MEDIUM-TERM OIL & GAS MARKETS 2011

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International Energy Agency

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PART 1: OIL

International Energy Agency

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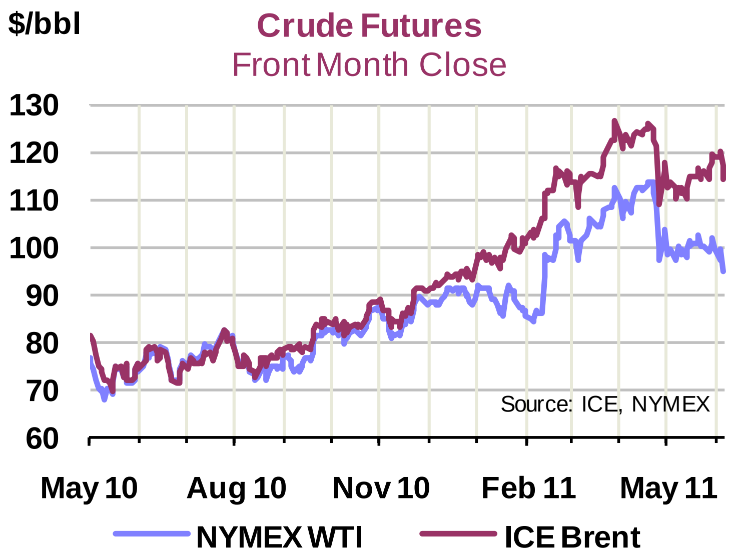
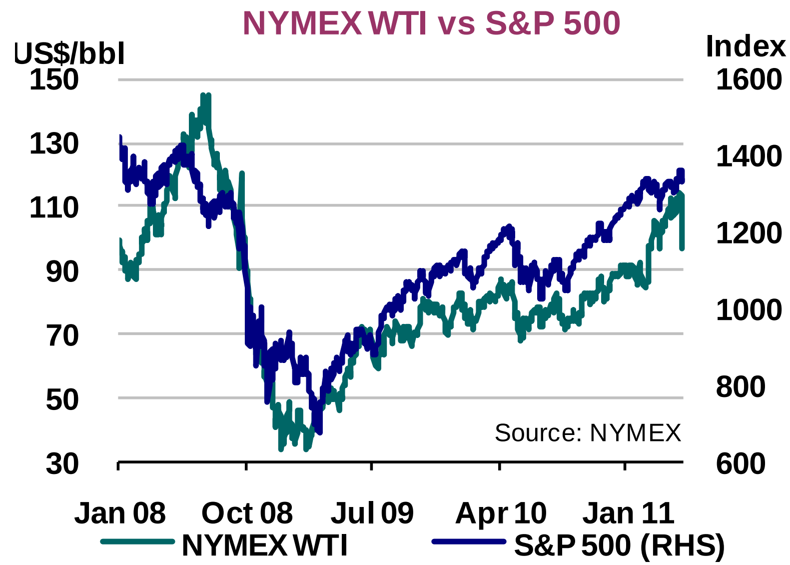
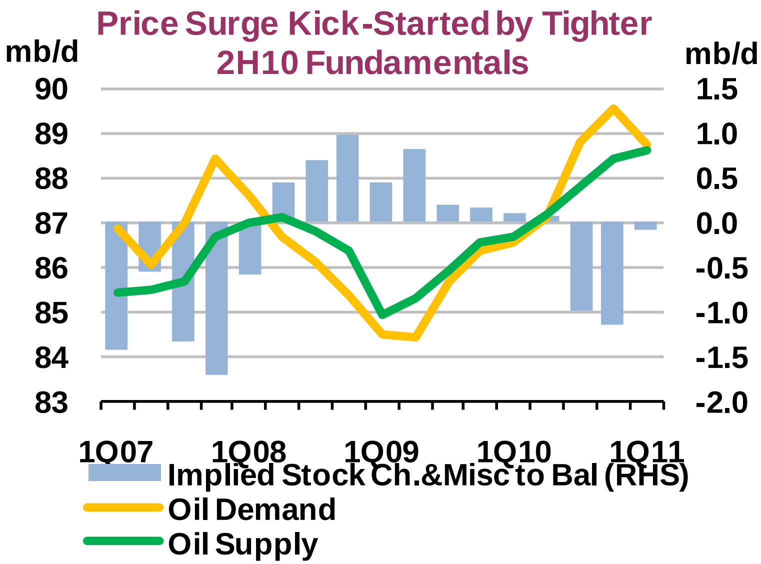
Recent Correction, but Oil Prices Remain High

