

Is the Oil-Price Increase from 2003 to 2005 an Indicator of a Long-Term upward Shift in the Price of Oil?

Wolfgang Mostert, Management Consultant, Energy Sector

Dalparken 6, 2820 Gentofte, Denmark. Phone: +45 39 63 61 31, email: Wolfgang@mostert.dk

In 2004, when the price of crude oil averaged \$34 per barrel, the Energy Information Agency (EIA) in *International Energy Outlook 2004* (IEO2004) and the International Energy Agency (IEA) in

Oil Price Scenarios 2010-2030 WEO2004 and WEO2005		
Period	WEO 2004 Year 2004 price level	WEO 2005 Year 2004 price level
2010	Reference Scenario: US\$24	Reference Scenario: US\$35
2020	Reference Scenario: US\$28	Reference Scenario: US\$37
2030	R.S.: US\$31 (average 2005-2030 of US\$27, average H.P.S = US\$38)	Reference Scenario: US\$39 High Price Scenario: US\$52

World Energy Outlook 2004 (WEO2004) answered no to the question. IEO2004's *reference scenario* saw the oil price rise slowly to \$28 per barrel in 2025; while *WEO2004's reference scenario* saw an oil price of US\$24 in 2010, after which it increased to US\$31 in year 2030.

In 2005, when the average oil price was above US\$50, both organizations adjusted their price scenarios upwards. The reference scenario price in WEO2005 for 2030 was raised from US\$31 to US\$39, that is, by 26%; the "deferred investment scenario" price

was US\$51. IEO2005 made similar adjustments with the oil price in 2025 reaching \$22 in the low world oil price case, \$36 in the reference case, and \$49 in the high world oil price case.

Such a change in opinion within a year leads to questions about the credibility of IEA's and EIA's scenario approaches, in particular, as IEA's past oil price scenarios have turned out to be unrealistic.

In 1980, influenced by the two oil chocks of the 1970s, IEA forecast a doubling in the price of oil from US\$70 in 1980 to US\$140 in 2000.¹ The price in year 2000 turned out to be one sixth of IEA's forecast.

During the next 15 years, the price projections in IEA's publications kept the *resource-pessimistic* mindset, that an upward price trend for oil is inevitable. Projections typically showed the oil price edging upward 2-3% per year in fixed prices from the year-of-publication price before levelling off after 10 to 20 years. But due to falling oil prices after 1980, the start-off price in the year of publication kept falling and thereby also the "final year" price.

After for many years calling "the price will rise" without seeing it happen, IEA changed the tune. With WEO1996 IEA adopted the *market fundamentalist* mode of thinking: all forecasts from now showed a flat oil price in the medium term followed by a modest upward trend in the long-term. Yet, also this time, the price projection in each WEO was lower than in the previous WEO. WEO1996 projects a flat oil price until 2000; WEO1998, WEO2000, WEO2002 and WEO2004 until 2010. WEO2000 and WEO2002 in addition reduced the post-2010 rate of price increase which was assumed in the previous WEO.

¹ All prices in the this paper are in year 2004-purchasing power, deflator: US consumer price index.

The price forecasts of the “*resource pessimistic WEOs*” – except WEO1994 – **overestimate** the oil up to 2005 as they all underestimated the supply of oil from non-OPEC sources, which made it difficult for OPEC to raise prices substantially above the marginal cost of non-OPEC supply. The *market fundamentalist WEOs*” all **underestimate** the oil price up to 2005. WEO2004 attributes this to the appearance of sustained OPEC cohesion since 1999 and to ongoing global tensions”. To this one can add IEA’s underestimation of the strength of China’s and the world demand for oil.

IEA’s dismal scenario record demonstrates the old truth that “it is difficult to forecast, in particular the future”.² That statement is particularly relevant for the oil market. Because the short term price elasticity of oil demand is close to zero, the oil market reacts hysterically to changes in demand and supply: a 1% change in the balance brought about by coinciding short-term factors can trigger a 30-50% short-term increase in the price of crude oil. *Short term large price fluctuations* are, therefore, a normal feature of the international oil market. In 1999, the price of crude oil hit a historical low of US\$9 per barrel; in 2005 the average price of crude oil imported in IEA-countries during a few days came close to the 1981 price record of US\$70. The 2003-1005 price jump is, therefore, not a sufficient indication of a structural shift in the international oil market.

