficiency of energy use in the transport sector per unit of GDP and population. Greater efficiency means a lower risk to energy security.
8. Environmental	Measure the exposure of national economies to national and international greenhouse gas emission reduction mandates. Lower emissions of carbon dioxide from energy mean a lower risk to energy security.

These fuel-specific measures, however, do not do a good job of indicating how important that fuel is in the overall energy mix of the country. Consider two countries that meet most of their demand for a particular fuel, say natural gas, through imports. If in one of these countries gas is a relatively small part of the energy mix and in the other gas is a very large part of the energy mix, their level of risk is quite different. To help account for these broader dependencies as well as the fuel-specific concerns, a metric measuring total energy import exposure is used to reflect the diversity of the different fuel mix in the country. This metric helps even out the effects of outlying values for individual fuels and picks up nuclear and renewable energies.

Energy price and expenditure data are very important measures of certain aspects of energy security, but the availability and quality of these data varies greatly and overall there is much less coverage of prices by sector and fuel than there is in the United States. As a result, the focus of the International Index is on overall energy prices rather than sector-level or end-use prices.

The primary source of energy price and expenditure data for the International Index is the IEA. Given IEA's mission and origins, it is not surprising that the amount and extent of price data for OECD countries is much greater than it is for non-OECD countries, but even the coverage in many OECD countries is less than ideal. To include energy price and expenditure metrics in the International Index, proxies had to be developed for energy prices for countries where IEA data were incomplete or unavailable. Using IEA price and consumption data for different fuels, we developed rough approximations of energy prices and expenditures that, while imperfect, meet the needs of the International Index.

Given all of these considerations, 29 metrics were developed for use in the International Index. These are listed and described in figure A1-3.

Table A1-3. Metrics Used to Create International Index of Energy Security Risk				
Metric by Classification		Definition	Importance	Weight (Percent)
Global Fuel Metrics				**14**
1.	Security of World Oil Reserves	Global proved oil reserves weighted by each country's relative Freedom Index and by an index of global diversity of oil reserves.	Indicates risk attached to the average barrel of global crude oil reserves. As a measure of reserves, it largely reflects longer-term concerns.	2
2.	Security of World Oil Production	Global oil production weighted by each country's relative Freedom Index and by an index of global diversity of oil production.	Indicates the level of risk attached to the average barrel of crude oil production globally.	3
3.	Security of World Natural Gas Reserves	Global proved natural gas reserves weighted by each country's relative Freedom Index and by an index of global diversity of gas reserves.	Indicates the risk attached to the average cubic foot of natural gas reserves globally. As a measure of reserves, it largely reflects longer-term concerns.	2
4.	Security of World Natural Gas Production	Global natural gas production weighted by each country's Freedom Index and by global diversity of gas production.	Indicates the level of risk attached to the average cubic foot of natural gas production globally.	3
5.	Security of World Coal Reserves	Global proved coal reserves weighted by each country's relative Freedom Index and by an index of global diversity of coal reserves.	Indicates the risk attached to the average ton of coal reserves globally. As a measure of reserves, it largely reflects longer-term concerns.	2
6.	Security of World Coal Production	Global coal production weighted by each country's relative Freedom Index and by an index of global diversity of coal production.	Indicates the level of risk attached to the average ton of coal production globally.	2
Fuel Import Metrics				**17**
7.	Petroleum Import Exposure	Net petroleum imports as a percentage of total national petroleum supply, adjusted to reflect the reliability of international petroleum production (measured using the Freedom Index) and the diversity across producing countries.	Indicates the degree to which changes in import levels expose the country to potentially unreliable and/or concentrated supplies of crude and refined petroleum.	3
8.	Natural Gas Import Exposure	Net natural gas imports as a percentage of total national gas supply, adjusted to reflect the reliability of international gas production (measured using the Freedom Index) and the diversity across producing countries.	Indicates the degree to which changes in import levels expose the country to potentially unreliable and/or concentrated supplies of natural gas.	3
9.	Coal Import Exposure	Net coal imports as a percentage of total national coal supply, adjusted to reflect the reliability of international coal production (measured using the Freedom Index) and the diversity across producing countries.	Indicates the degree to which changes in import levels expose the country to potentially unreliable and/or concentrated supplies of coal.	2

Table A1-3. Metrics Used to Create International Index of Energy Security Risk				
Metric by Classification		Definition	Importance	Weight (Percent)
10.	Total Energy Import Exposure	Net energy imports as a share of total primary energy consumption.	Indicates the degree to the country is reliant on foreign sources for it energy needs.	4
11.	Fossil Fuel Import Expenditures per GDP	Net fossil fuel import costs as a share of GDP.	Indicates the susceptibility of a country to imported fossil fuel price shocks.	5
Energy Expenditure Metrics				**20**
12.	Energy Expenditure Intensity	Total real cost of energy consumed per real $1,000 USD of GDP per year.	Indicates the magnitude of energy costs in the economy to energy price shocks, and exposure to price changes.	4
13.	Energy Expenditures per Capita	Total real dollar cost of the energy consumed per person per year.	Indicates the importance of energy in personal budgets and the susceptibility of households to energy price shocks.	3
14.	Retail Electricity Prices	Average electricity costs in real cents per kWh.	Indicates the availability of low-cost, reliable forms of power generation.	6
15.	Crude Oil Prices	Real cost per barrel of crude oil.	Indicates the susceptibility of the economy to high prices for petroleum, which supplies a significant portion of national energy demand.	7
Price & Market Volatility Metrics				**15**
16.	Crude Oil Price Volatility	Annual change in crude oil prices, averaged over a three-year period.	Indicates the susceptibility of the economy to large swings in the price of petroleum.	5
17.	Energy Expenditure Volatility	Average annual change in energy expenditures per $1,000 USD of GDP.	Indicates the susceptibility of the economy to large swings in expenditures for all forms of energy.	4
18.	World Oil Refinery Utilization	Average percent utilization of global petroleum refinery capacity.	Indicates the likelihood of higher prices at high capacity utilization, and higher risk of supply limitations during refinery outages or disruptions.	2
19.	GDP per Capita	Total real dollar GDP per person per year.	Indicates the importance of wealth and productivity to the ability to innovate and respond to energy shocks.	4

Table A1-3. Metrics Used to Create International Index of Energy Security Risk

Metric by Classification		Definition	Importance	Weight (Percent)
Energy Use Intensity Metrics				**14**
20.	Energy Consumption per Capita	Million British thermal units (Btu) consumed per person per year.	Indicates changes in both energy intensity and in per-capita GDP and importance of energy to individuals.	4
21.	Energy Intensity	Million Btu of primary energy used in the domestic economy per $1,000 USD of real GDP.	Indicates the importance of energy as a component of economic growth.	7
22.	Petroleum Intensity	Million Btu of petroleum consumed per $1,000 USD of real GDP.	Indicates the importance of petroleum as a component of economic growth.	3
Electric Power Sector Metrics				**7**
23.	Electricity Diversity	Average of market share concentration indexes (HHI) of: (1) the primary categories of electric power generating capacity, adjusted for availability; and (2) primary categories of electric power generation.	Indicates the flexibility of the power sector and its ability to dispatch electricity from a diverse range of sources.	5
24.	Non-CO_2 Emitting Share of Electricity Generation	Percentage of total electric power generation contributed by renewables, hydroelectric, nuclear and fossil-fired plants operating with carbon capture and storage technology.	Indicates the degree to which the power sector is employing non-CO_2 emitting generation.	2
Transportation Sector Metrics				**7**
25.	Transportation Energy per Capita	Million Btu consumed in the transportation sector per person per year.	Indicates changes in both transportation energy intensity and in per-capita GDP and importance of transportation energy to individuals.	3
26.	Transportation Energy Intensity	Million Btu of primary energy used in the transportation sector per $1,000 USD of real GDP.	Indicates the importance of energy used in transportation as a component of economic growth.	4
Environmental Metrics				**6**
27.	CO_2 Emissions Trend	Annual change in total national energy-related CO_2 emissions.	Indicates the exposure of the economy to domestic and international emissions reduction mandates.	2
28.	Energy-Related Carbon Dioxide Emissions per Capita	Metric tons of CO_2 emissions (energy-related), per capita.	Indicates the joint effect of the amount of energy used per capita, and the carbon intensity of that energy use.	2
29.	Energy-Related Carbon Dioxide Emissions Intensity	Metric tons of CO_2 per $1,000 USD of real GDP.	Indicates the importance of carbon-based fuels as a component of the economy.	2

Normalizing the Metrics into Indexes

The International Index provides an understanding of the absolute trends in energy security risks in selected countries and the relative trends vis-à-vis to other countries. Tracking a country's relative progress in this way can provide insights into market conditions, policies, and other events affecting energy security at a national level.

The various metrics used in the index are measured in many different units making it necessary to transform them into comparable "building blocks" that could then be assembled into an index.

For the International Index to convey information about both changes in energy security risk within a country over time and changes in risk compared to other countries over time, an international benchmark against which the individual countries could be compared had to be created. For this, we selected the average of the present roster of OECD nations.[14]

As a group, the OECD countries provide a good reference measure, with broad coverage across a range of developed nations. Importantly, data for the OECD nations generally are timely, complete, and wide-ranging, which enable an OECD-wide value for all of our metrics.

To set the OECD baseline, each of the 29 metric was normalized so that the value for 1980 equaled 1,000. For subsequent years, the indexed value for each metric was adjusted proportionally higher or lower relative to this 1980 value.[15]

The country-level metrics were normalized by calibrating their 1980 values in reference to the common OECD 1980 baseline. If, for example, a country's 1980 value in energy intensity was 17% higher than the OECD average value for that metric, the 1980 value for that metric would be set at 1,170. Normalized metric scores for subsequent years would rise or fall relative to that starting point. In this way, both a country's relative performance against the OECD average and its absolute performance can be measured for each metric.

Weighing the Metric Indexes

The 29 normalized metrics produced for each country from the procedure described above were combined to produce an overall risk score for each country that represents their weighted average.

The weighing of the 29 International metrics began with placing them into eight logical groupings. Each of the categories includes at least two and no more than six metrics (Table A1-3).

For weighting the metrics, the approximate weights of each metric category in the U.S. Index were assigned these categories in the International Index (Table A1-4). Fuel Imports were given a greater weighting in the International Index, and a lack of reliable and current data meant that no R&D metrics were used. Next, weights were allocated to the individual metrics based on weight of the category to which it belongs and, where possible, its relative importance within that category.

Table A1-4. Input Weights by Metric Category

Category	U.S., Index Weightings	International Index Weightings
Global Fuels	15.1	14
Fuel Imports	11.8	17
Energy Expenditures	18.3	20
Price & Market Volatility	12.6	15
Energy Use Intensity	15.3	14
Electric Power Sector	6.2	7
Transportations Sector	9.8	7
Environmental	7.6	6
R&D	3.3	NA

Using these steps, we were able to construct an energy security risk index for each country, as well as for the OECD. For each country, there are 29 metrics, each with a time series value that has been normalized into a risk measure where the OECD 1980 value is set to 1,000. For each country and each year, the 29 metrics are weighted according to the values shown in Table A1-3. The risk index for a country in any

given year is then the sum of the metric values, each multiplied by its assigned weighted share.[21] Using this logic, the OECD reference group, where each metric was normalized so that 1980 equals 1,000, therefore will have a 1980 total value of 1,000.

Methodological Revisions to the 2015 Edition

The International Index is the first of a kind effort to compare all major countries across many indicators of energy security. Often, the data employed are useful but incomplete, necessitating the development of approaches in which missing data do not unfairly distort the findings.

Several of the metrics in the International Index use country-level energy price data, either directly as prices or as part of energy expenditure-related metrics. For the first two editions of the International Index, several hybrid data sets were constructed from the IEA's Energy Prices and Taxes dataset, which was judged to be the most comprehensive available. The IEA price data are spread across 17 different fuel types, but have significant and unpredictable gaps. In previous versions of the International Index, a single average price for each fuel type was calculated using prices of that fuel in different markets. For example, if a country reported electricity prices for both household and industrial users, these two prices would be averaged to produce a single electricity price. If only one of the two was available, it would be used. If they reported neither, the OECD average would be used as a neutral default assumption.

While this approach resolved the issue of missing values, it also was vulnerable to a particular bias. In the case of countries with incomplete data, averages might be artificially high or low. If, for example, one country reported industrial electricity prices while another reported only residential electricity prices, which typically are higher, the price used for the latter country would appear relatively high. This bias affects multiple values in relatively unpredictable ways, given the amount of gaps in IEA data.

With this year's edition of the International Index, we have changed our data approach to be less vulnerable to incomplete energy price data. Previously, we combined prices across fuel types, e.g., averaging residential and industrial natural gas prices together. Our revised approach first converts all of a country's fuel prices into ratios relative to OECD prices, and these ratios are then aggregated and compared to the aggregate OECD values. This method gives similar results to our previous approach when price data are relatively complete, but greatly lessens potential distortions where countries have spotty or no data.

Appendix 2: International Energy Security Risk Index Scores

Appendix 2 presents the total energy security risk scores and the normalized index scores for the 29 individual metrics for the OECD group average and the 25 countries that make up the large energy user group. The risk scores are provided for 1980 to 2010 in five-year increments and for 2011, 2012, and 2013.

Data for the OECD and the large energy user group countries are found in Tables A2-1 through A2-26. In addition, the total energy security risk scores for the top 75 energy-consuming countries (as of 2010) in the International Index database are provided in Table A2-27. These countries together represent more than 95% of global energy demand.

