World Energy Outlook 2015

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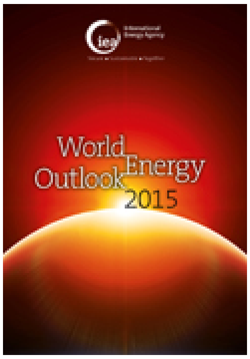
Corrigendum

Please note that despite our best efforts to ensure quality control, errors have slipped into the World Energy Outlook 2015



The text in pages 8, 10, 27, 47, 48 has changed. It should be replaced by the following pages.

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smaller, more remote or more challenging reservoirs, although the effect is dampened by technology and efficiency improvements. By contrast, cost reductions are the norm for more efficient equipment and appliances, as well as for wind power and solar PV, where technology gains are proceeding apace and there are plentiful suitable sites for their deployment. Fossil-fuel consumption continues to benefit from large subsidies: we estimate this global subsidy bill at around $490 billion in 2014, although it would have been around $610 billion without reforms enacted since 2009. Subsidies to aid the deployment of renewable energy technologies in the power sector were $112 billion in 2014 (plus $23 billion for biofuels). Supportive government policies and related subsidies continue to be critical to most of the capacity deployed, as only a few countries put a significant price on carbon in our central scenario. The need for subsidies however, is restrained by a shift in deployment to countries with higher quality renewable resources, by continued cost reductions and higher wholesale prices. A 50% rise in subsidies, to an estimated $170 billion in 2040, secures a five-fold increase in generation from non-hydro renewables (without the cost reductions and higher wholesale prices, the subsidy bill in 2040 would exceed $400 billion). The share of non-hydro-renewables that is competitive without any subsidy support doubles to one-third.

The direction of travel is changing, but the destination is still not 2 degrees

Despite the shift in policy intentions catalysed by COP21, more is needed to avoid the worst effects of climate change. There are unmistakeable signs that the much-needed global energy transition is underway, but not yet at a pace that leads to a lasting reversal of the trend of rising CO_2 emissions. Annual investment in low-carbon technologies in our central scenario increases, but the cumulative $7.4 trillion invested in renewable energy to 2040 represents only around 15% of total investment in global energy supply. The steady decarbonisation of electricity supply is not matched by a similarly rapid shift in end-use sectors, where it is much more difficult and expensive to displace coal and gas as fuels for industry, or oil as a transport fuel. The net result is that energy policies, as formulated today, lead to a slower increase in energy-related CO_2 emissions, but not the full de-coupling from economic growth and the absolute decline in emissions necessary to meet the 2 °C target. A *WEO* special report released in June 2015, *Energy and Climate Change*, showed what more can be done, at no net economic cost, to bring about a peak in energy-related emissions by 2020 – an essential step if the door to a 2 °C outcome is to remain open:

- Increasing energy efficiency in the industry, buildings and transport sectors.
- Progressively reducing the use of the least-efficient coal-fired power plants and banning their construction.
- Increasing investment in renewable energy technologies in the power sector from $270 billion in 2014 to $400 billion in 2030.
- Phasing out of remaining fossil-fuel subsidies to end-users by 2030.
- Reducing methane emissions in oil and gas production.

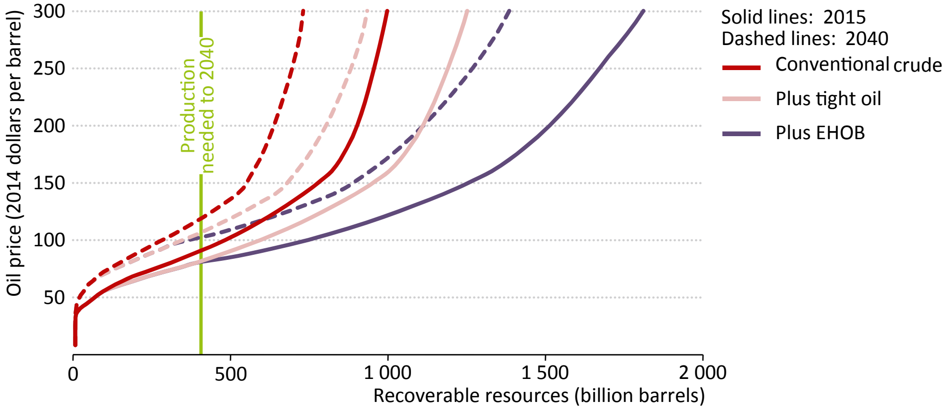
Table 1.6 ▷ Fossil-fuel import prices by scenario