An assumption that the average price of oil during the next 25 years will be significantly higher

Ave. Oil Prices 1920-2030 US\$/bl		
Period	Average Price Year 2004 price level	OPEC’s Production and Share of Total Supply
1920-1970	US\$16	
1973-1984	US\$56/bl	1973: 55% ~28 mbd
1985-2004	US\$24/bl	2004: 38% ~29 mbd
2005-2030	US\$40-45/bl (Mostert forecast)	2030: 44% (WEO2005RS) (WEO2004=54%) 2030: 50 mbd (WEO2005RS) (WEO2004=68mb/d)

than during the previous 25 years has to be grounded in a **theory of discontinuity**: the identification of fundamental shifts in the factors that shape the oil market. Looking back³, we can see that *structural shifts do occur*: the stability in the long-term average price of oil (indicating the presence of strong self-correcting demand and supply factors) was broken in 1973: after the turbulent 1973-84 period (the 1973 and 1979 oil crisis) the price of oil during the “back-to-normal” 1985 to 2004 period of US\$24 was 50% higher than the US\$16 price during the 1920-70 period. The causal structural factors are easy to identify: the change in the elasticity of supply

introduced by OPEC’s emergence in 1973 as a *production fixing cartel* of 11 oil exporting countries and the *nationalization of the oil industry* in the Middle East countries.⁴

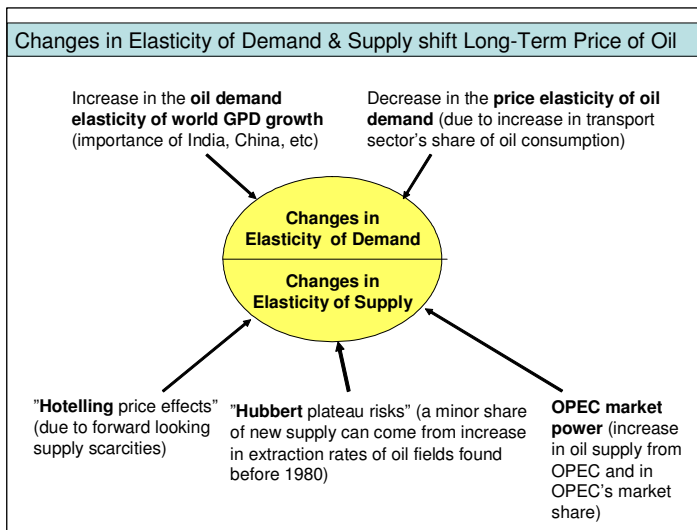
Looking forward towards the next 25 years, the issue for discussion is whether new structural shifts can be identified that make it likely to shift the market balance once more?

² Niels Bohr, nuclear scientist, Nobel prize winner.

³ “Life is lived forward, and understood backwards”. Soeren Kierkegaard, philosopher of existentialism

⁴ Although this is pretty clear evidence, IEO2005 nevertheless states: “Despite evidence that OPEC members have achieved some of their price goals in recent years by using a price-band strategy, production cutbacks have historically had only limited success.”

The answer is yes. Demand side and supply side factors interact to create a tighter oil market during



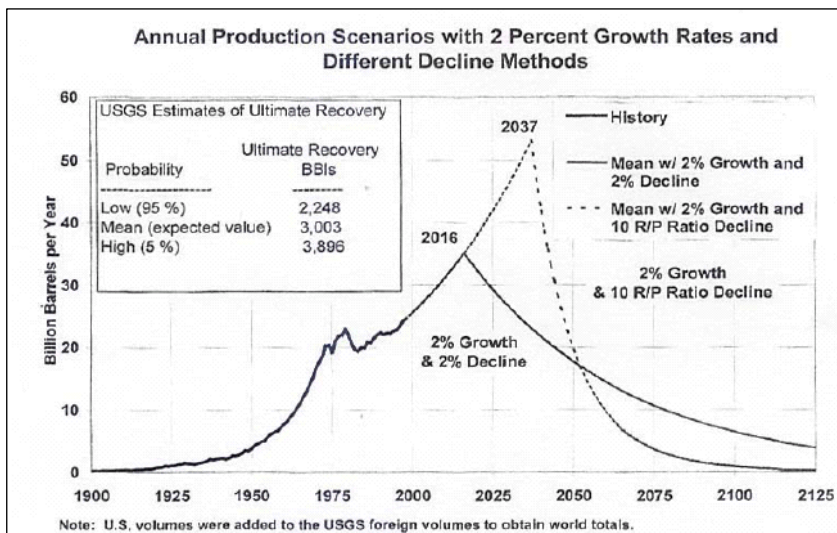
the 2006-2030 period compared with the demand-supply situation during the 1981-2005 period: the supply side as well as the demand side will be less elastic in the future. The low price scenarios of IEA and EIA showing a price lower than during the previous 25 years make no sense and serve no purpose!