It should be noted that data for many of countries, particularly price and expenditures data, are sparse if not lacking entirely. In general, where specific price information was not available, proxy prices were developed that would have a neutral effect on a country's risk index. Using IEA price and consumption data for different fuels, rough approximations of energy prices and expenditures were developed that, while imperfect, meet the general needs of the International Index.

The data presented in this Appendix 2 are available in Excel spreadsheet form at the Energy Institute website.

Table A2-1. International Energy Security Risk Index Scores: OECD Average										
Metric	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**	**2011**	**2012**	**2013**
Global Fuels										
Global Oil Reserves	1,000	1,045	1,244	1,460	1,279	872	881	932	950	956
Global Oil Production	1,000	909	777	741	689	727	773	810	818	811
Global Gas Reserves	1,000	1,364	868	1,095	1,001	986	935	937	963	978
Global Gas Production	1,000	1,483	940	695	755	812	829	872	861	870
Global Coal Reserves	1,000	1,075	688	554	582	675	686	695	695	696
Global Coal Production	1,000	1,095	915	1,042	941	1,321	1,659	1,768	1,799	1,830
Fuel Imports										
Oil Import Exposure	1,000	924	815	811	708	713	676	684	652	628
Gas Import Exposure	1,000	1,349	1,142	1,092	1,086	1,117	985	943	851	803
Coal Import Exposure	1,000	1,054	1,032	1,291	1,372	1,519	1,588	1,637	1,758	1,499
Total Energy Import Exposure	1,000	876	989	1,080	1,149	1,221	1,190	1,177	1,162	1,079
Fossil Fuel Import Expenditure per GDP	1,000	563	618	540	568	772	833	953	904	820
Energy Expenditures										
Energy Expenditure Intensity	1,000	636	596	495	494	645	710	822	797	757
Energy Expenditures per Capita	1,000	701	763	673	762	1,069	1,194	1,398	1,368	1,308
Retail Electricity Prices	1,000	827	900	897	645	724	867	899	869	868
Crude Oil Prices	1,000	614	415	292	440	700	978	1,289	1,242	1,176
Price & Market Volatility										
Crude Oil Price Volatility	1,000	495	510	179	664	651	2,845	1,995	1,956	963
Energy Expenditure Volatility	1,000	720	471	289	194	790	1,415	1,436	806	726
World Oil Refinery Usage	1,000	1,019	1,207	1,217	1,233	1,321	1,195	1,198	1,171	1,149
GDP per Capita	1,000	953	884	857	805	777	771	767	763	761
Energy Use Intensity										
Energy Consumption per Capita	1,000	969	1,028	1,081	1,132	1,136	1,087	1,074	1,054	1,034
Energy Intensity	1,000	879	803	795	734	685	646	632	614	598
Petroleum Intensity	1,000	785	722	712	646	603	535	519	506	501
Electric Power Sector										
Electricity Diversity	1,000	977	935	914	922	917	868	854	839	807
Non-Carbon Generation	1,000	883	867	859	882	903	884	886	891	900
Transportation Sector										
Transport Energy per Capita	1,000	1,005	1,152	1,242	1,331	1,370	1,283	1,306	1,333	1,361
Transport Energy Intensity	1,000	912	900	912	862	826	763	768	777	788
Environmental										
CO2 Emissions Trend	1,000	975	1,045	1,111	1,209	1,262	1,203	1,185	1,168	1,154
CO2 per Capita	1,000	937	965	983	1,031	1,038	956	936	918	902
CO2 GDP Intensity	1,000	851	754	722	668	626	569	550	535	522
Total Index	**1,000**	**879**	**818**	**786**	**797**	**876**	**1,030**	**1,031**	**990**	**912**

Table A2-2. International Energy Security Risk Index Scores: Australia

Metric	1980	1985	1990	1995	2000	2005	2010	2011	2012	2013
Global Fuels										
Global Oil Reserves	1,000	1,045	1,244	1,460	1,279	872	881	932	950	956
Global Oil Production	1,000	909	777	741	689	727	773	810	818	811
Global Gas Reserves	1,000	1,364	868	1,095	1,001	986	935	937	963	978
Global Gas Production	1,000	1,483	940	695	755	812	829	872	861	870
Global Coal Reserves	1,000	1,075	688	554	582	675	686	695	695	696
Global Coal Production	1,000	1,095	915	1,042	941	1,321	1,659	1,768	1,799	1,830
Fuel Imports										
Oil Import Exposure	380	0	132	246	53	447	443	553	569	643
Gas Import Exposure	357	287	0	0	0	0	0	0	23	0
Coal Import Exposure	0	0	0	0	0	0	0	0	0	0
Total Energy Import Exposure	445	124	241	339	171	548	521	601	591	660
Fossil Fuel Import Expenditure per GDP	443	93	195	215	117	525	553	777	785	817
Energy Expenditures										
Energy Expenditure Intensity	793	607	580	520	499	741	822	1,053	1,067	928
Energy Expenditures per Capita	896	735	790	754	839	1,374	1,621	2,093	2,160	1,895
Retail Electricity Prices	627	544	626	658	450	602	720	746	722	721
Crude Oil Prices	1,000	614	415	292	440	700	978	1,289	1,242	1,176
Price & Market Volatility										
Crude Oil Price Volatility	1,000	495	510	179	664	651	2,845	1,995	1,956	963
Energy Expenditure Volatility	789	776	345	238	548	1,159	1,350	1,549	840	947
World Oil Refinery Usage	1,000	1,019	1,207	1,217	1,233	1,321	1,195	1,198	1,171	1,149
GDP per Capita	941	908	857	831	771	735	712	709	703	700
Energy Use Intensity										
Energy Consumption per Capita	1,049	1,163	1,222	1,254	1,417	1,604	1,545	1,584	1,674	1,621
Energy Intensity	928	960	897	866	843	866	783	797	827	794
Petroleum Intensity	854	799	758	740	647	649	583	594	584	574
Electric Power Sector										
Electricity Diversity	1,190	1,253	1,281	1,317	1,361	1,316	1,222	1,162	1,158	1,112
Non-Carbon Generation	1,210	1,254	1,320	1,321	1,331	1,325	1,268	1,228	1,192	1,199
Transportation Sector										
Transport Energy per Capita	1,323	1,603	1,667	1,696	1,840	2,015	1,571	1,586	1,598	1,610
Transport Energy Intensity	1,170	1,323	1,224	1,171	1,094	1,087	797	798	789	788
Environmental										
CO2 Emissions Trend	1,000	1,195	1,346	1,454	1,792	2,075	2,131	1,973	1,943	1,916
CO2 per Capita	1,223	1,363	1,417	1,446	1,681	1,828	1,738	1,587	1,536	1,488
CO2 GDP Intensity	1,082	1,125	1,040	998	1,000	987	881	798	759	729
Total Index	**876**	**816**	**760**	**738**	**766**	**914**	**1,029**	**1,057**	**1,028**	**962**

Table A2-3. International Energy Security Risk Index Scores: Brazil

Metric	1980	1985	1990	1995	2000	2005	2010	2011	2012	2013
Global Fuels										
Global Oil Reserves	1,000	1,045	1,244	1,460	1,279	872	881	932	950	956
Global Oil Production	1,000	909	777	741	689	727	773	810	818	811
Global Gas Reserves	1,000	1,364	868	1,095	1,001	986	935	937	963	978
Global Gas Production	1,000	1,483	940	695	755	812	829	872	861	870
Global Coal Reserves	1,000	1,075	688	554	582	675	686	695	695	696
Global Coal Production	1,000	1,095	915	1,042	941	1,321	1,659	1,768	1,799	1,830
Fuel Imports										
Oil Import Exposure	1,328	558	601	542	303	77	0	74	122	132
Gas Import Exposure	1,621	507	604	44	743	1,349	1,225	1,035	1,053	1,197
Coal Import Exposure	4,789	4,719	4,877	5,160	4,506	4,454	4,459	4,465	4,261	3,676
Total Energy Import Exposure	1,411	761	937	976	715	540	494	549	639	761
Fossil Fuel Import Expenditure per GDP	1,196	476	744	677	567	499	513	764	889	973
Energy Expenditures										
Energy Expenditure Intensity	1,753	1,197	1,232	741	1,133	1,393	1,632	2,318	2,732	3,161
Energy Expenditures per Capita	403	259	268	174	272	360	500	722	853	1,003
Retail Electricity Prices	1,209	1,000	1,311	915	993	1,116	1,336	1,154	1,162	1,178
Crude Oil Prices	1,000	614	415	292	440	700	978	1,289	1,242	1,176
Price & Market Volatility										
Crude Oil Price Volatility	1,000	495	510	179	664	651	2,845	1,995	1,956	963
Energy Expenditure Volatility	1,871	1,039	1,223	1,858	1,654	2,344	3,557	4,449	4,232	4,851
World Oil Refinery Usage	1,000	1,019	1,207	1,217	1,233	1,321	1,195	1,198	1,171	1,149
GDP per Capita	2,086	2,148	2,142	2,066	2,041	1,968	1,808	1,791	1,790	1,775
Energy Use Intensity										
Energy Consumption per Capita	186	189	216	244	275	282	325	346	341	334
Energy Intensity	808	874	991	1,040	1,144	1,093	1,062	1,110	1,093	1,052
Petroleum Intensity	980	873	1,074	1,126	1,235	1,096	1,048	1,123	1,154	1,164
Electric Power Sector										
Electricity Diversity	1,561	1,576	1,616	1,621	1,472	1,323	1,178	1,189	1,166	1,129
Non-Carbon Generation	88	65	66	72	126	149	180	164	155	156
Transportation Sector										
Transport Energy per Capita	221	204	283	354	393	396	496	503	511	520
Transport Energy Intensity	964	940	1,301	1,511	1,638	1,535	1,621	1,615	1,638	1,639
Environmental										
CO2 Emissions Trend	1,000	1,038	1,278	1,557	1,855	1,997	2,429	2,561	2,522	2,487
CO2 per Capita	138	128	143	161	178	180	209	218	213	208
CO2 GDP Intensity	600	590	658	689	743	697	682	700	682	656
Total Index	**1,147**	**929**	**978**	**938**	**984**	**1,036**	**1,240**	**1,304**	**1,318**	**1,307**

Table A2-4. International Energy Security Risk Index Scores: Canada

Metric	1980	1985	1990	1995	2000	2005	2010	2011	2012	2013
Global Fuels										
Global Oil Reserves	1,000	1,045	1,244	1,460	1,279	872	881	932	950	956
Global Oil Production	1,000	909	777	741	689	727	773	810	818	811
Global Gas Reserves	1,000	1,364	868	1,095	1,001	986	935	937	963	978
Global Gas Production	1,000	1,483	940	695	755	812	829	872	861	870
Global Coal Reserves	1,000	1,075	688	554	582	675	686	695	695	696
Global Coal Production	1,000	1,095	915	1,042	941	1,321	1,659	1,768	1,799	1,830
Fuel Imports										
Oil Import Exposure	51	0	0	0	0	0	0	0	0	0
Gas Import Exposure	0	0	0	0	0	0	0	0	0	0
Coal Import Exposure	518	0	0	0	0	0	0	0	0	0
Total Energy Import Exposure	262	23	84	0	16	0	0	0	0	0
Fossil Fuel Import Expenditure per GDP	466	30	111	0	17	0	0	0	0	0
Energy Expenditures										
Energy Expenditure Intensity	861	747	790	536	526	810	806	934	904	948
Energy Expenditures per Capita	1,137	1,064	1,200	838	956	1,590	1,601	1,883	1,833	1,938
Retail Electricity Prices	405	408	487	447	380	475	540	582	595	595
Crude Oil Prices	1,000	614	415	292	440	700	978	1,289	1,242	1,176
Price & Market Volatility										
Crude Oil Price Volatility	1,000	495	510	179	664	651	2,845	1,995	1,956	963
Energy Expenditure Volatility	895	494	784	628	409	1,277	1,956	2,027	1,120	813
World Oil Refinery Usage	1,000	1,019	1,207	1,217	1,233	1,321	1,195	1,198	1,171	1,149
GDP per Capita	870	838	812	800	742	714	709	704	702	699
Energy Use Intensity										
Energy Consumption per Capita	2,238	2,198	2,219	2,337	2,377	2,406	2,138	2,214	2,148	2,093
Energy Intensity	1,694	1,543	1,462	1,494	1,307	1,226	1,076	1,098	1,060	1,024
Petroleum Intensity	1,377	978	975	936	860	872	801	781	773	765
Electric Power Sector										
Electricity Diversity	974	943	858	847	874	837	804	801	793	784
Non-Carbon Generation	330	298	327	313	398	371	355	324	308	310
Transportation Sector										
Transport Energy per Capita	2,553	2,183	2,206	2,276	2,332	2,349	2,313	2,345	2,374	2,408
Transport Energy Intensity	1,932	1,532	1,453	1,455	1,282	1,197	1,164	1,163	1,171	1,178
Environmental										
CO2 Emissions Trend	1,000	970	1,029	1,112	1,253	1,364	1,195	1,208	1,190	1,173
CO2 per Capita	1,681	1,546	1,530	1,566	1,684	1,745	1,453	1,454	1,415	1,379
CO2 GDP Intensity	1,272	1,085	1,008	1,001	926	889	731	721	698	675
Total Index	**1,027**	**871**	**840**	**785**	**791**	**875**	**1,001**	**1,009**	**960**	**893**