		New Policies Scenario			Current Policies Scenario			450 Scenario			Low Oil Price Scenario		
	2014	2020	2030	2040	2020	2030	2040	2020	2030	2040	2020	2030	2040
Real terms (2014 prices)													
IEA crude oil imports ($/barrel)	97	80	113	128	83	130	150	77	97	95	55	70	85
Natural gas ($/MBtu)													
United States	4.4	4.7	6.2	7.5	4.7	6.3	7.8	4.5	5.7	5.9	4.7	6.2	7.5
Europe imports	9.3	7.8	11.2	12.4	8.1	12.5	13.8	7.5	9.4	8.9	5.9	8.9	11.4
Japan imports	16.2	11.0	13.0	14.1	11.4	14.9	16.0	10.7	11.8	11.1	8.8	10.7	12.4
OECD steam coal imports ($/tonne)	78	94	102	108	99	115	123	80	79	77	88	97	102
Nominal terms													
IEA crude oil imports ($/barrel)	97	89	153	210	92	176	246	85	131	156	61	95	140
Natural gas ($/MBtu)													
United States	4.4	5.2	8.3	12.3	5.2	8.6	12.8	5.0	7.6	9.7	5.2	8.3	12.3
Europe imports	9.3	8.6	15.1	20.3	9.0	16.9	22.6	8.4	12.7	14.6	6.6	12.1	18.7
Japan imports	16.2	12.2	17.6	23.1	12.6	20.1	26.3	11.9	15.9	18.2	9.8	14.4	20.3
OECD steam coal imports ($/tonne)	78	104	138	178	110	155	202	89	106	126	98	130	168

Notes: MBtu = million British thermal units. Gas prices are weighted averages expressed on a gross calorific-value basis. All prices are for bulk supplies exclusive of tax. The US price reflects the wholesale price prevailing on the domestic market. Nominal prices assume inflation of 1.9% per year from 2014.

The rebound in prices occurs most rapidly in the Current Policies Scenario, because of higher oil consumption, with the average IEA crude oil import price – used as a proxy for international oil prices – approaching $83/barrel (in year-2014 dollars) in 2020 in this scenario. In the New Policies Scenario, the market tightens less quickly and the oil price reaches $80/barrel in 2020.

Figure 1.4 ▷ Non-OPEC supply cost curves for 2015 and 2040 in the New Policies Scenario



Notes: EHOB = extra-heavy oil and bitumen. The vertical green line indicates the amount of production required between 2015 and 2040 in the New Policies Scenario

The oil price trajectories are determined by the level needed to stimulate sufficient investment in supply in order to meet projected demand in each scenario. Higher demand in the Current Policies Scenario means a higher call on oil from costly fields in non-OPEC countries. Conversely, in the 450 Scenario, more aggressive policy action to curb demand means that market equilibrium can be found at a lower price. The non-OPEC supply cost curves for 2015 and 2040, derived from the WEM, help to illustrate the underlying logic behind the various long-term trajectories (Figure 1.4). As might be expected, a higher oil price allows an increased volume of resources to be developed, including larger volumes of unconventional oil. But the picture also changes over time: the 2040 cost curves, illustrated here for different non-OPEC resource categories in the New Policies Scenario, are higher and steeper than those for 2015, as capital and operating costs are pushed higher by the gradual depletion of the resource base and the need to develop more challenging or remote fields.[11] The relationship between the supply cost curves and oil prices is not straightforward, but the inference is that a price in the range of $80-120/barrel is likely to be required to enable supply to meet demand in

11. The situation is complicated by the two-way interaction between costs and prices: an increasing oil price pushes up industry activity levels, tightening markets for upstream supplies and services (and meaning that higher prices also tend to lead to higher costs). Likewise, as shown in 2014-2015, an oil price fall is accompanied by strong pressure on supply and service providers to reduce costs. This correlation between oil prices and industry costs is captured in the way that costs are modelled in the World Energy Model.