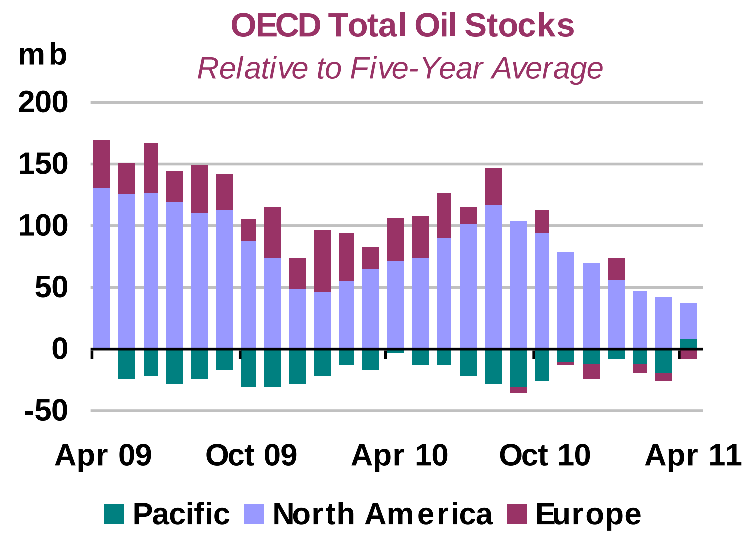




- Futures prices oscillating around $112/bbl Brent and $95/bbl WTI
- Libyan outage, MENA supply risks, resilient non-OECD economy, buoyant financial markets are still counteracting…
- …fears on economic impact of high prices, demand destruction, and an (albeit diminishing) degree of supply flexibility
- Despite cross-commodity sell off on 5 May, bullish pressures remain

Tightening Fundamentals Since Mid-2010





- Data lags mean the extent of physical market tightening in second-half 2010 wasn't immediately apparent
- Demand exceeded supply by average 1.1 mb/d in 2H10
- 2010 demand growth of 2.8 mb/d not far off 2004's surge, as global economy rebounded by 4.8%
- +4.3% GDP now equates to +1.3 mb/d for 2011 (non-OECD)
- China continuing to generate~35% of total growth (incl 1Q middle distillate stock builds) and gasoil/diesel 40%
- OECD stocks have tightened, overhang now largely US crude

Key Assumptions for the Outlook

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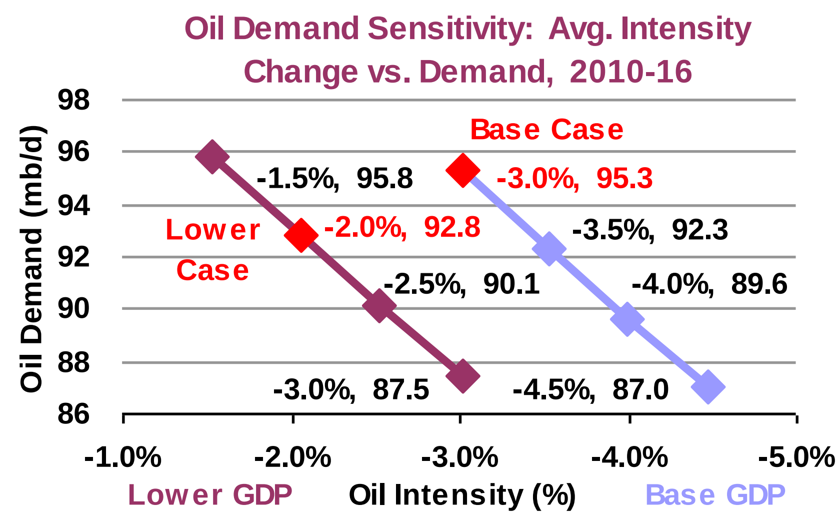
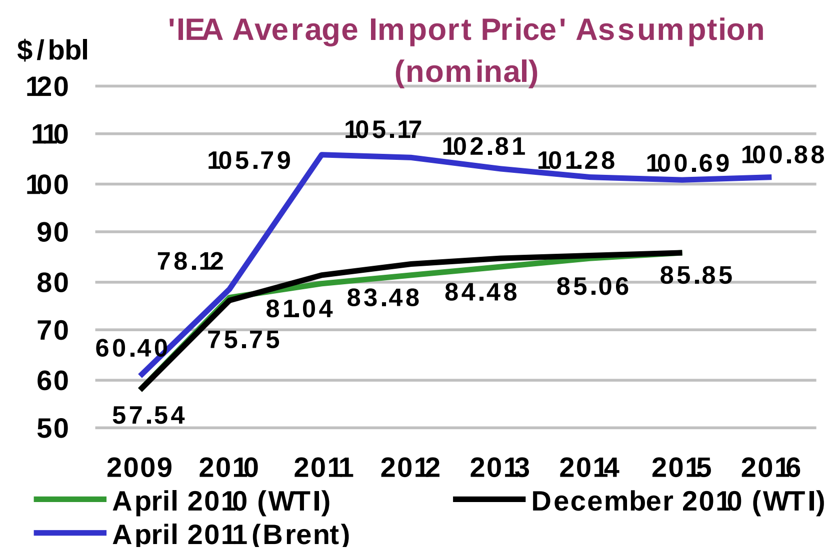
- Ongoing economic uncertainty, so two GDP scenarios retained
- Base case sees 4.5% GDP growth twinned with 3% pa reduction in oil intensity
- Low GDP case equates annual 3.3% GDP and 2% intensity reduction
- Volatility in WTI/Brent differentials sees switch to Brent futures strip as price underpinning for *MTOGM*
- Current assumption for 2011-2016 nominal IEA crude import price is circa $103/bbl, around $20/bbl higher than used in 2010