Table A2-5. International Energy Security Risk Index Scores: China

Metric	1980	1985	1990	1995	2000	2005	2010	2011	2012	2013
Global Fuels										
Global Oil Reserves	1,000	1,045	1,244	1,460	1,279	872	881	932	950	956
Global Oil Production	1,000	909	777	741	689	727	773	810	818	811
Global Gas Reserves	1,000	1,364	868	1,095	1,001	986	935	937	963	978
Global Gas Production	1,000	1,483	940	695	755	812	829	872	861	870
Global Coal Reserves	1,000	1,075	688	554	582	675	686	695	695	696
Global Coal Production	1,000	1,095	915	1,042	941	1,321	1,659	1,768	1,799	1,830
Fuel Imports										
Oil Import Exposure	0	0	0	110	307	435	548	578	589	591
Gas Import Exposure	733	756	399	304	0	0	318	551	644	687
Coal Import Exposure	0	0	0	0	0	0	60	99	158	81
Total Energy Import Exposure	10	7	5	64	213	264	337	353	409	405
Fossil Fuel Import Expenditure per GDP	37	22	10	176	500	856	1,091	1,287	1,307	1,183
Energy Expenditures										
Energy Expenditure Intensity	3,907	2,101	1,536	857	875	986	1,447	1,456	1,565	1,639
Energy Expenditures per Capita	47	37	40	35	53	93	226	248	285	320
Retail Electricity Prices	306	253	275	275	339	381	456	405	408	413
Crude Oil Prices	1,000	614	415	292	440	700	978	1,289	1,242	1,176
Price & Market Volatility										
Crude Oil Price Volatility	1,000	495	510	179	664	651	2,845	1,995	1,956	963
Energy Expenditure Volatility	4,485	4,163	1,391	2,033	666	1,071	1,208	883	1,330	1,689
World Oil Refinery Usage	1,000	1,019	1,207	1,217	1,233	1,321	1,195	1,198	1,171	1,149
GDP per Capita	9,100	7,492	6,163	4,915	4,044	3,256	2,529	2,425	2,343	2,263
Energy Use Intensity										
Energy Consumption per Capita	99	118	134	161	177	277	402	433	429	421
Energy Intensity	8,195	6,601	5,073	3,895	2,893	2,933	2,571	2,548	2,355	2,156
Petroleum Intensity	3,558	2,404	1,835	1,610	1,484	1,301	1,065	993	958	912
Electric Power Sector										
Electricity Diversity	979	1,062	1,174	1,198	1,241	1,260	1,197	1,187	1,160	1,128
Non-Carbon Generation	1,171	1,126	1,157	1,160	1,187	1,187	1,125	1,178	1,390	1,398
Transportation Sector										
Transport Energy per Capita	11	14	20	32	47	78	161	164	167	171
Transport Energy Intensity	920	805	776	776	775	824	1,031	965	919	875
Environmental										
CO2 Emissions Trend	1,000	1,219	1,503	1,880	2,259	3,772	5,521	6,017	5,926	5,844
CO2 per Capita	133	152	173	204	234	379	540	586	574	564
CO2 GDP Intensity	11,047	8,521	6,586	4,933	3,830	4,016	3,455	3,445	3,152	2,887
Total Index	**2,061**	**1,687**	**1,293**	**1,116**	**995**	**1,076**	**1,249**	**1,241**	**1,242**	**1,172**

Table A2-6. International Energy Security Risk Index Scores: Denmark

Metric	1980	1985	1990	1995	2000	2005	2010	2011	2012	2013
Global Fuels										
Global Oil Reserves	1,000	1,045	1,244	1,460	1,279	872	881	932	950	956
Global Oil Production	1,000	909	777	741	689	727	773	810	818	811
Global Gas Reserves	1,000	1,364	868	1,095	1,001	986	935	937	963	978
Global Gas Production	1,000	1,483	940	695	755	812	829	872	861	870
Global Coal Reserves	1,000	1,075	688	554	582	675	686	695	695	696
Global Coal Production	1,000	1,095	915	1,042	941	1,321	1,659	1,768	1,799	1,830
Fuel Imports										
Oil Import Exposure	1,656	1,296	504	194	0	0	0	0	0	0
Gas Import Exposure	1,835	0	0	0	0	0	0	0	0	0
Coal Import Exposure	8,136	7,215	5,989	6,229	5,611	5,436	5,183	5,137	5,010	4,333
Total Energy Import Exposure	2,581	2,166	1,404	1,017	513	500	526	472	375	365
Fossil Fuel Import Expenditure per GDP	1,322	570	274	138	29	32	56	78	56	52
Energy Expenditures										
Energy Expenditure Intensity	971	478	616	568	479	576	669	748	637	639
Energy Expenditures per Capita	1,576	889	1,223	1,244	1,184	1,492	1,687	1,898	1,605	1,609
Retail Electricity Prices	1,246	841	1,144	1,187	948	1,288	1,422	1,530	1,403	1,543
Crude Oil Prices	1,000	614	415	292	440	700	978	1,289	1,242	1,176
Price & Market Volatility										
Crude Oil Price Volatility	1,000	495	510	179	664	651	2,845	1,995	1,956	963
Energy Expenditure Volatility	963	868	938	521	182	518	702	536	618	462
World Oil Refinery Usage	1,000	1,019	1,207	1,217	1,233	1,321	1,195	1,198	1,171	1,149
GDP per Capita	785	734	710	676	636	621	630	628	630	630
Energy Use Intensity										
Energy Consumption per Capita	946	894	841	948	922	877	839	792	751	737
Energy Intensity	583	481	423	433	373	339	333	312	298	293
Petroleum Intensity	833	568	449	465	380	312	286	277	264	261
Electric Power Sector										
Electricity Diversity	1,707	1,872	1,747	1,504	1,040	902	882	892	897	900
Non-Carbon Generation	1,451	1,359	1,405	1,365	1,204	1,027	960	837	765	769
Transportation Sector										
Transport Energy per Capita	729	826	936	1,068	1,150	1,185	1,224	1,248	1,274	1,301
Transport Energy Intensity	449	445	472	488	466	457	485	491	505	516
Environmental										
CO2 Emissions Trend	1,000	975	879	1,065	839	798	706	718	707	698
CO2 per Capita	1,146	1,120	1,004	1,195	922	865	747	757	743	730
CO2 GDP Intensity	706	603	506	546	373	334	296	298	295	289
Total Index	**1,263**	**1,014**	**892**	**829**	**733**	**780**	**929**	**917**	**885**	**819**

Table A2-7. International Energy Security Risk Index Scores: France

Metric	1980	1985	1990	1995	2000	2005	2010	2011	2012	2013
Global Fuels										
Global Oil Reserves	1,000	1,045	1,244	1,460	1,279	872	881	932	950	956
Global Oil Production	1,000	909	777	741	689	727	773	810	818	811
Global Gas Reserves	1,000	1,364	868	1,095	1,001	986	935	937	963	978
Global Gas Production	1,000	1,483	940	695	755	812	829	872	861	870
Global Coal Reserves	1,000	1,075	688	554	582	675	686	695	695	696
Global Coal Production	1,000	1,095	915	1,042	941	1,321	1,659	1,768	1,799	1,830
Fuel Imports										
Oil Import Exposure	1,625	1,639	1,281	1,145	991	967	987	1,019	1,012	1,014
Gas Import Exposure	4,701	5,643	4,340	3,205	2,993	2,690	2,343	2,350	2,274	2,202
Coal Import Exposure	4,871	4,061	3,578	3,956	4,768	5,436	5,183	5,137	5,010	4,333
Total Energy Import Exposure	1,913	1,574	1,488	1,429	1,494	1,517	1,462	1,466	1,437	1,446
Fossil Fuel Import Expenditure per GDP	1,203	684	641	530	560	749	802	901	868	830
Energy Expenditures										
Energy Expenditure Intensity	1,078	544	554	470	394	521	560	630	584	576
Energy Expenditures per Capita	1,365	723	839	743	695	960	1,035	1,181	1,090	1,071
Retail Electricity Prices	1,318	747	1,041	977	521	643	870	953	881	959
Crude Oil Prices	1,000	614	415	292	440	700	978	1,289	1,242	1,176
Price & Market Volatility										
Crude Oil Price Volatility	1,000	495	510	179	664	651	2,845	1,995	1,956	963
Energy Expenditure Volatility	1,068	598	717	557	111	632	1,143	1,009	692	548
World Oil Refinery Usage	1,000	1,019	1,207	1,217	1,233	1,321	1,195	1,198	1,171	1,149
GDP per Capita	889	868	813	796	753	737	736	730	732	733
Energy Use Intensity										
Energy Consumption per Capita	853	825	878	948	1,001	1,012	952	928	913	895
Energy Intensity	674	621	579	601	567	549	516	495	489	481
Petroleum Intensity	770	554	493	488	445	409	365	349	339	337
Electric Power Sector										
Electricity Diversity	592	818	968	997	1,006	1,020	937	970	915	876
Non-Carbon Generation	709	236	164	113	134	157	144	125	108	109
Transportation Sector										
Transport Energy per Capita	774	750	895	983	1,054	989	862	878	895	913
Transport Energy Intensity	611	564	591	622	597	537	467	468	480	491
Environmental										
CO2 Emissions Trend	1,000	812	752	762	822	847	795	766	754	744
CO2 per Capita	800	631	569	565	596	592	540	518	507	498
CO2 GDP Intensity	632	475	376	358	338	321	292	276	272	268
Total Index	**1,190**	**1,017**	**934**	**862**	**850**	**922**	**1,061**	**1,055**	**1,018**	**942**

Table A2-8. International Energy Security Risk Index Scores: Germany

Metric	1980	1985	1990	1995	2000	2005	2010	2011	2012	2013
Global Fuels										
Global Oil Reserves	1,000	1,045	1,244	1,460	1,279	872	881	932	950	956
Global Oil Production	1,000	909	777	741	689	727	773	810	818	811
Global Gas Reserves	1,000	1,364	868	1,095	1,001	986	935	937	963	978
Global Gas Production	1,000	1,483	940	695	755	812	829	872	861	870
Global Coal Reserves	1,000	1,075	688	554	582	675	686	695	695	696
Global Coal Production	1,000	1,095	915	1,042	941	1,321	1,659	1,768	1,799	1,830
Fuel Imports										
Oil Import Exposure	1,622	1,646	1,286	1,161	989	950	978	1,002	992	994
Gas Import Exposure	3,700	3,620	3,190	2,657	2,306	2,127	2,049	1,970	1,977	1,902
Coal Import Exposure	0	0	358	873	1,622	1,690	2,130	2,067	1,931	1,634
Total Energy Import Exposure	1,343	1,166	1,314	1,602	1,654	1,663	1,765	1,734	1,741	1,761
Fossil Fuel Import Expenditure per GDP	1,168	731	702	587	577	761	851	921	912	878
Energy Expenditures										
Energy Expenditure Intensity	1,219	674	689	617	389	593	682	671	629	621
Energy Expenditures per Capita	1,493	890	1,047	1,008	692	1,083	1,341	1,365	1,309	1,295
Retail Electricity Prices	1,315	823	1,337	1,351	608	1,008	1,403	1,524	1,425	1,673
Crude Oil Prices	1,000	614	415	292	440	700	978	1,289	1,242	1,176
Price & Market Volatility										
Crude Oil Price Volatility	1,000	495	510	179	664	651	2,845	1,995	1,956	963
Energy Expenditure Volatility	1,208	896	693	168	207	697	1,210	661	310	282
World Oil Refinery Usage	1,000	1,019	1,207	1,217	1,233	1,321	1,195	1,198	1,171	1,149
GDP per Capita	903	870	811	782	750	740	713	701	693	692
Energy Use Intensity										
Energy Consumption per Capita	1,066	1,072	1,051	989	974	961	963	924	944	928
Energy Intensity	870	811	691	606	548	526	490	454	453	445
Petroleum Intensity	767	617	531	516	452	415	366	344	341	342
Electric Power Sector										
Electricity Diversity	1,130	1,088	1,048	964	885	748	638	673	689	695
Non-Carbon Generation	1,294	1,074	1,013	951	918	914	861	891	880	885
Transportation Sector										
Transport Energy per Capita	744	770	950	998	1,022	920	844	864	901	921
Transport Energy Intensity	608	583	625	611	574	504	429	425	432	442
Environmental										
CO2 Emissions Trend	1,000	960	938	844	809	802	751	709	698	688
CO2 per Capita	1,219	1,180	1,127	986	939	929	877	827	828	815
CO2 GDP Intensity	995	893	741	603	528	508	445	407	398	391
Total Index	**1,129**	**967**	**922**	**847**	**798**	**872**	**1,058**	**1,023**	**994**	**944**