On the *demand side* two factors interact to reduce the elasticity of demand. First, the *GDP-elasticity of the demand for oil* will be higher. From 1979 to 2004, world GDP growth averaged 2.9%, and the growth in world oil consumption 1.1% per year,

yielding a GDP growth/oil growth ratio of less than 0.4. The "*oil growth-GDP growth ratio*" for 2005-2030 is expected to be higher because an increasing share of world GDP growth comes from oil-thirsty emerging economies. Second, the *price elasticity of world oil demand* will be lower than in the past because the increasing concentration of oil use in the transport sector reduces the oil substitution possibilities.

The *elasticity of supply* will be reduced by "geology" and by the increase in OPEC's ability to exercise market power.

Supply side pessimists are concerned about the *Hubbert hypothesis* that oil supply in a region peaks when half the extractable resource is consumed; for "conventional oil" that will happen before 2030. Assuming an average extraction rate of 55% of the world's conventional oil resources, and an original endowment of some 6 trillion barrels of oil, some 3.5 trillion barrels of conventional oil can be produced. The expected cumulative consumption between 2005 and 2030 of one trillion



barrels of crude oil equals the past extraction of oil up to 2004. By 2030 only about 1.5 trillion barrels of extractable conventional oil will be left in the ground. Supply optimists, including IEA and EIA believe that increased supply from the production of non-conventional oil and use of enhanced oil production technology can cover the projected growth in demand of 1.6-2.0 percent per year until 2037, whereupon production of conventional oil drops almost vertically. Thus,

IEA and EIA discard the idea of a Hubbert peak occurring around 2016.

IEO2004's "mountain peak" production scenario may be technically-geologically feasible. But it is incompatible with the market mechanism: if the market believes in a production peak in 2037, a "*Hotelling-price effect* (optimal pricing policy for a monopolist holding an exhaustible resource) will start raising prices long before that year and impose a flatter "hill" profile for the supply of oil. According to WEO2004, the reference scenario prices reflect IEA's "judgement of *the prices that will be needed to encourage sufficient investment in supply to meet projected demand*". That misses the point. The issue is not whether prices are high enough to attract whatever investment is needed – they certainly are. The issue is whether, if demand and supply develops as projected, producers would be willing to sell at the scenario prices. Market actors will by 2025 know that they are looking at a more than US\$100 per barrel oil price 13 years down the road. No producer will supply oil at IEO2004's US\$28 price in 2025, knowing that the same oil sold 13 years later can fetch an additional US\$75. Assuming a 10% discount rate, and a variable cost of oil production of US\$2.5/barrel, producers will, as a minimum, ask for a US\$33 price in 2025 and for US\$53 in 2030.

The development in world oil supply increases *OPEC's ability to manipulate the market* in its favour. During the previous 25 years, all increment in world oil supply was covered by supply from non-OPEC countries, which increased from 32 mbd in 1980 to 51.5 mbd in 2004. OPEC's share of world oil production dropped from 53% in 1973 to 38% by 1985, and OPEC's output of 28 mbd in 1980 was first regained in 2004. In the intervening period, there was substantial excess supply capacity in OPEC-countries, which made it difficult for OPEC to keep discipline when production quotas were agreed upon. In pursuing its policy of production restraints, OPEC faces two problems of economic self-interest. The first is that all oil producers in the world benefit from the higher oil price achieved by a production cut, but only OPEC carries the burden in terms of reduced physical sales of crude. Since OPEC acts as the marginal producer, higher oil prices hit OPEC sales of oil with a double hammer in the medium term: total oil demand goes down and non-OPEC supply increases leaving OPEC with a sharply reduced market. This is the collective member issue: is a high price policy in OPEC's interest? The second problem is that all OPEC members in case of a decided cut-back in production end up with surplus production capacity. This tempts individual members to cheat by "secretly" producing above the allocated quota and "secretly" selling the extra output on the market. The higher the surplus capacity, the more difficult it is to agree on production cuts and the higher is the temptation to cheat. The reverse is equally true: the lower the surplus capacity of OPEC, the stronger is the cartel's ability through production cuts to impose its target price on the market. That will be easier in the future: WEO2004's reference scenario expects in 2030 *conventional oil production* in non-OPEC countries to be lower than in 2005, while unconventional oil⁵ provides 10 mbd, equal to 8% of oil supply; and OPEC-countries regain a 53% share of world oil supply.