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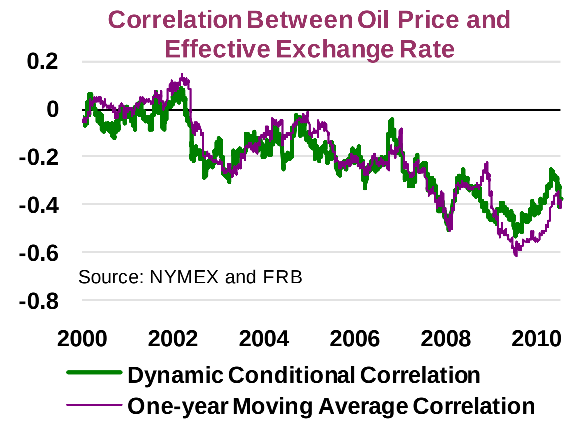
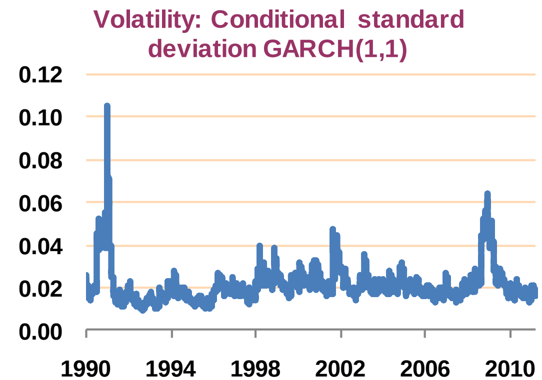
Myth or Reality? The $, Volatility & Speculation

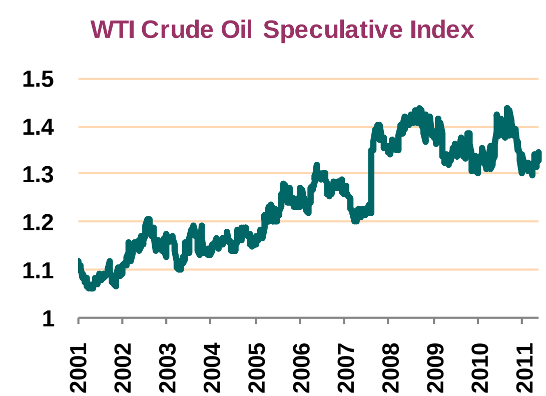
- US dollar weakness frequently cited as a cause of high oil prices
- Granger tests - causality from price to exchange rate, but reverse also possible, due to demand or inflation hedge
- In reality, price and ER may be jointly determined

- Commodities inherently volatile, notably price-inelastic oil
- 2008/9 volatility was temporary, & less extreme than early-90s
- But new financial players & rise in non-commercials raises 'excessive speculation' concerns

- Recent speculative levels similar to other commodity markets, & lower than in 2008, relative to risk hedging appetite
- So fundamentals may remain more important than many think