Table A2-9. International Energy Security Risk Index Scores: India

Metric	1980	1985	1990	1995	2000	2005	2010	2011	2012	2013
Global Fuels										
Global Oil Reserves	1,000	1,045	1,244	1,460	1,279	872	881	932	950	956
Global Oil Production	1,000	909	777	741	689	727	773	810	818	811
Global Gas Reserves	1,000	1,364	868	1,095	1,001	986	935	937	963	978
Global Gas Production	1,000	1,483	940	695	755	812	829	872	861	870
Global Coal Reserves	1,000	1,075	688	554	582	675	686	695	695	696
Global Coal Production	1,000	1,095	915	1,042	941	1,321	1,659	1,768	1,799	1,830
Fuel Imports										
Oil Import Exposure	1,200	524	568	621	662	678	725	741	753	761
Gas Import Exposure	733	599	517	382	21	489	472	631	688	356
Coal Import Exposure	0	175	14	302	476	523	819	844	862	698
Total Energy Import Exposure	630	298	374	508	733	797	889	892	959	922
Fossil Fuel Import Expenditure per GDP	1,406	517	759	863	1,169	1,490	1,750	2,042	2,069	1,877
Energy Expenditures										
Energy Expenditure Intensity	1,282	1,157	941	571	823	1,119	1,063	1,091	1,189	1,257
Energy Expenditures per Capita	20	21	21	15	26	45	60	65	73	80
Retail Electricity Prices	325	269	292	240	267	333	399	367	370	375
Crude Oil Prices	1,000	614	415	292	440	700	978	1,289	1,242	1,176
Price & Market Volatility										
Crude Oil Price Volatility	1,000	495	510	179	664	651	2,845	1,995	1,956	963
Energy Expenditure Volatility	1,270	940	1,188	874	1,084	1,622	1,259	1,296	1,059	1,159
World Oil Refinery Usage	1,000	1,019	1,207	1,217	1,233	1,321	1,195	1,198	1,171	1,149
GDP per Capita	7,931	7,396	6,748	6,253	5,634	4,980	4,218	4,111	4,043	3,969
Energy Use Intensity										
Energy Consumption per Capita	32	42	51	68	72	81	106	108	106	103
Energy Intensity	2,043	2,325	2,319	2,652	2,281	2,018	1,883	1,824	1,733	1,627
Petroleum Intensity	1,382	1,496	1,462	1,538	1,548	1,320	1,148	1,085	1,089	1,055
Electric Power Sector										
Electricity Diversity	934	1,031	1,103	1,165	1,105	1,052	1,033	1,052	1,017	975
Non-Carbon Generation	904	1,009	1,062	1,174	1,209	1,187	1,207	1,167	1,243	1,250
Transportation Sector										
Transport Energy per Capita	10	15	22	36	28	29	48	49	49	50
Transport Energy Intensity	621	832	991	1,399	889	715	857	823	805	786
Environmental										
CO2 Emissions Trend	1,000	1,536	1,987	2,988	3,403	4,057	5,498	5,926	5,836	5,755
CO2 per Capita	38	52	60	82	86	95	120	128	124	121
CO2 GDP Intensity	2,368	2,829	2,740	3,217	2,728	2,349	2,136	2,159	2,030	1,906
Total Index	**1,217**	**1,126**	**1,084**	**1,101**	**1,094**	**1,133**	**1,266**	**1,270**	**1,252**	**1,164**

Table A2-10. International Energy Security Risk Index Scores: Indonesia

Metric	1980	1985	1990	1995	2000	2005	2010	2011	2012	2013
Global Fuels										
Global Oil Reserves	1,000	1,045	1,244	1,460	1,279	872	881	932	950	956
Global Oil Production	1,000	909	777	741	689	727	773	810	818	811
Global Gas Reserves	1,000	1,364	868	1,095	1,001	986	935	937	963	978
Global Gas Production	1,000	1,483	940	695	755	812	829	872	861	870
Global Coal Reserves	1,000	1,075	688	554	582	675	686	695	695	696
Global Coal Production	1,000	1,095	915	1,042	941	1,321	1,659	1,768	1,799	1,830
Fuel Imports										
Oil Import Exposure	0	0	0	0	0	102	298	372	407	457
Gas Import Exposure	0	0	0	0	0	0	0	0	0	0
Coal Import Exposure	156	0	0	0	0	0	0	0	0	0
Total Energy Import Exposure	1	0	0	0	0	255	447	559	633	729
Fossil Fuel Import Expenditure per GDP	0	0	0	0	0	465	1,039	1,489	1,574	1,628
Energy Expenditures										
Energy Expenditure Intensity	789	972	575	524	215	789	1,434	1,595	1,735	1,910
Energy Expenditures per Capita	24	35	26	32	13	55	123	143	164	188
Retail Electricity Prices	750	620	711	638	199	415	345	345	348	352
Crude Oil Prices	1,000	614	415	292	440	700	978	1,289	1,242	1,176
Price & Market Volatility										
Crude Oil Price Volatility	1,000	495	510	179	664	651	2,845	1,995	1,956	963
Energy Expenditure Volatility	785	1,202	370	802	1,259	1,524	3,324	3,190	3,057	2,554
World Oil Refinery Usage	1,000	1,019	1,207	1,217	1,233	1,321	1,195	1,198	1,171	1,149
GDP per Capita	5,746	5,295	4,674	4,032	4,111	3,797	3,419	3,335	3,255	3,184
Energy Use Intensity										
Energy Consumption per Capita	45	53	73	94	105	114	147	148	145	141
Energy Intensity	1,486	1,488	1,586	1,525	1,767	1,644	1,715	1,641	1,536	1,432
Petroleum Intensity	2,211	1,916	1,902	1,615	2,003	1,962	1,700	1,712	1,651	1,609
Electric Power Sector										
Electricity Diversity	1,334	1,296	961	933	914	975	975	1,037	1,017	993
Non-Carbon Generation	2,174	2,434	1,669	1,217	1,221	1,255	1,229	1,262	1,408	1,416
Transportation Sector										
Transport Energy per Capita	27	32	42	62	80	85	115	117	118	120
Transport Energy Intensity	882	897	925	1,016	1,349	1,230	1,349	1,297	1,251	1,213
Environmental										
CO2 Emissions Trend	1,000	1,181	1,818	2,504	3,103	3,855	4,832	4,974	4,899	4,831
CO2 per Capita	53	56	79	100	115	133	156	158	154	150
CO2 GDP Intensity	1,760	1,581	1,724	1,626	1,946	1,920	1,820	1,759	1,631	1,520
Total Index	**996**	**959**	**836**	**790**	**862**	**961**	**1,240**	**1,251**	**1,240**	**1,164**

Table A2-11. International Energy Security Risk Index Scores: Italy

Metric	1980	1985	1990	1995	2000	2005	2010	2011	2012	2013
Global Fuels										
Global Oil Reserves	1,000	1,045	1,244	1,460	1,279	872	881	932	950	956
Global Oil Production	1,000	909	777	741	689	727	773	810	818	811
Global Gas Reserves	1,000	1,364	868	1,095	1,001	986	935	937	963	978
Global Gas Production	1,000	1,483	940	695	755	812	829	872	861	870
Global Coal Reserves	1,000	1,075	688	554	582	675	686	695	695	696
Global Coal Production	1,000	1,095	915	1,042	941	1,321	1,659	1,768	1,799	1,830
Fuel Imports										
Oil Import Exposure	1,628	1,658	1,285	1,135	964	916	926	956	936	931
Gas Import Exposure	3,695	3,948	3,050	2,212	2,390	2,365	2,137	2,120	2,035	1,938
Coal Import Exposure	7,906	6,995	5,879	6,208	5,610	5,416	5,158	5,118	4,993	4,318
Total Energy Import Exposure	2,134	2,083	2,128	2,088	2,149	2,235	2,186	2,154	2,092	1,998
Fossil Fuel Import Expenditure per GDP	1,128	729	737	594	625	879	940	1,035	964	897
Energy Expenditures										
Energy Expenditure Intensity	845	540	781	627	597	728	773	818	772	735
Energy Expenditures per Capita	933	647	1,088	929	972	1,222	1,254	1,329	1,222	1,136
Retail Electricity Prices	1,218	978	1,349	1,184	922	1,377	1,728	1,789	1,818	1,884
Crude Oil Prices	1,000	614	415	292	440	700	978	1,289	1,242	1,176
Price & Market Volatility										
Crude Oil Price Volatility	1,000	495	510	179	664	651	2,845	1,995	1,956	963
Energy Expenditure Volatility	837	435	786	681	123	947	1,162	829	594	660
World Oil Refinery Usage	1,000	1,019	1,207	1,217	1,233	1,321	1,195	1,198	1,171	1,149
GDP per Capita	951	914	847	821	784	772	785	784	795	804
Energy Use Intensity										
Energy Consumption per Capita	609	598	666	696	748	788	726	709	678	665
Energy Intensity	551	500	478	469	460	469	448	436	428	430
Petroleum Intensity	741	601	565	550	478	437	384	370	343	336
Electric Power Sector										
Electricity Diversity	908	755	815	866	830	875	836	753	721	706
Non-Carbon Generation	1,057	1,044	1,215	1,196	1,172	1,203	1,064	1,022	1,008	1,014
Transportation Sector										
Transport Energy per Capita	651	727	883	955	1,010	1,043	919	939	960	980
Transport Energy Intensity	589	607	634	644	621	622	567	578	607	634
Environmental										
CO2 Emissions Trend	1,000	984	1,117	1,160	1,204	1,269	1,121	1,078	1,062	1,047
CO2 per Capita	595	584	662	686	711	736	635	610	599	588
CO2 GDP Intensity	539	488	475	462	437	438	392	375	379	380
Total Index	**1,183**	**1,056**	**1,023**	**947**	**926**	**1,039**	**1,174**	**1,149**	**1,117**	**1,043**

Table A2-12. International Energy Security Risk Index Scores: Japan

Metric	1980	1985	1990	1995	2000	2005	2010	2011	2012	2013
Global Fuels										
Global Oil Reserves	1,000	1,045	1,244	1,460	1,279	872	881	932	950	956
Global Oil Production	1,000	909	777	741	689	727	773	810	818	811
Global Gas Reserves	1,000	1,364	868	1,095	1,001	986	935	937	963	978
Global Gas Production	1,000	1,483	940	695	755	812	829	872	861	870
Global Coal Reserves	1,000	1,075	688	554	582	675	686	695	695	696
Global Coal Production	1,000	1,095	915	1,042	941	1,321	1,659	1,768	1,799	1,830
Fuel Imports										
Oil Import Exposure	1,674	1,724	1,348	1,195	1,018	985	997	1,032	1,026	1,026
Gas Import Exposure	6,244	6,645	4,311	3,224	2,914	2,602	2,276	2,289	2,218	2,142
Coal Import Exposure	6,299	6,068	5,467	5,938	5,519	5,436	5,183	5,137	5,010	4,333
Total Energy Import Exposure	2,233	2,164	2,188	2,152	2,162	2,216	2,198	2,320	2,515	2,463
Fossil Fuel Import Expenditure per GDP	1,369	798	799	665	703	906	981	1,209	1,244	1,140
Energy Expenditures										
Energy Expenditure Intensity	1,086	597	614	567	526	546	684	833	866	756
Energy Expenditures per Capita	1,240	813	1,043	1,018	973	1,064	1,359	1,644	1,737	1,541
Retail Electricity Prices	1,728	1,457	1,604	2,111	1,471	1,116	1,238	1,368	1,430	1,251
Crude Oil Prices	1,000	614	415	292	440	700	978	1,289	1,242	1,176
Price & Market Volatility										
Crude Oil Price Volatility	1,000	495	510	179	664	651	2,845	1,995	1,956	963
Energy Expenditure Volatility	1,076	868	494	239	313	315	1,127	1,095	920	1,007
World Oil Refinery Usage	1,000	1,019	1,207	1,217	1,233	1,321	1,195	1,198	1,171	1,149
GDP per Capita	936	857	767	746	735	716	709	712	706	700
Energy Use Intensity										
Energy Consumption per Capita	731	730	853	938	992	992	963	927	900	889
Energy Intensity	640	536	502	523	536	509	485	470	449	436
Petroleum Intensity	888	644	605	604	561	511	420	424	441	420
Electric Power Sector										
Electricity Diversity	795	680	671	670	696	689	689	712	763	759
Non-Carbon Generation	1,030	916	969	914	860	907	926	1,157	1,383	1,391
Transportation Sector										
Transport Energy per Capita	576	580	774	895	936	898	839	857	880	904
Transport Energy Intensity	505	426	456	499	506	460	422	434	439	443
Environmental										
CO2 Emissions Trend	1,000	978	1,106	1,179	1,269	1,311	1,246	1,247	1,228	1,211
CO2 per Capita	733	693	766	804	856	878	837	835	824	814
CO2 GDP Intensity	642	509	451	448	463	450	421	423	411	399
Total Index	**1,312**	**1,172**	**1,042**	**1,009**	**985**	**985**	**1,151**	**1,178**	**1,184**	**1,088**

Table A2-13. International Energy Security Risk Index Scores: Mexico

Metric	1980	1985	1990	1995	2000	2005	2010	2011	2012	2013
Global Fuels										
Global Oil Reserves	1,000	1,045	1,244	1,460	1,279	872	881	932	950	956
Global Oil Production	1,000	909	777	741	689	727	773	810	818	811
Global Gas Reserves	1,000	1,364	868	1,095	1,001	986	935	937	963	978
Global Gas Production	1,000	1,483	940	695	755	812	829	872	861	870
Global Coal Reserves	1,000	1,075	688	554	582	675	686	695	695	696
Global Coal Production	1,000	1,095	915	1,042	941	1,321	1,659	1,768	1,799	1,830
Fuel Imports										
Oil Import Exposure	0	0	0	0	0	0	0	0	0	0
Gas Import Exposure	0	101	431	543	252	509	531	821	886	688
Coal Import Exposure	1,979	799	114	1,320	1,494	2,595	1,706	1,040	1,121	924
Total Energy Import Exposure	18	19	55	114	83	203	242	347	404	313
Fossil Fuel Import Expenditure per GDP	5	6	19	33	22	78	114	187	202	146
Energy Expenditures										
Energy Expenditure Intensity	229	333	452	382	546	662	674	724	687	724
Energy Expenditures per Capita	83	120	161	136	229	282	297	328	319	336
Retail Electricity Prices	691	345	472	328	498	688	651	686	655	638
Crude Oil Prices	1,000	614	415	292	440	700	978	1,289	1,242	1,176
Price & Market Volatility										
Crude Oil Price Volatility	1,000	495	510	179	664	651	2,845	1,995	1,956	963
Energy Expenditure Volatility	231	487	650	935	866	486	1,237	1,168	637	426
World Oil Refinery Usage	1,000	1,019	1,207	1,217	1,233	1,321	1,195	1,198	1,171	1,149
GDP per Capita	1,658	1,663	1,677	1,676	1,545	1,532	1,507	1,486	1,467	1,468
Energy Use Intensity										
Energy Consumption per Capita	297	318	304	310	345	340	347	375	364	355
Energy Intensity	816	878	855	871	824	798	789	829	783	764
Petroleum Intensity	1,186	1,252	1,248	1,267	1,150	1,071	957	934	912	886
Electric Power Sector										
Electricity Diversity	955	992	887	804	843	861	948	951	943	941
Non-Carbon Generation	1,062	1,089	1,143	1,058	1,105	1,162	1,165	1,066	1,064	1,070
Transportation Sector										
Transport Energy per Capita	294	301	431	439	513	540	633	640	648	656
Transport Energy Intensity	808	833	1,213	1,235	1,224	1,266	1,437	1,414	1,393	1,414
Environmental										
CO2 Emissions Trend	1,000	1,168	1,257	1,337	1,593	1,655	1,798	1,924	1,894	1,868
CO2 per Capita	309	326	317	304	333	325	331	350	340	332
CO2 GDP Intensity	849	901	892	856	795	762	752	773	732	715
Total Index	**707**	**668**	**655**	**657**	**694**	**757**	**919**	**912**	**882**	**802**

