

World Energy Investment 2016

<http://dx.doi.org/10.1787/9789264262836-en>

ISBN 9789264262812 (print)

ISBN 9789264262836 (PDF)

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Corrigendum

Please note that despite our best efforts to ensure quality control, errors have slipped into World Energy Investment 2016.

Page 13:

Executive Summary

Corrected “USD 690 billion” to “USD 680 billion” in first paragraph.

Page 25:

Table 1.1: Investment in fossil fuel and electricity supply by region

Replaced “1” with “15” in the Non-OECD Asia row and

Renewables, transport and heat column.

Replaced “459” with “473” in Non-OECD Asia row and TOTAL column.

Page 65:

Investment in oil, gas and coal: Highlights

Replaced “40 years” with “30 years” in second bullet.

Page 69:

Third paragraph

Replaced “40 years” with “30 years”.

Two figures have been corrected. Please find the correct versions on the next pages.

Page 22:

Figure 1.1

Page 92:

Figure 3.16

World energy | 20 Investment | 16

Global energy investment in 2015 amounted to United States dollar (USD) 1.8 trillion, down 8% (in real terms) from 2014 mainly due to a sharp fall in upstream oil and gas investment. After three years during which the United States was the largest destination for investment in energy supply, the People's Republic of China (hereafter, "China") retook the top position in 2015, largely due to the record level of electricity sector investment in China and the decline of US oil and gas investment. The rebalancing and slowdown of the Chinese economy, which are curbing the country's energy needs, are having a major impact on energy investment globally, largely as a result of lower demand growth for oil, gas and coal. In mature economies such as Europe, Japan and the United States the dominance of the services sector is weakening the link between energy demand and growth in gross domestic product (GDP). These structural changes are reinforced by investment in energy efficiency, which reached USD 220 billion globally in 2015. Given that the majority of upstream oil and gas and almost 40% of electricity sector investment is aimed at replacing ageing assets, substantial investment is essential to maintaining supply security even as macroeconomic and energy policy developments slow demand growth globally. Oil and gas still represent the largest single category of global energy investment, accounting for over 45% of the total. Investment in the electricity sector rose to a record USD 680 billion, or over 37% of the total, despite a marked slowdown in demand growth, driven primarily by the expansion of renewables and networks.

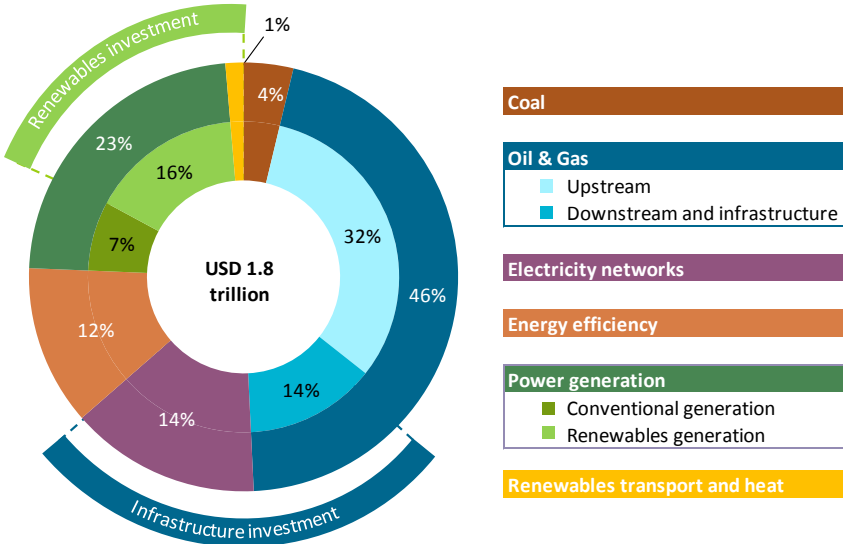
Fossil fuels continue to dominate energy supply, but the composition of investment flows points towards a reorientation of the energy system. Oil, the largest primary energy source, slightly increased its share of the global energy mix, but its share of global energy investment declined as the industry reacted to a sharp fall in prices since late 2014 with cuts in capital expenditure, most notably in North America. Unlike oil, gas demand growth remained subdued due to the slowdown of electricity demand and the expansion of renewables that contributed to a fall in gas-fired power generation investment. In addition, low oil and gas prices have also led to cuts in investment in upstream and transportation infrastructure, with most major gas infrastructure projects in East Africa and the Eurasian region facing delays. Coal demand has declined, largely because of China and the United States, but coal has retained its position as the world's second-largest primary fuel. China continued the restructuring of its mining industry, which represents half of global supply, in order to reduce excess capacity. Investment in coal globally is increasingly affected by climate policy, which is expected to drive down demand especially in Europe and the United States. On the other hand, Indian coal production continues to be supported by strong investment. Renewables are expanding rapidly but asymmetrically: wind, solar and hydropower and are reshaping the electricity system. In USD terms

Global energy investment trends

A slump in capital spending on energy, mainly due to lower costs

Total energy investment worldwide in 2015 is estimated to have amounted to just over United States dollar (USD) 1.8 trillion,² accounting for 2.4% of global gross domestic product (GDP) (Figure 1.1). Investment in real dollar terms was 8% lower than in 2014, mainly due to a sharp decline in capital spending in upstream oil and gas.