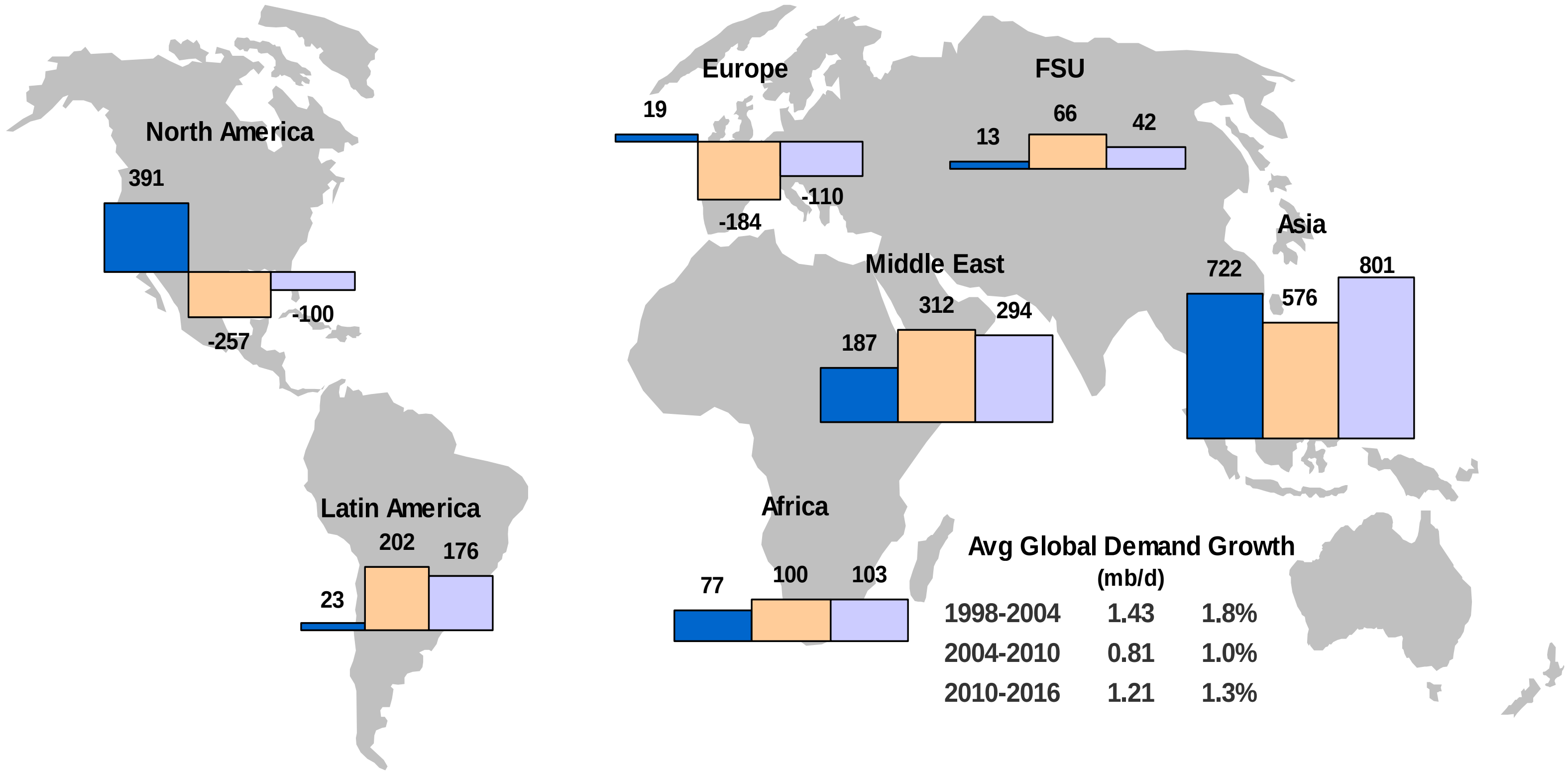




Emerging Markets Underpin Demand Growth

Average Global Oil Demand Growth 1998-2004/2004-2010/2010-2016

thousand barrels per day



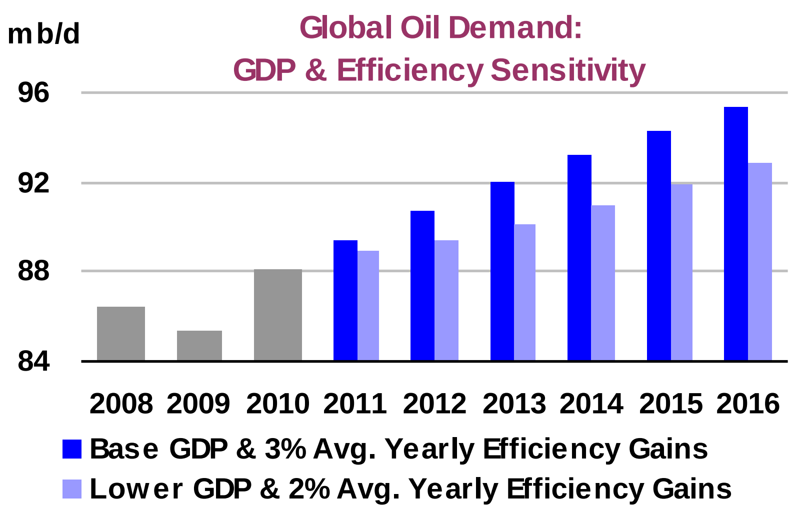
Avg Global Demand Growth

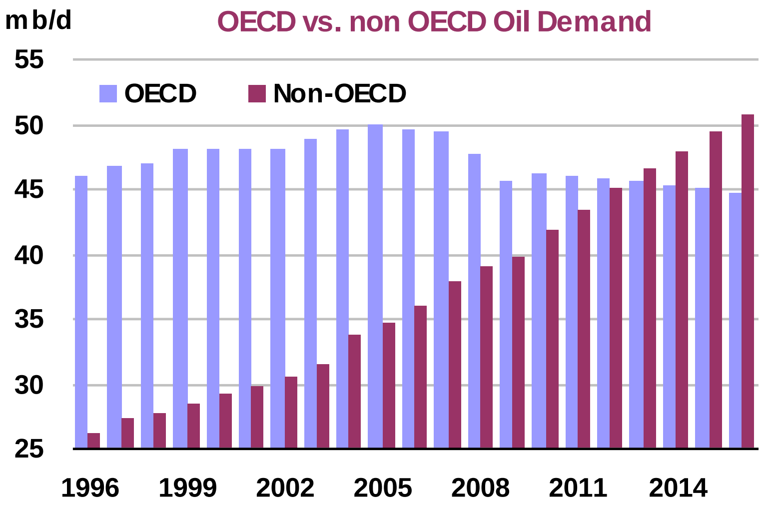
(mb/d)

1998-2004	1.43	1.8%
2004-2010	0.81	1.0%
2010-2016	1.21	1.3%