Table A2-14. International Energy Security Risk Index Scores: Netherlands

Metric	1980	1985	1990	1995	2000	2005	2010	2011	2012	2013
Global Fuels										
Global Oil Reserves	1,000	1,045	1,244	1,460	1,279	872	881	932	950	956
Global Oil Production	1,000	909	777	741	689	727	773	810	818	811
Global Gas Reserves	1,000	1,364	868	1,095	1,001	986	935	937	963	978
Global Gas Production	1,000	1,483	940	695	755	812	829	872	861	870
Global Coal Reserves	1,000	1,075	688	554	582	675	686	695	695	696
Global Coal Production	1,000	1,095	915	1,042	941	1,321	1,659	1,768	1,799	1,830
Fuel Imports										
Oil Import Exposure	1,622	1,456	1,164	1,101	951	963	995	1,022	1,012	1,013
Gas Import Exposure	0	0	0	0	0	0	0	0	0	0
Coal Import Exposure	8,136	7,215	5,989	6,229	5,611	5,436	5,183	5,137	5,010	4,333
Total Energy Import Exposure	1,441	1,201	1,384	1,345	1,419	1,495	1,479	1,528	1,561	1,515
Fossil Fuel Import Expenditure per GDP	1,399	718	822	633	655	997	1,162	1,387	1,413	1,314
Energy Expenditures										
Energy Expenditure Intensity	1,385	821	948	957	697	1,178	1,108	1,200	1,196	1,168
Energy Expenditures per Capita	1,873	1,146	1,512	1,653	1,426	2,511	2,481	2,700	2,647	2,557
Retail Electricity Prices	1,434	797	869	948	732	1,381	1,059	1,076	1,020	1,111
Crude Oil Prices	1,000	614	415	292	440	700	978	1,289	1,242	1,176
Price & Market Volatility										
Crude Oil Price Volatility	1,000	495	510	179	664	651	2,845	1,995	1,956	963
Energy Expenditure Volatility	1,372	886	1,435	677	361	1,822	1,906	1,702	592	623
World Oil Refinery Usage	1,000	1,019	1,207	1,217	1,233	1,321	1,195	1,198	1,171	1,149
GDP per Capita	860	846	792	761	699	685	668	667	672	676
Energy Use Intensity										
Energy Consumption per Capita	1,272	1,166	1,244	1,299	1,336	1,454	1,443	1,382	1,371	1,348
Energy Intensity	941	836	780	751	653	682	644	614	619	616
Petroleum Intensity	989	720	735	686	626	701	654	646	657	635
Electric Power Sector										
Electricity Diversity	1,278	1,396	1,326	1,308	1,313	1,182	1,192	1,170	1,091	1,056
Non-Carbon Generation	1,384	1,363	1,359	1,342	1,317	1,263	1,245	1,215	1,253	1,260
Transportation Sector										
Transport Energy per Capita	849	821	1,001	1,087	1,190	1,284	1,373	1,399	1,429	1,461
Transport Energy Intensity	628	588	628	629	582	602	613	622	645	667
Environmental										
CO2 Emissions Trend	1,000	951	1,050	1,107	1,225	1,335	1,267	1,258	1,239	1,222
CO2 per Capita	1,284	1,192	1,276	1,301	1,397	1,487	1,386	1,370	1,344	1,321
CO2 GDP Intensity	950	854	800	753	683	698	619	609	607	604
Total Index	**1,259**	**1,040**	**1,018**	**963**	**930**	**1,128**	**1,240**	**1,235**	**1,179**	**1,106**

Table A2-15. International Energy Security Risk Index Scores: New Zealand

Metric	1980	1985	1990	1995	2000	2005	2010	2011	2012	2013
Global Fuels										
Global Oil Reserves	1,000	1,045	1,244	1,460	1,279	872	881	932	950	956
Global Oil Production	1,000	909	777	741	689	727	773	810	818	811
Global Gas Reserves	1,000	1,364	868	1,095	1,001	986	935	937	963	978
Global Gas Production	1,000	1,483	940	695	755	812	829	872	861	870
Global Coal Reserves	1,000	1,075	688	554	582	675	686	695	695	696
Global Coal Production	1,000	1,095	915	1,042	941	1,321	1,659	1,768	1,799	1,830
Fuel Imports										
Oil Import Exposure	1,520	1,238	615	748	669	826	617	696	716	769
Gas Import Exposure	0	0	0	32	0	0	0	0	0	0
Coal Import Exposure	0	0	0	0	0	0	0	0	0	0
Total Energy Import Exposure	926	601	520	663	645	867	628	660	706	774
Fossil Fuel Import Expenditure per GDP	913	444	494	481	477	735	624	774	782	795
Energy Expenditures										
Energy Expenditure Intensity	704	482	637	541	394	590	650	785	780	777
Energy Expenditures per Capita	703	537	722	647	523	886	983	1,204	1,218	1,233
Retail Electricity Prices	522	287	471	534	346	680	762	863	863	864
Crude Oil Prices	1,000	614	415	292	440	700	978	1,289	1,242	1,176
Price & Market Volatility										
Crude Oil Price Volatility	1,000	495	510	179	664	651	2,845	1,995	1,956	963
Energy Expenditure Volatility	685	523	879	431	408	935	1,864	1,821	1,002	540
World Oil Refinery Usage	1,000	1,019	1,207	1,217	1,233	1,321	1,195	1,198	1,171	1,149
GDP per Capita	1,000	947	939	914	868	817	813	808	800	794
Energy Use Intensity										
Energy Consumption per Capita	898	995	1,191	1,187	1,210	1,150	1,108	1,108	1,070	1,046
Energy Intensity	899	893	1,050	992	912	767	733	723	685	659
Petroleum Intensity	699	541	677	679	624	589	549	533	516	514
Electric Power Sector										
Electricity Diversity	1,267	1,071	1,075	1,144	954	847	807	809	751	724
Non-Carbon Generation	146	346	303	250	412	517	386	349	314	316
Transportation Sector										
Transport Energy per Capita	1,258	1,247	1,537	1,648	1,696	1,916	1,543	1,566	1,595	1,622
Transport Energy Intensity	1,259	1,119	1,356	1,378	1,278	1,278	1,021	1,021	1,021	1,022
Environmental										
CO2 Emissions Trend	1,000	1,151	1,435	1,533	1,788	2,015	1,848	1,855	1,827	1,801
CO2 per Capita	582	642	781	756	840	883	766	763	746	730
CO2 GDP Intensity	582	576	688	632	633	589	507	497	478	460
Total Index	**874**	**755**	**776**	**743**	**735**	**837**	**959**	**970**	**927**	**855**

Table A2-16. International Energy Security Risk Index Scores: Norway

Metric	1980	1985	1990	1995	2000	2005	2010	2011	2012	2013
Global Fuels										
Global Oil Reserves	1,000	1,045	1,244	1,460	1,279	872	881	932	950	956
Global Oil Production	1,000	909	777	741	689	727	773	810	818	811
Global Gas Reserves	1,000	1,364	868	1,095	1,001	986	935	937	963	978
Global Gas Production	1,000	1,483	940	695	755	812	829	872	861	870
Global Coal Reserves	1,000	1,075	688	554	582	675	686	695	695	696
Global Coal Production	1,000	1,095	915	1,042	941	1,321	1,659	1,768	1,799	1,830
Fuel Imports										
Oil Import Exposure	1,652	1,712	1,343	1,183	982	925	978	1,011	1,000	986
Gas Import Exposure	2,367	2,515	2,965	1,852	1,783	1,632	1,461	1,426	1,434	1,347
Coal Import Exposure	0	0	0	0	0	0	84	54	0	0
Total Energy Import Exposure	480	425	551	612	790	914	1,006	974	979	950
Fossil Fuel Import Expenditure per GDP	1,520	856	940	752	814	1,130	1,281	1,418	1,306	1,182
Energy Expenditures										
Energy Expenditure Intensity	781	497	465	766	646	867	1,048	1,121	1,005	909
Energy Expenditures per Capita	216	196	120	217	240	376	573	634	580	532
Retail Electricity Prices	332	239	217	467	412	675	960	983	915	918
Crude Oil Prices	1,000	614	415	292	440	700	978	1,289	1,242	1,176
Price & Market Volatility										
Crude Oil Price Volatility	1,000	495	510	179	664	651	2,845	1,995	1,956	963
Energy Expenditure Volatility	543	391	255	199	380	907	2,764	2,114	1,253	1,100
World Oil Refinery Usage	1,000	1,019	1,207	1,217	1,233	1,321	1,195	1,198	1,171	1,149
GDP per Capita	2,230	2,124	1,971	1,879	1,640	1,518	1,352	1,329	1,317	1,307
Energy Use Intensity										
Energy Consumption per Capita	800	742	582	539	532	541	596	596	565	557
Energy Intensity	2,816	2,475	2,261	1,902	1,431	1,246	1,089	1,053	980	951
Petroleum Intensity	944	741	681	695	691	679	645	613	561	532
Electric Power Sector										
Electricity Diversity	1,807	1,820	1,827	1,822	1,800	1,716	1,588	1,542	1,488	1,436
Non-Carbon Generation	1,419	1,433	1,438	1,433	1,426	1,415	1,350	1,333	1,380	1,388
Transportation Sector										
Transport Energy per Capita	246	230	212	245	333	418	633	642	658	675
Transport Energy Intensity	913	833	821	867	896	962	1,157	1,134	1,140	1,151
Environmental										
CO2 Emissions Trend	1,000	984	778	718	682	670	710	718	707	697
CO2 per Capita	1,090	1,025	792	722	691	681	721	722	711	701
CO2 GDP Intensity	4,076	3,467	3,074	2,548	1,859	1,570	1,319	1,276	1,233	1,197
Total Index	**1,208**	**1,073**	**981**	**898**	**873**	**937**	**1,173**	**1,134**	**1,068**	**987**

Table A2-17. International Energy Security Risk Index Scores: Poland

Metric	1980	1985	1990	1995	2000	2005	2010	2011	2012	2013
Global Fuels										
Global Oil Reserves	1,000	1,045	1,244	1,460	1,279	872	881	932	950	956
Global Oil Production	1,000	909	777	741	689	727	773	810	818	811
Global Gas Reserves	1,000	1,364	868	1,095	1,001	986	935	937	963	978
Global Gas Production	1,000	1,483	940	695	755	812	829	872	861	870
Global Coal Reserves	1,000	1,075	688	554	582	675	686	695	695	696
Global Coal Production	1,000	1,095	915	1,042	941	1,321	1,659	1,768	1,799	1,830
Fuel Imports										
Oil Import Exposure	1,652	1,712	1,343	1,183	982	925	978	1,011	1,000	986
Gas Import Exposure	2,367	2,515	2,965	1,852	1,783	1,632	1,461	1,426	1,434	1,347
Coal Import Exposure	0	0	0	0	0	0	84	54	0	0
Total Energy Import Exposure	480	425	551	612	790	914	1,006	974	979	950
Fossil Fuel Import Expenditure per GDP	1,520	856	940	752	814	1,130	1,281	1,418	1,306	1,182
Energy Expenditures										
Energy Expenditure Intensity	781	497	465	766	646	867	1,048	1,121	1,005	909
Energy Expenditures per Capita	216	196	120	217	240	376	573	634	580	532
Retail Electricity Prices	332	239	217	467	412	675	960	983	915	918
Crude Oil Prices	1,000	614	415	292	440	700	978	1,289	1,242	1,176
Price & Market Volatility										
Crude Oil Price Volatility	1,000	495	510	179	664	651	2,845	1,995	1,956	963
Energy Expenditure Volatility	543	391	255	199	380	907	2,764	2,114	1,253	1,100
World Oil Refinery Usage	1,000	1,019	1,207	1,217	1,233	1,321	1,195	1,198	1,171	1,149
GDP per Capita	2,230	2,124	1,971	1,879	1,640	1,518	1,352	1,329	1,317	1,307
Energy Use Intensity										
Energy Consumption per Capita	800	742	582	539	532	541	596	596	565	557
Energy Intensity	2,816	2,475	2,261	1,902	1,431	1,246	1,089	1,053	980	951
Petroleum Intensity	944	741	681	695	691	679	645	613	561	532
Electric Power Sector										
Electricity Diversity	1,807	1,820	1,827	1,822	1,800	1,716	1,588	1,542	1,488	1,436
Non-Carbon Generation	1,419	1,433	1,438	1,433	1,426	1,415	1,350	1,333	1,380	1,388
Transportation Sector										
Transport Energy per Capita	246	230	212	245	333	418	633	642	658	675
Transport Energy Intensity	913	833	821	867	896	962	1,157	1,134	1,140	1,151
Environmental										
CO2 Emissions Trend	1,000	984	778	718	682	670	710	718	707	697
CO2 per Capita	1,090	1,025	792	722	691	681	721	722	711	701
CO2 GDP Intensity	4,076	3,467	3,074	2,548	1,859	1,570	1,319	1,276	1,233	1,197
Total Index	**1,208**	**1,073**	**981**	**898**	**873**	**937**	**1,173**	**1,134**	**1,068**	**987**