What conclusions do IEA and EIA draw from the structural changes taking place on the market? Both underline that they do not engage in price forecasts, they do scenarios! WEO2005 analyzes three scenarios:

- The *Reference Scenario* has as its premise that governments stick with current policies; no new and stronger energy policy instruments are introduced.
- In the *Deferred Investment Scenario*, OPEC members exercise production restraint to drive up the price of oil.

⁵ Definition: oil that does not flow freely to a well; but has to be mined or heated to be extracted.

- *The World Alternative Policy Scenario*“ depicts the energy future that might emerge if consuming-country governments press ahead with the vigorous new policy measures already being contemplated. They involve promoting more efficient energy use and switching away from fossil fuels, for environmental or energy-security reasons.” In the Scenario, global primary energy demand is about 10% lower in 2030 than in the Reference Scenario.

Although both IEA and EIA accept that OPEC through its production quotas can manipulate the market, none of them assign any major importance to it. WEO2004 and WEO2005 conclude that a higher average price for oil is not in OPEC’s interest; IEO2004 and IEO2005 doubt that OPEC members can get their act together.⁶ IEA draws the following conclusion from the “Deferred Investment Scenario” in WEO2005: “The increase in prices fails to compensate for lower export volumes. Over 2004-2030, the cumulative value of aggregate MENA oil and gas export revenues would be more than a trillion dollars lower (in year-2004 prices) than in the Reference Scenario. The loss of revenues is almost five times more than the reduction in oil and gas investment. Revenues also fall in terms of net present value. Oil accounts for about 70% of the fall in revenues.”

IEA’s methodology for analysing OPEC’s economic self-interest is questionable. The following weaknesses can be pointed out.

First, it is obvious that the correct approach to revenue analysis is to look at the NPV of *OPEC’s net revenue*. To calculate the difference in *total revenues* as IEA does and then add the difference in the costs of investment and NPV-calculations as an afterthought is not the right way forward. It is correct that the economic rent of OPEC oil production is huge; yet, when we look at marginal revenue analysis, the cost of expanded oil production is not insignificant: OECD’s Economic Outlook No. 76 from 2004 quotes a cost of production for new oil fields in the Gulf states of US\$7 per barrel: US\$5 for investment in exploration and development and US\$2 for cost of operation.

Secondly, by comparing the “deferred investment scenario’s” oil demand and oil prices with the “reference scenario’s” oil demand and oil prices, IEA *overestimates the de facto price elasticity of world oil demand* to an OPEC-induced price increase. The realistic scenario for the behaviour of consumer countries – irrespective of OPEC’s policy – is the *World Alternative Policy Scenario*. We all know that the energy policy of OECD countries will change due to concerns about security of oil and gas supply and about the higher greenhouse gas emissions that would result from the reference scenario. IEA, therefore, totally overestimates the demand reaction to the increased oil and gas prices in the deferred investment scenario. Most of the demand reduction and substitution potential of a OPEC high price policy will be sucked up by the policy measures in the “world alternative policy scenario”. What remains is the non-OPEC oil supply reaction.

Thirdly, IEA overlooks the *wealth-depletion effect of a low-price OPEC policy*. The NPV of the net-revenue from selling saved oil resources 15-20 years later on the market must either be added to the net revenue of a high-price policy or be deducted from the revenue stream. If OPEC assumes pessimistically that the oil price after 2038 is US\$50 and OPEC cost of production US\$7 per barrel, then the NPV of the net revenue of a barrel saved between 2005 and 2030 and sold 20 years later is US\$6.4 per barrel (discount rate of 10%).

⁶ IEO2005:” OPEC’s market management strategies have often ended in failure, and its successes for the most part have been the result of tight market conditions and disciplined participation by OPEC members. Currently, spare production capacity worldwide—with the exception of two or three Persian Gulf members of OPEC—is negligible, making OPEC’s consensus building easier.

Fourthly, the assumed pricing policy of OPEC is not in agreement with the findings of behavioural finance: that in trading off present and future consumption, people apply higher discount rate in the short term than in the long term.⁷ The temptation of OPEC politicians to squeeze the lemon in the short run whenever the occasion arises will be strong.

Thus, the realistic “reference scenario” for international policy makers, who are interested in seeing the future and evaluate their pricing and investment policies is a combination of the “deferred investment scenario” and the “world alternative policy scenario”. A reasonable price assumption for the 2005-2030 period is an average price of US\$40-45; a higher price of US\$45 and above is possible, but would make a number of synthetic oil technologies very favourable.

⁷ A person being asked whether he/she prefers €1000 in year 2005 or €1100 in year 2006 and opts for the €1000, will most likely prefer €1100 in the year 2016 to €1000 in the year 1000!