- **Crucially, since non-OECD income growth will remain the primary demand driver, higher international oil prices are likely to have a minor effect…**
- **…except in the OECD, compounding market saturation, efficiency gains, behavioural changes and interfuel substitution**

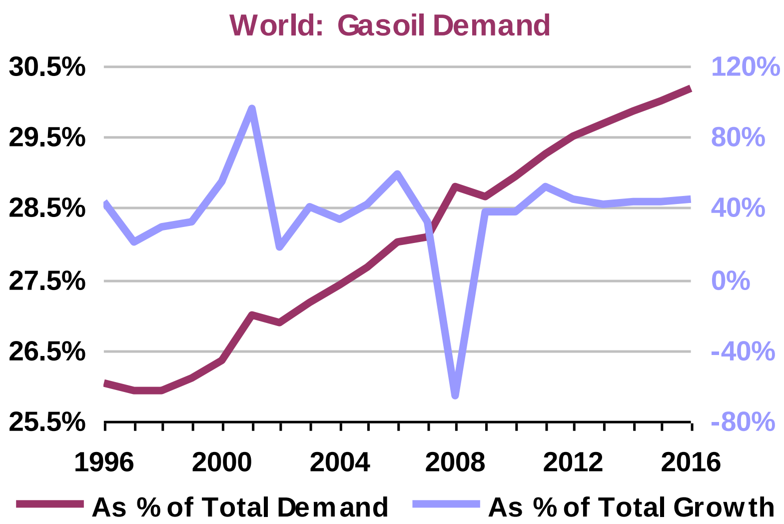
Income Growth & Efficiency Key Demand Drivers