Table A2-18. International Energy Security Risk Index Scores: Russian Federation

Metric	1980	1985	1990	1995	2000	2005	2010	2011	2012	2013
Global Fuels										
Global Oil Reserves	NA	NA	NA	1,460	1,279	872	881	932	950	956
Global Oil Production	NA	NA	NA	741	689	727	773	810	818	811
Global Gas Reserves	NA	NA	NA	1,095	1,001	986	935	937	963	978
Global Gas Production	NA	NA	NA	695	755	812	829	872	861	870
Global Coal Reserves	NA	NA	NA	554	582	675	686	695	695	696
Global Coal Production	NA	NA	NA	1,042	941	1,321	1,659	1,768	1,799	1,830
Fuel Imports										
Oil Import Exposure	NA	NA	NA	0	0	0	0	0	0	0
Gas Import Exposure	NA	NA	NA	0	0	0	0	0	0	0
Coal Import Exposure	NA	NA	NA	0	0	0	0	0	0	0
Total Energy Import Exposure	NA	NA	NA	0	0	0	0	0	0	0
Fossil Fuel Import Expenditure per GDP	NA	NA	NA	0	0	0	0	0	0	0
Energy Expenditures										
Energy Expenditure Intensity	NA	NA	NA	408	726	1,053	1,342	1,434	1,559	1,726
Energy Expenditures per Capita	NA	NA	NA	79	153	306	467	518	582	651
Retail Electricity Prices	NA	NA	NA	897	645	724	867	899	869	868
Crude Oil Prices	NA	NA	NA	292	440	700	978	1,289	1,242	1,176
Price & Market Volatility										
Crude Oil Price Volatility	NA	NA	NA	179	664	651	2,845	1,995	1,956	963
Energy Expenditure Volatility	NA	NA	NA	615	2,472	4,321	2,979	2,313	1,766	1,579
World Oil Refinery Usage	NA	NA	NA	1,217	1,233	1,321	1,195	1,198	1,171	1,149
GDP per Capita	NA	NA	NA	2,279	2,178	1,854	1,695	1,664	1,637	1,628
Energy Use Intensity										
Energy Consumption per Capita	NA	NA	NA	1,059	1,002	1,095	1,173	1,177	1,169	1,150
Energy Intensity	NA	NA	NA	5,501	4,750	3,764	3,371	3,258	3,134	3,049
Petroleum Intensity	NA	NA	NA	2,491	1,992	1,598	1,443	1,440	1,429	1,465
Electric Power Sector										
Electricity Diversity	NA	NA	NA	798	803	829	861	851	865	884
Non-Carbon Generation	NA	NA	NA	982	960	956	976	982	1,008	1,014
Transportation Sector										
Transport Energy per Capita	NA	NA	NA	341	350	407	562	573	587	600
Transport Energy Intensity	NA	NA	NA	1,770	1,658	1,399	1,616	1,587	1,572	1,592
Environmental										
CO2 Emissions Trend	NA	NA	NA	1,111	1,209	1,262	1,203	1,185	1,168	1,154
CO2 per Capita	NA	NA	NA	978	924	1,002	1,042	1,130	1,112	1,094
CO2 GDP Intensity	NA	NA	NA	5,078	4,382	3,447	2,996	3,129	2,979	2,900
Total Index	**NA**	**NA**	**NA**	**1,154**	**1,165**	**1,171**	**1,248**	**1,207**	**1,173**	**1,115**

Table A2-19. International Energy Security Risk Index Scores: South Africa

Metric	1980	1985	1990	1995	2000	2005	2010	2011	2012	2013
Global Fuels										
Global Oil Reserves	1,000	1,045	1,244	1,460	1,279	872	881	932	950	956
Global Oil Production	1,000	909	777	741	689	727	773	810	818	811
Global Gas Reserves	1,000	1,364	868	1,095	1,001	986	935	937	963	978
Global Gas Production	1,000	1,483	940	695	755	812	829	872	861	870
Global Coal Reserves	1,000	1,075	688	554	582	675	686	695	695	696
Global Coal Production	1,000	1,095	915	1,042	941	1,321	1,659	1,768	1,799	1,830
Fuel Imports										
Oil Import Exposure	1,687	1,445	1,083	618	582	605	692	741	742	741
Gas Import Exposure	80	108	91	68	60	0	1,799	1,709	1,707	1,634
Coal Import Exposure	0	0	0	0	0	0	0	0	0	0
Total Energy Import Exposure	627	546	584	563	517	538	587	635	654	660
Fossil Fuel Import Expenditure per GDP	1,316	1,040	1,121	981	967	1,272	1,514	1,878	1,873	1,759
Energy Expenditures										
Energy Expenditure Intensity	1,763	701	669	654	595	829	1,066	1,188	1,340	1,477
Energy Expenditures per Capita	512	192	177	163	151	234	331	377	430	476
Retail Electricity Prices	931	439	598	458	323	435	471	424	427	433
Crude Oil Prices	1,000	614	415	292	440	700	978	1,289	1,242	1,176
Price & Market Volatility										
Crude Oil Price Volatility	1,000	495	510	179	664	651	2,845	1,995	1,956	963
Energy Expenditure Volatility	1,747	1,566	885	494	449	1,543	2,168	2,117	1,911	1,817
World Oil Refinery Usage	1,000	1,019	1,207	1,217	1,233	1,321	1,195	1,198	1,171	1,149
GDP per Capita	1,855	1,911	1,944	2,006	1,986	1,881	1,795	1,776	1,766	1,761
Energy Use Intensity										
Energy Consumption per Capita	556	631	562	590	585	604	618	611	600	583
Energy Intensity	1,912	2,304	2,125	2,375	2,309	2,137	1,992	1,926	1,871	1,810
Petroleum Intensity	930	975	962	1,035	981	952	831	869	868	845
Electric Power Sector										
Electricity Diversity	1,935	1,674	1,692	1,693	1,717	1,723	1,724	1,713	1,717	1,716
Non-Carbon Generation	1,438	1,392	1,370	1,369	1,352	1,375	1,370	1,366	1,385	1,392
Transportation Sector										
Transport Energy per Capita	356	354	371	391	378	405	402	406	411	416
Transport Energy Intensity	1,225	1,292	1,401	1,574	1,491	1,433	1,296	1,280	1,280	1,289
Environmental										
CO2 Emissions Trend	1,000	1,285	1,268	1,478	1,642	1,840	2,013	1,964	1,934	1,907
CO2 per Capita	770	872	765	803	793	820	840	809	786	765
CO2 GDP Intensity	2,650	3,184	2,892	3,231	3,128	2,903	2,708	2,550	2,451	2,372
Total Index	**1,167**	**1,067**	**978**	**948**	**951**	**1,034**	**1,257**	**1,252**	**1,241**	**1,175**

Table A2-20. International Energy Security Risk Index Scores: South Korea

Metric	1980	1985	1990	1995	2000	2005	2010	2011	2012	2013
Global Fuels										
Global Oil Reserves	1,000	1,045	1,244	1,460	1,279	872	881	932	950	956
Global Oil Production	1,000	909	777	741	689	727	773	810	818	811
Global Gas Reserves	1,000	1,364	868	1,095	1,001	986	935	937	963	978
Global Gas Production	1,000	1,483	940	695	755	812	829	872	861	870
Global Coal Reserves	1,000	1,075	688	554	582	675	686	695	695	696
Global Coal Production	1,000	1,095	915	1,042	941	1,321	1,659	1,768	1,799	1,830
Fuel Imports										
Oil Import Exposure	1,687	1,773	1,378	1,228	1,032	1,002	1,004	1,036	1,028	1,030
Gas Import Exposure	5,473	7,382	4,797	3,543	3,128	2,710	2,330	2,331	2,255	2,185
Coal Import Exposure	3,054	4,093	4,079	5,664	5,333	5,297	5,115	5,077	4,949	4,280
Total Energy Import Exposure	1,982	1,932	2,043	2,322	2,269	2,245	2,309	2,309	2,320	2,355
Fossil Fuel Import Expenditure per GDP	2,363	1,273	1,553	1,674	1,587	1,888	2,104	2,532	2,497	2,345
Energy Expenditures										
Energy Expenditure Intensity	2,652	1,277	936	1,375	1,132	1,399	1,446	1,679	1,697	1,663
Energy Expenditures per Capita	567	393	450	919	935	1,422	1,752	2,093	2,154	2,165
Retail Electricity Prices	1,534	1,080	896	782	551	531	456	471	483	609
Crude Oil Prices	1,000	614	415	292	440	700	978	1,289	1,242	1,176
Price & Market Volatility										
Crude Oil Price Volatility	1,000	495	510	179	664	651	2,845	1,995	1,956	963
Energy Expenditure Volatility	2,416	3,515	850	1,101	1,718	1,830	2,076	2,581	1,647	704
World Oil Refinery Usage	1,000	1,019	1,207	1,217	1,233	1,321	1,195	1,198	1,171	1,149
GDP per Capita	2,162	1,802	1,442	1,223	1,100	992	909	896	888	876
Energy Use Intensity										
Energy Consumption per Capita	259	317	503	792	936	1,075	1,230	1,277	1,286	1,263
Energy Intensity	1,211	1,031	1,046	1,185	1,134	1,057	1,016	1,024	1,013	970
Petroleum Intensity	1,573	1,050	1,214	1,591	1,313	1,070	905	869	866	842
Electric Power Sector										
Electricity Diversity	1,372	840	785	749	864	861	877	851	844	835
Non-Carbon Generation	1,235	938	668	1,051	883	888	999	998	1,029	1,034
Transportation Sector										
Transport Energy per Capita	40	186	361	689	704	850	844	858	875	894
Transport Energy Intensity	188	604	750	1,031	853	836	697	688	689	687
Environmental										
CO2 Emissions Trend	1,000	1,308	1,838	2,895	3,330	3,748	4,411	4,638	4,567	4,504
CO2 per Capita	312	382	510	764	843	927	1,063	1,109	1,087	1,068
CO2 GDP Intensity	1,460	1,240	1,061	1,143	1,021	912	877	890	857	820
Total Index	**1,451**	**1,355**	**1,118**	**1,214**	**1,205**	**1,257**	**1,414**	**1,467**	**1,420**	**1,306**

Table A2-21. International Energy Security Risk Index Scores: Spain

Metric	1980	1985	1990	1995	2000	2005	2010	2011	2012	2013
Global Fuels										
Global Oil Reserves	1,000	1,045	1,244	1,460	1,279	872	881	932	950	956
Global Oil Production	1,000	909	777	741	689	727	773	810	818	811
Global Gas Reserves	1,000	1,364	868	1,095	1,001	986	935	937	963	978
Global Gas Production	1,000	1,483	940	695	755	812	829	872	861	870
Global Coal Reserves	1,000	1,075	688	554	582	675	686	695	695	696
Global Coal Production	1,000	1,095	915	1,042	941	1,321	1,659	1,768	1,799	1,830
Fuel Imports										
Oil Import Exposure	1,665	1,663	1,314	1,181	1,022	986	1,010	1,043	1,032	1,028
Gas Import Exposure	6,805	6,342	3,694	3,386	3,099	2,739	2,375	2,375	2,296	2,224
Coal Import Exposure	1,505	2,088	2,188	3,141	3,375	3,597	2,487	3,898	4,090	3,526
Total Energy Import Exposure	1,868	1,604	1,714	1,919	1,995	2,123	1,926	2,012	1,994	1,884
Fossil Fuel Import Expenditure per GDP	1,118	696	746	686	781	1,123	1,162	1,326	1,275	1,157
Energy Expenditures										
Energy Expenditure Intensity	784	497	545	496	436	694	690	798	779	740
Energy Expenditures per Capita	624	413	559	540	568	979	952	1,097	1,053	991
Retail Electricity Prices	1,032	843	1,493	1,174	608	832	1,190	1,342	1,298	1,296
Crude Oil Prices	1,000	614	415	292	440	700	978	1,289	1,242	1,176
Price & Market Volatility										
Crude Oil Price Volatility	1,000	495	510	179	664	651	2,845	1,995	1,956	963
Energy Expenditure Volatility	777	804	573	380	296	1,039	1,248	1,201	661	726
World Oil Refinery Usage	1,000	1,019	1,207	1,217	1,233	1,321	1,195	1,198	1,171	1,149
GDP per Capita	1,121	1,097	988	958	876	842	851	853	860	864
Energy Use Intensity										
Energy Consumption per Capita	457	488	567	615	767	839	753	726	717	708
Energy Intensity	574	587	554	565	589	595	546	528	530	529
Petroleum Intensity	793	641	606	661	652	623	536	515	487	461
Electric Power Sector										
Electricity Diversity	761	660	644	633	571	557	541	528	525	531
Non-Carbon Generation	1,054	812	680	750	813	925	679	727	742	746
Transportation Sector										
Transport Energy per Capita	444	513	702	788	1,036	1,174	1,067	1,088	1,114	1,146
Transport Energy Intensity	557	617	685	724	795	832	773	791	824	856
Environmental										
CO2 Emissions Trend	1,000	1,052	1,149	1,248	1,619	1,946	1,602	1,634	1,609	1,587
CO2 per Capita	471	482	521	558	708	785	606	616	606	600
CO2 GDP Intensity	591	580	509	513	544	557	439	448	449	448
Total Index	**1,101**	**1,003**	**912**	**880**	**892**	**1,013**	**1,105**	**1,146**	**1,114**	**1,037**