Figure 1.1 • Global energy investment in 2015



Excluding energy efficiency, global investment in energy supply totalled over USD 1.6 trillion, down nearly 10% (Figure 1.2, Table 1.1). Oil, gas and coal supply remained the biggest recipient of supply-side investment, totalling USD 900 billion, though its share of total energy investment dropped to 55% from over 60% in 2014. In absolute terms, the largest declines took place in the North American upstream oil and gas sector. Investment in the power sector, including generation capacity, transmission and distribution (T&D) networks and storage, reached a record USD 680 billion in 2015, up 4% on 2014 and 80% higher than a decade prior. Electricity’s share of total energy supply investment rose to 42% in 2015, compared with less than 40% during the past five years. This trend partly reflects the rising role of electricity in total final energy consumption, but also underlying cost and activity changes in both power and fossil fuel supply. Renewable energy investment

² Unless otherwise stated, economic and investment numbers cited in this report are presented in real USD (2015), converted at market exchange rates.

Table 1.1.1 • Investment in fossil fuel and electricity supply by region

USD 2015 billion	Oil and gas		Coal		Power generation			Renewables transport and heat	Electricity networks	TOTAL
	Upstream	Downstream and infrastructure	Mining and infrastructure	Coal, gas and oil	Nuclear	Renewables				
						Renewables	Renewables			
OECD	246	109	17	22	2	153	7	113	669	
Americas	193	62	6	7	0	52	1	58	380	
<i>United States</i>	136	46	4	5	0	39	1	49	281	
Europe	46	19	3	11	0	64	6	39	187	
Asia Oceania	7	28	8	4	2	36	0	15	102	
<i>Japan</i>	0	4	1	1	0	30	0	7	43	
Non-OECD	337	117	46	89	19	136	17	150	911	
Europe/Eurasia	67	23	6	3	5	2	0	16	122	
<i>Russia</i>	44	18	5	2	5	1	0	9	83	
Non-OECD Asia	87	30	36	73	15	110	15	108	473	
<i>China</i>	51	9	26	43	15	90	15	66	315	
<i>India</i>	7	4	7	18	0	10	0	20	66	
<i>Southeast Asia</i>	22	11	3	11	0	7	0	10	64	
Middle East	73	44	0	5	0	2	0	8	132	
Africa	49	8	2	5	0	4	1	7	77	
Latin America	61	13	1	1	0	17	1	11	107	
<i>Brazil</i>	33	5	0	0	0	10	1	6	55	
World	583	249	68	111	21	288	39	262	1607	
<i>European Union</i>	15	17	2	9	0	56	3	39	141	

Note: Investment is defined as overnight capital expenditures on new assets. See Introduction section. Renewables for transport and heat include biofuels for transport and solar thermal heating installations.

3. Investment in oil, gas and coal

Highlights

- **USD 900 billion was invested in oil, gas and coal supply in 2015, 18% less than in 2014 – the peak year in real terms.** Investment in upstream oil and gas plunged the most. It still made up 65% of total fossil fuel investment, down from more than 70%. Transportation and downstream investment fell less because of the long lead times of projects, many of which were launched several years ago.
- **Upstream oil and gas investment plunged by 25% in 2015 to USD 583 billion and is set to fall by a further 24% to about USD 450 billion in 2016 (in 2015 dollars).** For the first time in 30 years, investment will have declined for two consecutive years. The Middle East and Russia represent the most resilient regions, leading national oil companies to reach an all-time high of 44% of global upstream investment, while North American shale and other high development costs areas have seen the biggest reductions.
- **Upstream costs fell heavily in 2015 and 2016 after having more than doubled between 2000 and 2014.** The IEA Upstream Capital Cost Index dropped by 15% in 2015; a further 17% decline is expected in 2016. Costs fell most in North America, where the IEA Shale Upstream Cost Index dropped 30% in 2015 and an estimated 22% in 2016.
- **LNG investment reached historic highs in 2014 and 2015 with spending around USD 35 billion per year,** mainly due to the conversion and completion of liquefaction plants in the United States and Australia. However, as projects are completed, 2016 investment is expected to be about 30% lower. Only one final investment decision for a new LNG project has been taken in 2016 so far. An overhang of gas supply capacity has emerged with slower demand growth.
- **Reduced cash flow has forced most of the oil and gas companies to increase debt in order to finance capital spending and dividends.** Net debt to equity ratios have almost doubled across private oil and gas companies in the last two years, with North American Independents coming under severe financial pressures.
- **Investment in coal supply declined by 9% in 2015, a trend that is expected to continue in the near future.** Poor growth prospects for global coal demand and massive overinvestment in Chinese coal mining over the last decade underpin the trend.