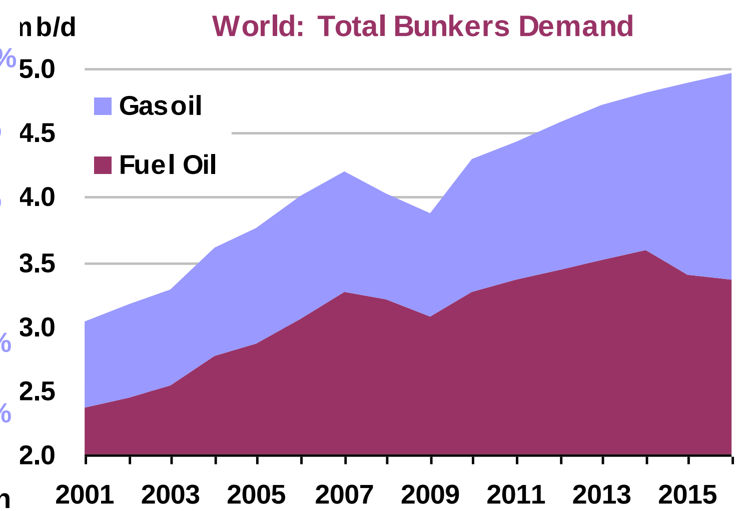




- <u>Base case oil demand rises 1.2 mb/d per year</u>, to 95.3 mb/d in 2016
  - +4.5% yearly GDP & oil intensity falls 3% per year, near recent trends
  - Income growth outstrips the price impact of average $103/bbl oil
- <u>Lower GDP case generates slower growth, near +0.8 mb/d yearly</u>
  - GDP growth 25% lower, and oil intensity falls a lesser 2% annually
  - In this case, *2016 global demand is 2.4 mb/d lower*, at 92.8 mb/d
- In both cases, non-OECD generates all the growth, with China, Asia & the Middle East accounting for up to 94% of the increment
- Illustrates the importance of better non-OECD data
- Subsidies mean oil demand can grow, despite $100/bbl crude

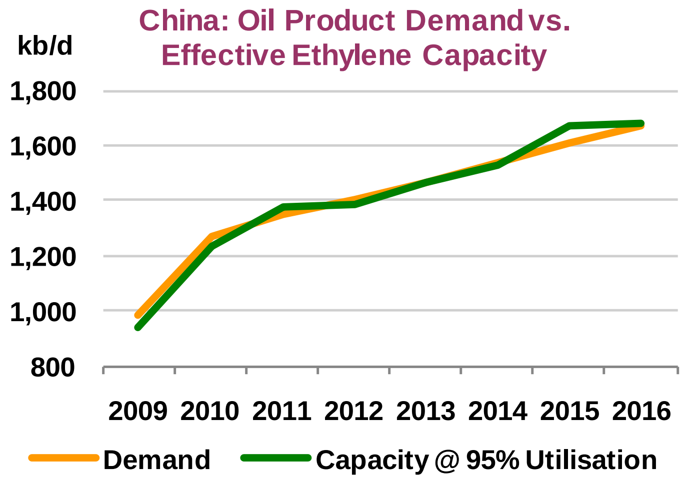
Transport & Gasoil Underpin Demand Growth