Table A2-22. International Energy Security Risk Index Scores: Thailand

Metric	1980	1985	1990	1995	2000	2005	2010	2011	2012	2013
Global Fuels										
Global Oil Reserves	1,000	1,045	1,244	1,460	1,279	872	881	932	950	956
Global Oil Production	1,000	909	777	741	689	727	773	810	818	811
Global Gas Reserves	1,000	1,364	868	1,095	1,001	986	935	937	963	978
Global Gas Production	1,000	1,483	940	695	755	812	829	872	861	870
Global Coal Reserves	1,000	1,075	688	554	582	675	686	695	695	696
Global Coal Production	1,000	1,095	915	1,042	941	1,321	1,659	1,768	1,799	1,830
Fuel Imports										
Oil Import Exposure	1,677	1,333	1,171	1,051	779	674	591	596	569	559
Gas Import Exposure	0	0	0	0	59	646	367	393	337	259
Coal Import Exposure	372	782	446	1,526	1,906	2,574	3,497	3,396	3,342	2,871
Total Energy Import Exposure	2,419	1,517	1,609	1,704	1,442	1,486	1,413	1,401	1,338	1,308
Fossil Fuel Import Expenditure per GDP	3,325	1,647	2,092	1,962	2,095	2,995	3,211	4,056	3,597	3,336
Energy Expenditures										
Energy Expenditure Intensity	1,945	1,063	968	1,060	1,081	1,583	2,554	2,883	2,990	3,286
Energy Expenditures per Capita	93	61	83	132	130	232	440	496	552	615
Retail Electricity Prices	1,018	776	660	687	484	517	653	635	639	648
Crude Oil Prices	1,000	614	415	292	440	700	978	1,289	1,242	1,176
Price & Market Volatility										
Crude Oil Price Volatility	1,000	495	510	179	664	651	2,845	1,995	1,956	963
Energy Expenditure Volatility	1,928	1,657	574	407	1,866	2,190	2,351	3,580	3,288	3,598
World Oil Refinery Usage	1,000	1,019	1,207	1,217	1,233	1,321	1,195	1,198	1,171	1,149
GDP per Capita	4,563	4,188	3,418	2,838	2,885	2,612	2,409	2,411	2,327	2,311
Energy Use Intensity										
Energy Consumption per Capita	60	76	125	202	232	313	366	388	385	378
Energy Intensity	1,254	1,329	1,454	1,623	1,928	2,135	2,122	2,255	2,084	2,019
Petroleum Intensity	2,351	1,810	2,004	2,213	2,311	2,314	2,109	2,127	1,954	1,913
Electric Power Sector										
Electricity Diversity	1,248	887	899	1,022	1,249	1,344	1,438	1,356	1,354	1,359
Non-Carbon Generation	1,320	1,290	1,355	1,326	1,339	1,354	1,324	1,327	1,308	1,315
Transportation Sector										
Transport Energy per Capita	55	83	159	305	291	374	337	344	352	360
Transport Energy Intensity	1,147	1,463	1,862	2,454	2,425	2,551	1,957	2,001	1,905	1,920
Environmental										
CO2 Emissions Trend	1,000	1,327	2,501	4,324	4,819	7,204	8,137	8,033	7,912	7,802
CO2 per Capita	64	77	134	222	234	333	372	366	359	353
CO2 GDP Intensity	1,333	1,357	1,566	1,790	1,951	2,274	2,156	2,127	1,946	1,886
Total Index	**1,347**	**1,112**	**1,060**	**1,125**	**1,249**	**1,460**	**1,653**	**1,748**	**1,678**	**1,616**

Table A2-23. International Energy Security Risk Index Scores: Turkey

Metric	1980	1985	1990	1995	2000	2005	2010	2011	2012	2013
Global Fuels										
Global Oil Reserves	1,000	1,045	1,244	1,460	1,279	872	881	932	950	956
Global Oil Production	1,000	909	777	741	689	727	773	810	818	811
Global Gas Reserves	1,000	1,364	868	1,095	1,001	986	935	937	963	978
Global Gas Production	1,000	1,483	940	695	755	812	829	872	861	870
Global Coal Reserves	1,000	1,075	688	554	582	675	686	695	695	696
Global Coal Production	1,000	1,095	915	1,042	941	1,321	1,659	1,768	1,799	1,830
Fuel Imports										
Oil Import Exposure	1,467	1,552	1,164	1,082	959	938	939	971	970	974
Gas Import Exposure	21	20	4,504	3,451	2,996	2,662	2,336	2,338	2,268	2,196
Coal Import Exposure	1,304	682	1,696	1,581	2,365	2,534	2,399	2,442	2,689	2,298
Total Energy Import Exposure	1,517	1,393	1,527	1,633	1,855	1,947	1,908	1,927	1,971	2,028
Fossil Fuel Import Expenditure per GDP	1,049	735	851	816	929	1,204	1,353	1,539	1,582	1,512
Energy Expenditures										
Energy Expenditure Intensity	961	629	857	630	689	1,031	1,217	1,154	1,237	1,189
Energy Expenditures per Capita	194	144	234	186	230	401	519	529	572	565
Retail Electricity Prices	1,068	598	778	738	709	834	1,093	969	1,023	1,021
Crude Oil Prices	1,000	614	415	292	440	700	978	1,289	1,242	1,176
Price & Market Volatility										
Crude Oil Price Volatility	1,000	495	510	179	664	651	2,845	1,995	1,956	963
Energy Expenditure Volatility	952	1,130	1,377	1,011	838	1,164	1,295	914	597	637
World Oil Refinery Usage	1,000	1,019	1,207	1,217	1,233	1,321	1,195	1,198	1,171	1,149
GDP per Capita	2,227	2,093	1,914	1,841	1,732	1,605	1,531	1,477	1,471	1,451
Energy Use Intensity										
Energy Consumption per Capita	133	152	205	239	280	308	349	374	384	374
Energy Intensity	660	668	752	810	841	792	819	817	831	787
Petroleum Intensity	847	764	773	841	752	588	504	467	485	493
Electric Power Sector										
Electricity Diversity	883	872	837	820	811	893	872	844	822	813
Non-Carbon Generation	799	1,018	866	849	1,090	1,096	1,069	1,080	1,135	1,141
Transportation Sector										
Transport Energy per Capita	128	142	206	251	243	245	279	282	285	289
Transport Energy Intensity	633	623	753	851	728	632	653	615	617	608
Environmental										
CO2 Emissions Trend	1,000	1,357	1,888	2,233	2,944	3,366	3,927	4,320	4,255	4,196
CO2 per Capita	141	171	217	237	289	308	337	367	356	347
CO2 GDP Intensity	700	750	794	802	866	793	791	800	771	731
Total Index	**902**	**813**	**969**	**899**	**948**	**1,016**	**1,186**	**1,162**	**1,159**	**1,087**

Table A2-24. International Energy Security Risk Index Scores: Ukraine

Metric	1980	1985	1990	1995	2000	2005	2010	2011	2012	2013
Global Fuels										
Global Oil Reserves	NA	NA	NA	1,460	1,279	872	881	932	950	956
Global Oil Production	NA	NA	NA	741	689	727	773	810	818	811
Global Gas Reserves	NA	NA	NA	1,095	1,001	986	935	937	963	978
Global Gas Production	NA	NA	NA	695	755	812	829	872	861	870
Global Coal Reserves	NA	NA	NA	554	582	675	686	695	695	696
Global Coal Production	NA	NA	NA	1,042	941	1,321	1,659	1,768	1,799	1,830
Fuel Imports										
Oil Import Exposure	NA	NA	NA	994	700	725	734	785	790	810
Gas Import Exposure	NA	NA	NA	2,819	2,427	2,142	1,546	1,644	1,433	1,358
Coal Import Exposure	NA	NA	NA	980	361	416	741	265	528	405
Total Energy Import Exposure	NA	NA	NA	1,427	1,304	1,356	1,072	1,098	956	958
Fossil Fuel Import Expenditure per GDP	NA	NA	NA	6,816	6,208	7,460	4,870	5,637	5,097	4,793
Energy Expenditures										
Energy Expenditure Intensity	NA	NA	NA	5,136	4,776	5,505	4,259	5,164	4,824	4,550
Energy Expenditures per Capita	NA	NA	NA	357	315	548	458	587	550	530
Retail Electricity Prices	NA	NA	NA	897	645	724	867	899	869	868
Crude Oil Prices	NA	NA	NA	292	440	700	978	1,289	1,242	1,176
Price & Market Volatility										
Crude Oil Price Volatility	NA	NA	NA	179	664	651	2,845	1,995	1,956	963
Energy Expenditure Volatility	NA	NA	NA	3,010	1,845	5,071	11,117	12,588	6,801	6,135
World Oil Refinery Usage	NA	NA	NA	1,217	1,233	1,321	1,195	1,198	1,171	1,149
GDP per Capita	NA	NA	NA	3,791	3,894	3,168	3,049	2,967	2,961	2,930
Energy Use Intensity										
Energy Consumption per Capita	NA	NA	NA	754	657	754	614	663	662	654
Energy Intensity	NA	NA	NA	10,845	9,959	7,573	5,709	5,839	5,798	5,611
Petroleum Intensity	NA	NA	NA	3,228	1,916	1,794	1,400	1,380	1,464	1,432
Electric Power Sector										
Electricity Diversity	NA	NA	NA	820	870	849	860	850	843	836
Non-Carbon Generation	NA	NA	NA	850	701	662	651	650	674	678
Transportation Sector										
Transport Energy per Capita	NA	NA	NA	236	200	240	245	252	259	266
Transport Energy Intensity	NA	NA	NA	3,397	3,036	2,408	2,281	2,220	2,270	2,285
Environmental										
CO2 Emissions Trend	NA	NA	NA	1,111	1,209	1,262	1,203	1,185	1,168	1,154
CO2 per Capita	NA	NA	NA	739	597	674	554	602	594	587
CO2 GDP Intensity	NA	NA	NA	10,628	9,052	6,762	5,148	5,300	5,209	5,042
Total Index	**NA**	**NA**	**NA**	**2,590**	**2,323**	**2,310**	**2,297**	**2,426**	**2,139**	**2,009**

Table A2-25. International Energy Security Risk Index Scores: United Kingdom

Metric	1980	1985	1990	1995	2000	2005	2010	2011	2012	2013
Global Fuels										
Global Oil Reserves	1,460	1,279	872	881	932	950	956	1,460	1,279	872
Global Oil Production	741	689	727	773	810	818	811	741	689	727
Global Gas Reserves	1,095	1,001	986	935	937	963	978	1,095	1,001	986
Global Gas Production	695	755	812	829	872	861	870	695	755	812
Global Coal Reserves	554	582	675	686	695	695	696	554	582	675
Global Coal Production	1,042	941	1,321	1,659	1,768	1,799	1,830	1,042	941	1,321
Fuel Imports										
Oil Import Exposure	1,105	964	959	975	1,009	996	995	1,105	964	959
Gas Import Exposure	122	0	308	1,015	1,128	1,184	1,124	122	0	308
Coal Import Exposure	2,228	2,766	3,706	3,358	3,309	3,738	3,218	2,228	2,766	3,706
Total Energy Import Exposure	210	194	499	946	1,072	1,233	1,298	210	194	499
Fossil Fuel Import Expenditure per GDP	26	15	102	276	374	414	422	26	15	102
Energy Expenditures										
Energy Expenditure Intensity	481	446	482	545	602	583	567	481	446	482
Energy Expenditures per Capita	754	828	1,009	1,116	1,236	1,193	1,173	754	828	1,009
Retail Electricity Prices	882	646	839	974	1,039	1,053	1,107	882	646	839
Crude Oil Prices	292	440	700	978	1,289	1,242	1,176	292	440	700
Price & Market Volatility										
Crude Oil Price Volatility	179	664	651	2,845	1,995	1,956	963	179	664	651
Energy Expenditure Volatility	382	123	359	1,165	1,003	520	387	382	123	359
World Oil Refinery Usage	1,217	1,233	1,321	1,195	1,198	1,171	1,149	1,217	1,233	1,321
GDP per Capita	799	734	691	699	698	699	695	799	734	691
Energy Use Intensity										
Energy Consumption per Capita	915	928	913	799	753	749	734	915	928	913
Energy Intensity	584	500	436	390	367	366	355	584	500	436
Petroleum Intensity	477	386	344	301	291	275	272	477	386	344
Electric Power Sector										
Electricity Diversity	934	948	929	933	859	832	800	934	948	929
Non-Carbon Generation	1,007	1,082	1,081	1,108	1,023	923	928	1,007	1,082	1,081
Transportation Sector										
Transport Energy per Capita	978	1,017	1,023	915	929	946	964	978	1,017	1,023
Transport Energy Intensity	624	548	489	447	452	462	466	624	548	489
Environmental										
CO2 Emissions Trend	913	913	950	862	810	797	786	913	913	950
CO2 per Capita	872	860	872	762	710	694	680	872	860	872
CO2 GDP Intensity	557	463	417	372	345	339	329	557	463	417
Total Index	**673**	**666**	**751**	**955**	**946**	**935**	**866**	**673**	**666**	**751**