Upstream oil and gas

Upstream operators slash spending as prices plunge

The biggest story in fossil-energy investment in 2015 and in the first half of 2016 was in upstream oil and gas, where both investment levels and costs collapsed, triggered by the drop in oil prices. This came on the heels of a prolonged and rising wave of investment. Between 2000 and 2014, investments in the upstream oil and gas sector increased almost fivefold, driven by higher oil and gas prices and rising unit costs. Capital spending grew by 12% on average per year in 2015 prices, from about USD 160 billion in 2000 to almost USD 780 billion in 2014.³ The cost of materials used in building and developing upstream facilities, and of services, equipment and drilling rigs, all increased steadily over this period, usually at double-digit rates.

North America was the main contributor to rising spending, due mainly to the surging production of unconventional oil and gas, which is typically more capital-intensive than conventional fields per unit of energy produced. Between 2010 and 2014, US tight oil production increased eightfold to an average of around 3.6 million barrels per day (mb/d). Over the same period, shale gas production more than doubled, reaching 380 billion cubic metres (bcm). This was underpinned by a doubling of oil and gas upstream spending in the region, taking North America's share of global oil and gas investment close to 40%, about twice its share in 2000. The region accounted for nearly half of the total increase in upstream investment between 2000 and 2014. All other regions saw increases in spending too, though at widely differing rates, given the regional variability in finding and development costs (Box 3.2).

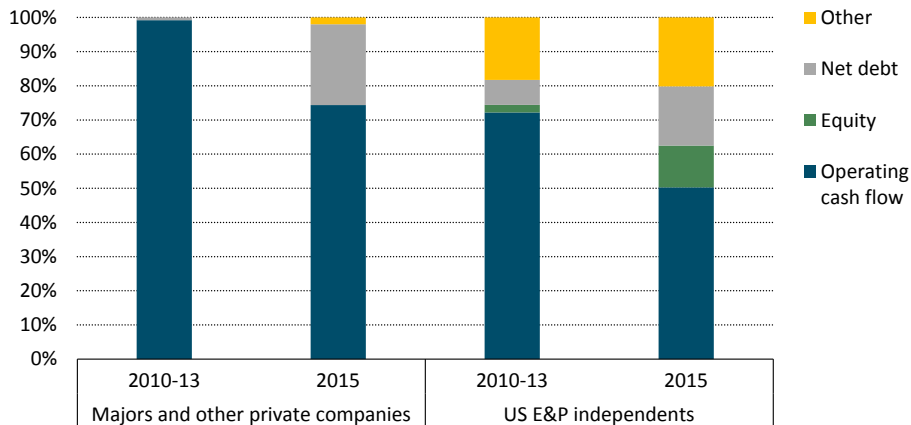
Global upstream investment fell dramatically following the oil price collapse in the second half of 2014. The drop amounted to 25% in 2015 and 24% in 2016 based on current plans (Figure 3.3). The total fall exceeds USD 300 billion over the two years – an unprecedented occurrence. Indeed, two consecutive years of reduced upstream investment had not been seen for 30 years. Furthermore, there are no signs that companies plan to increase their upstream capital spending in 2017. Many operators have revised downwards their 2016 capital spending guidance throughout the year and, as of September 2016, they plan to maintain 2017 investment at 2016 levels or even reducing it further, taking advantage of the sector's cost deflation and efficiency gains.

³ Adjusted for general inflation. The impact of the sector's cost trends is explored in a later section.

Majors and Independents

The spending plans of the oil Majors have been reduced in line with the drop in own cash flow and all, with the exception of Eni, have maintained their dividends. This has been achieved by reducing operating costs and share buybacks and scaling back capital investment. Nevertheless, the net debt of the Majors and large private oil companies has increased sharply since 2014 as they have sought to maintain dividends (Figure 3.16).

Figure 3.16 • Sources of finance for world upstream oil and gas investment by type of company



Note: The estimates shown for Majors and other private categories are for the top 20 listed companies by market capitalisation excluding NOCs (such as PetroChina and Statoil) and US-based E&P Independents. US E&P Independents consist of 30 companies heavily involved in light tight oil with their market capitalisation ranging from large (e.g. Anadarko and EOG resources) to small (e.g. Bill Barrett and Comstock). Other comprises mostly asset sales. Net debt is total debts minus cash and cash equivalents. Source: Analysis based on company disclosures and Bloomberg LP (2016), *Bloomberg Terminal*.

US exploration and production (E&P) Independents do not have the magnitude of financial market access that the Majors enjoy. For many US E&P Independents with heavy exposure to tight oil, negative earnings have squeezed cash flows, requiring them to increasingly raise equity and debt, as well as sell assets to compensate for lower cash flow (Figure 3.17). Preliminary analysis of earnings in the first quarter of 2016, when oil prices reached their lowest levels, indicates that the net debt/equity ratios of these companies stayed high. Given the shorter tight oil investment cycle, Independents were able to cut back spending by 45% between 2015 and 2016 as their cash flow was squeezed.

Since the beginning of 2015, the credit ratings of over 130 US E&P Independents have been downgraded by major credit agencies, leaving many of them at non-investment grade. This has raised their cost of debt, further reducing the profitability of investments already hit by lower oil prices. This is exacerbating volatility in the US shale industry, which has demonstrated some characteristics of a financial bubble (Box 3.4).