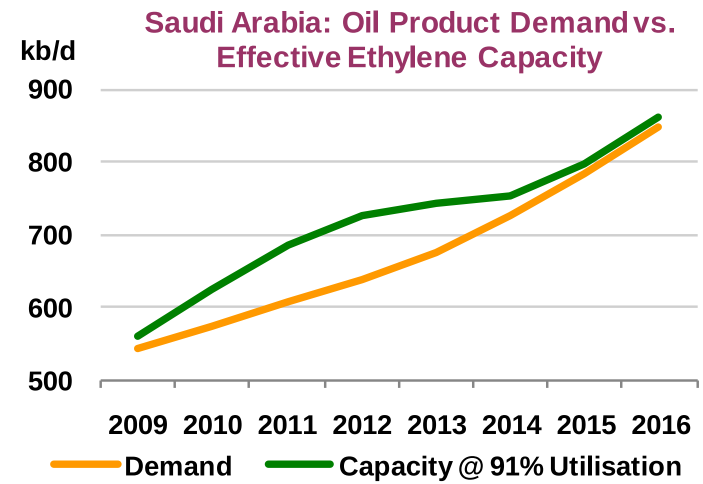




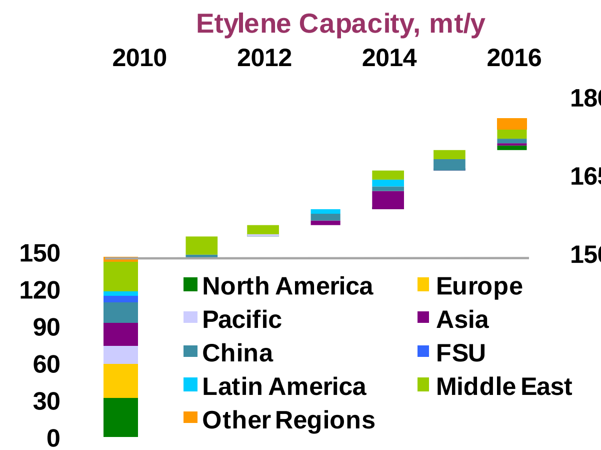
- Transport fuel use generates 65% of total oil growth, even though some will derive from biofuels and NGLs
- Oil has fewer short-to-medium term competitors in transport
- 40% of growth, 30% of total demand by 2016 will be gasoil/diesel
- Engine efficiency, all-round flexibility, make gasoil ‘ fuel of choice’
- Bunker sulphur quality changes and ever-present fuel switching possibilities add further lustre to gasoil’s rising star
- Bunker fuels rise from 4.3 mb/d to 5 mb/d, with residual fuel oil’s 75% share diminishing

Petrochemicals Another Growth Driver





- A further analytical step: modelling the medium-term global ethylene balance to assess its implications for petrochemical-based oil demand
- We estimate that oil-based feedstocks averaged 9.2 mb/d in 2010, rising to 10.9 mb/d in 2016



- New integrated LPG/ethane-oriented Middle East and naphtha-based Asian petrochemical/refining complexes are currently being built
- Will put pressure upon older, smaller and less integrated petrochemical facilities in the OECD and elsewhere

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'Hidden' Crude Demand - Strategic & Commercial Oil Storage Capacity Additions in Asia

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- **Why Asia?**
  - **Asia accounts for 2/3 of incremental oil demand in 2011-16**
  - **Import-dependent region**
  - **Crude imports predominantly long haul**
  - **Logistical and security challenges of rising import dependence**

Largest Strategic and Commercial Oil Storage Capacity Additions in Asia

million barrels per day

Country	Type	Fuel	Additions	Completion
China	SPR-I	Crude Oil	103.2	2008
	SPR-II	Crude Oil	169.0	2013
	SPR-III	Crude Oil	227.8	2016
	Commercial	Crude Oil & Products	235.0	2012/2015
India	SPR-I	Crude Oil	39.1	2013
	Commercial	Crude Oil & Products	24.1	2013
South Korea	Commercial	Crude Oil & Products	36.9	2016
Malaysia	Commercial	Crude Oil & Products	13.5	2014
Singapore	Commercial	Crude Oil & Products	11.1	2014
Indonesia	Commercial	Oil Products	2.4	2015
Total Strategic Additions (India + China)	SPR	Crude Oil	435.9	2016
Estimated fill (kb/d)			238.9	2012-2016
Largest Commercial Additions	Commercial	Crude Oil & Products	323.0	2016
Estimated fill (kb/d)			177.0	2012-2016

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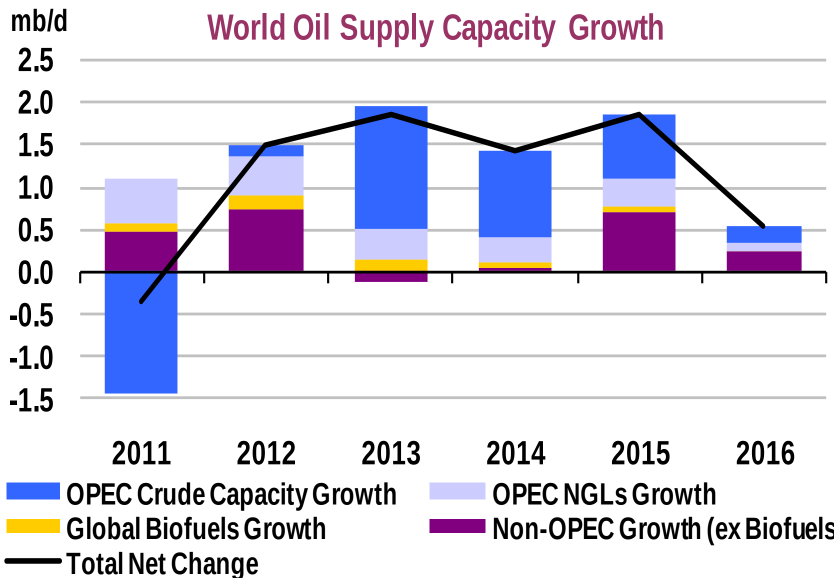
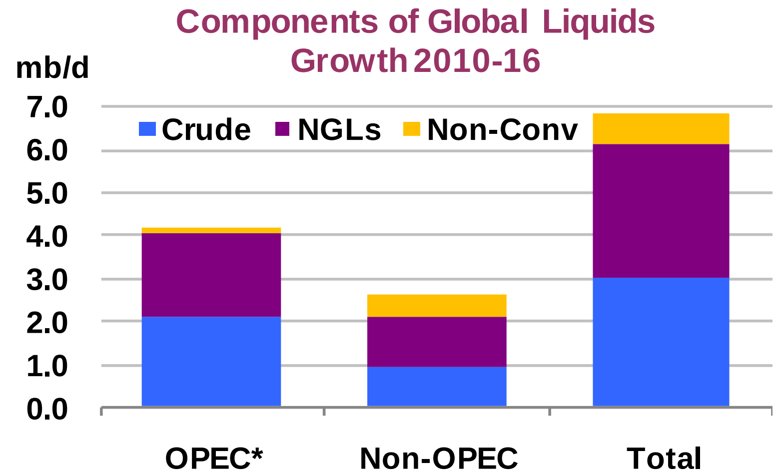
Oil Production Capacity Growth Now More Robust, but Challenges Remain