Table A2-26. International Energy Security Risk Index Scores: United States

Metric	1980	1985	1990	1995	2000	2005	2010	2011	2012	2013
Global Fuels										
Global Oil Reserves	1,000	1,045	1,244	1,460	1,279	872	881	932	950	956
Global Oil Production	1,000	909	777	741	689	727	773	810	818	811
Global Gas Reserves	1,000	1,364	868	1,095	1,001	986	935	937	963	978
Global Gas Production	1,000	1,483	940	695	755	812	829	872	861	870
Global Coal Reserves	1,000	1,075	688	554	582	675	686	695	695	696
Global Coal Production	1,000	1,095	915	1,042	941	1,321	1,659	1,768	1,799	1,830
Fuel Imports										
Oil Import Exposure	618	503	587	570	561	606	510	493	422	369
Gas Import Exposure	104	319	321	558	542	491	260	137	8	0
Coal Import Exposure	0	0	0	0	0	0	0	0	0	0
Total Energy Import Exposure	605	513	667	779	883	963	841	784	696	670
Fossil Fuel Import Expenditure per GDP	892	468	616	535	593	803	809	895	773	696
Energy Expenditures										
Energy Expenditure Intensity	1,147	813	627	422	449	578	561	628	593	580
Energy Expenditures per Capita	1,629	1,299	1,126	808	1,002	1,396	1,343	1,520	1,465	1,449
Retail Electricity Prices	763	842	666	591	515	540	582	567	553	569
Crude Oil Prices	1,000	614	415	292	440	700	978	1,289	1,242	1,176
Price & Market Volatility										
Crude Oil Price Volatility	1,000	495	510	179	664	651	2,845	1,995	1,956	963
Energy Expenditure Volatility	1,162	832	356	380	667	806	1,456	1,360	664	439
World Oil Refinery Usage	1,000	1,019	1,207	1,217	1,233	1,321	1,195	1,198	1,171	1,149
GDP per Capita	839	791	746	723	669	644	646	643	636	633
Energy Use Intensity										
Energy Consumption per Capita	1,930	1,803	1,901	1,920	1,967	1,906	1,780	1,757	1,699	1,663
Energy Intensity	1,358	1,129	1,059	1,004	881	790	743	726	688	666
Petroleum Intensity	1,261	988	905	831	747	696	618	598	570	571
Electric Power Sector										
Electricity Diversity	943	964	894	889	925	953	898	872	850	831
Non-Carbon Generation	1,117	1,058	1,015	996	1,034	1,053	1,023	997	975	980
Transportation Sector										
Transport Energy per Capita	2,325	2,290	2,442	2,539	2,669	2,739	2,468	2,508	2,552	2,599
Transport Energy Intensity	1,636	1,433	1,360	1,328	1,196	1,135	1,031	1,036	1,033	1,040
Environmental										
CO2 Emissions Trend	1,000	964	1,055	1,114	1,228	1,256	1,180	1,150	1,132	1,117
CO2 per Capita	1,899	1,749	1,825	1,805	1,878	1,835	1,647	1,593	1,557	1,524
CO2 GDP Intensity	1,337	1,095	1,016	944	841	760	688	658	630	610
Total Index	**1,090**	**959**	**880**	**835**	**875**	**924**	**1,038**	**1,018**	**958**	**885**

Table A2-27. International Energy Security Risk Index Scores for Top 75 Energy-Consuming Countries in 2010: 1980-2012 (OECD 1980=1,000)										
Country	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**	**2011**	**2012**	**2013**
OECD Group Average	1,000	877	814	790	806	884	1,040	1,041	1,002	935
Algeria	1,224	1,067	1,084	1,030	964	1,048	1,275	1,287	1,215	1,140
Argentina	1,040	928	903	855	849	943	1,145	1,192	1,125	1,042
Australia	876	816	760	738	766	914	1,029	1,057	1,028	962
Austria	1,138	1,051	959	903	855	999	1,115	1,096	1,048	974
Azerbaijan	-	-	-	3,873	2,428	2,026	1,453	1,481	1,311	1,196
Bahrain	1,228	1,482	1,485	1,194	1,314	1,508	1,692	1,589	1,454	1,380
Bangladesh	1,259	1,163	1,106	1,106	1,121	1,232	1,368	1,329	1,271	1,194
Belarus	3,395	2,836	2,490	2,726	2,101	2,132	1,911	2,030	1,869	1,799
Belgium	1,433	1,181	1,146	1,087	1,054	1,149	1,376	1,330	1,260	1,182
Brazil	1,147	929	978	938	984	1,036	1,240	1,304	1,318	1,307
Bulgaria	3,146	2,540	1,995	1,545	1,612	1,552	1,529	1,531	1,484	1,419
Canada	1,027	871	840	785	791	875	1,001	1,009	960	893
Chile	995	853	868	845	1,038	1,147	1,345	1,381	1,302	1,188
China	2,061	1,687	1,293	1,116	995	1,076	1,249	1,241	1,242	1,172
Colombia	885	805	666	653	664	703	847	862	822	753
Croatia	-	-	-	853	915	1,026	1,165	1,148	1,178	1,139
Czech Republic	-	-	-	930	902	987	1,171	1,161	1,136	1,067
Denmark	1,263	1,014	892	829	733	780	929	917	885	819
Ecuador	1,022	951	920	914	956	1,013	1,479	1,416	1,324	1,183
Egypt	1,491	1,469	1,459	1,316	1,283	1,585	1,869	1,826	1,660	1,582
Finland	1,436	1,198	1,080	980	909	948	1,131	1,148	1,108	1,030
France	1,190	1,017	934	862	850	922	1,061	1,055	1,018	942
Germany	1,129	967	922	847	798	872	1,058	1,023	994	944
Greece	956	860	901	829	925	955	1,133	1,174	1,144	1,077
Hungary	1,145	990	972	860	858	996	1,152	1,139	1,091	1,015
India	1,217	1,126	1,084	1,101	1,094	1,133	1,266	1,270	1,252	1,164
Indonesia	996	959	836	790	862	961	1,240	1,251	1,240	1,164
Iran	1,173	1,164	1,360	1,307	1,444	1,818	2,081	2,075	1,895	1,833
Iraq	2,606	2,164	1,885	1,747	1,554	1,999	2,071	2,069	1,820	1,643
Ireland	1,218	1,012	920	867	956	1,034	1,162	1,126	1,093	1,030
Israel	1,313	1,221	1,063	1,022	1,048	1,048	1,296	1,239	1,200	1,162
Italy	1,183	1,056	1,023	947	926	1,039	1,174	1,149	1,117	1,043
Japan	1,312	1,172	1,042	1,009	985	985	1,151	1,178	1,184	1,088
Kazakhstan	-	-	-	1,511	1,339	1,134	1,223	1,187	1,116	1,053
Kuwait	1,182	971	932	912	1,127	1,203	1,521	1,591	1,522	1,387
Libya	1,782	1,486	1,317	1,186	1,176	1,251	1,503	1,989	1,583	1,479
Malaysia	1,152	1,098	1,105	1,002	1,089	1,178	1,553	1,491	1,337	1,250
Mexico	707	668	655	657	694	757	919	912	882	802

Table A2-27. International Energy Security Risk Index Scores for Top 75 Energy-Consuming Countries in 2010: 1980-2012 (OECD 1980=1,000)										
Country	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**	**2011**	**2012**	**2013**
OECD Group Average	1,000	877	814	790	806	884	1,040	1,041	1,002	935
Morocco	1,106	996	1,042	1,052	1,117	1,207	1,483	1,467	1,382	1,274
Netherlands	1,259	1,040	1,018	963	930	1,128	1,240	1,235	1,179	1,106
New Zealand	874	755	776	743	735	837	959	970	927	855
Nigeria	842	881	879	944	909	830	920	930	858	786
Norway	916	830	829	795	753	750	873	853	832	774
Oman	864	802	870	764	943	1,176	1,729	1,631	1,588	1,455
Pakistan	1,302	1,217	1,155	1,135	1,218	1,245	1,540	1,541	1,437	1,341
Paraguay	1,074	1,050	1,330	1,485	1,671	1,667	1,745	1,703	1,664	1,492
Peru	932	814	802	800	846	911	1,122	1,068	1,038	940
Philippines	1,257	1,057	1,076	1,136	1,135	1,136	1,200	1,245	1,158	1,058
Poland	1,208	1,073	981	898	873	937	1,173	1,134	1,068	987
Portugal	1,053	1,042	1,024	1,031	998	1,113	1,221	1,230	1,200	1,125
Qatar	2,120	1,621	1,453	1,533	1,450	1,725	1,595	1,682	1,604	1,478
Romania	1,276	1,088	1,254	946	924	1,002	1,016	1,084	1,020	961
Russia	-	-	-	1,154	1,165	1,171	1,248	1,207	1,173	1,115
Saudi Arabia	924	1,175	1,140	990	1,097	1,323	1,538	1,678	1,576	1,449
Serbia	-	-	-	-	-	-	1,454	1,606	1,577	1,466
Singapore	2,118	1,794	1,790	1,633	1,705	1,849	2,749	2,475	2,558	2,580
Slovakia	-	-	-	1,111	1,036	1,109	1,219	1,214	1,150	1,085
South Africa	1,167	1,067	978	948	951	1,034	1,257	1,252	1,241	1,175
South Korea	1,451	1,355	1,118	1,214	1,205	1,257	1,414	1,467	1,420	1,306
Spain	1,101	1,003	912	880	892	1,013	1,105	1,146	1,114	1,037
Sweden	1,320	1,154	1,005	929	883	904	1,067	1,064	1,025	944
Switzerland	1,220	1,072	949	894	846	870	1,018	1,007	981	907
Syria	1,626	1,619	2,008	1,497	1,598	1,524	2,031	1,890	1,938	1,924
Taiwan	1,304	1,154	1,085	1,140	1,173	1,239	1,388	1,395	1,357	1,292
Thailand	1,347	1,112	1,060	1,125	1,249	1,460	1,653	1,748	1,678	1,616
Trinidad & Tobago	1,100	1,350	1,134	1,233	1,285	1,729	2,195	2,113	1,974	1,858
Turkey	902	813	969	899	948	1,016	1,186	1,162	1,159	1,087
Turkmenistan	-	-	-	1,914	2,053	3,277	2,688	2,573	2,198	2,036
Ukraine	-	-	-	2,590	2,323	2,310	2,297	2,426	2,139	2,009
United Arab Emirates	943	1,305	1,332	1,320	1,236	1,358	1,733	1,694	1,580	1,464
United Kingdom	886	773	698	673	666	751	955	946	935	866
United States	1,090	959	880	835	875	924	1,038	1,018	958	885
Uzbekistan	-	-	-	3,911	3,551	3,674	3,055	3,087	2,351	2,080
Venezuela	1,062	1,041	826	809	883	902	1,087	1,058	1,012	979
Vietnam	1,031	983	834	829	824	956	1,219	1,233	1,208	1,125

Appendix 3: Data Sources

The Energy Institute relied primarily on government data from the Energy Information Administration (EIA) and the International Energy Agency (IEA) to develop its International Index of Energy Security Risk. Where historical data from government sources were not available, other widely-used and respected sources were employed. The following provides a list of the main sources of the data used to compile the metrics.

British Petroleum: BP Statistical Review of World Energy. Available at: http://www.bp.com/en/global/corporate/about-bp/energy-economics/statistical-review-of-world-energy.html. For refinery capacity and utilization data.

Energy Information Administration:

- International Energy Statistics. Available at: http://www.eia.doe.gov/countries/data.cfm. For historical international energy production, consumption, reserve, import, export, electricity capacity, and other energy data.

- Annual Energy Review. Available at: http://www.eia.doe.gov/emeu/aer/contents.html. For crude oil price data.

Freedom House: Freedom in the World: Comparative and Historical Data. Available at: http://www.freedomhouse.org/report-types/freedom-world. For historical international political rights and civil liberties data. Freedom House's annual index of political rights and civil liberties was used as a proxy for reliability of international trading partners.

International Energy Agency: IEA Statistics, Energy Prices and Taxes. Available at: http://www.iea.org/stats/index.asp. Subscription required. For energy price and expenditure data.

World Bank: Development Indicators. Available at: http://data.worldbank.org/indicator/all. For population, gross domestic product, net energy imports, electricity generation by energy source, and transport energy.

Endnotes

1 Horizontal drilling and advanced seismic imaging are two other technologies central to the U.S. "shale gale revolution."

2 These benefits are detailed in three reports by IHS reports available here: http://www.energyxxi.org/shale.

3 IHS Energy. 2014. The Value of US Power Supply Diversity. Available at: http://www.energyxxi.org/power-diversity.

4 NERA Economic Consulting. 2014. Potential Energy Impacts of the EPA Proposed Clean Power Plan. Available at: http://americaspower.org/sites/default/files/NERA_CPP%20Report_Final_Oct%202014.pdf.

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

6 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.

7 EIA. 2013. Technically Recoverable Shale Oil and Shale Gas Resources: An Assessment of 137 Shale Formations in 41 Countries Outside the United States. Available at: http://www.eia.gov/analysis/studies/worldshalegas/.

8 IEA. 2014.World Energy Outlook 2014. Available at: http://www.worldenergyoutlook.org/publications/weo-2014/.

9 A technically-recoverable resource is a broad measure of potential value, which is different from a "technically recoverable reserve," which has actual value and can be extracted.

10 These are down from the original targets of 10 gigawatts of offshore wind in 2020 and 25 gigawatts in 2030.

11 IEA. 2013. Southeast Asia Energy Outlook, World Energy Outlook Special Report. Available at: http://www.iea.org/publications/freepublications/publication/SoutheastAsiaEnergyOutlook_WEO2013SpecialReport.pdf.

12 The International Index only looks at carbon dioxide emissions from energy. Indonesia is also a very large emitter of carbon dioxide from deforestation.

13 CRS. 2011. U.S. Fossil Fuel Resources: Terminology, Reporting, and Summary. CRS Report for Congress R40872. Available at: http://www.fas.org/sgp/crs/misc/R40872.pdf.

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