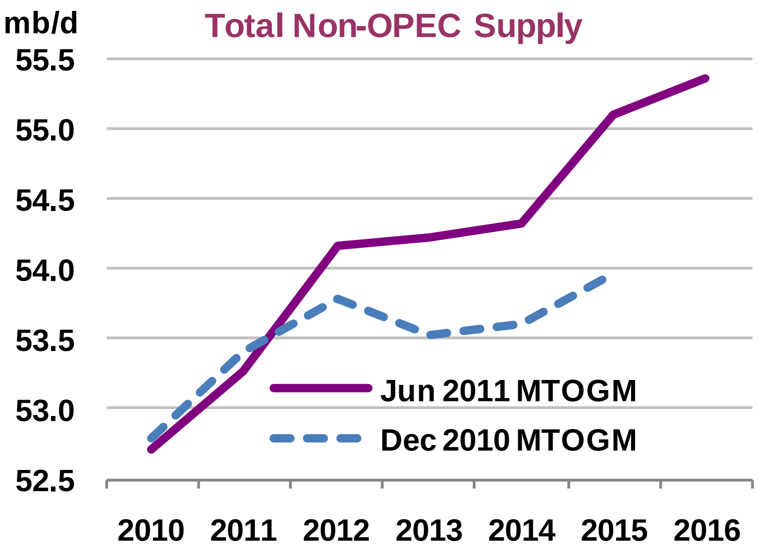


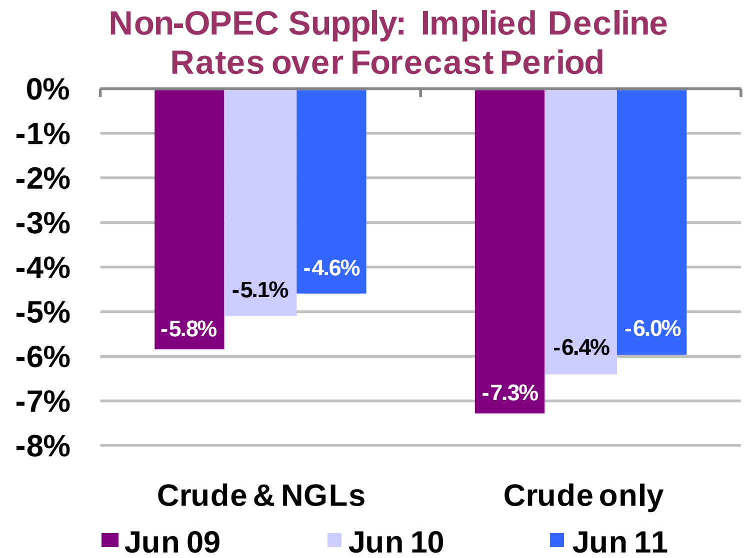
* OPEC crude is capacity additions
Global Refinery processing gains included in Non-OPEC

- Global oil supply capacity rises to 100.6 mb/d in 2016, growing around <u>+1.1 mb/d per year</u> (2015 outlook now 2 mb/d higher)
- Growth split evenly --non-OPEC oil, OPEC crude & OPEC NGLs
- Higher non-OPEC – new projects & modest easing in decline rates
- Industry still confronts 3-to-1 relationship between replacing mature output (-3 mb/d pa) and meeting demand growth
- High prices bring new supply…
- …but downside risks remain: MENA; infrastructure; resource nationalism; rising costs & project delays

Non-OPEC Supply Adjusted Higher

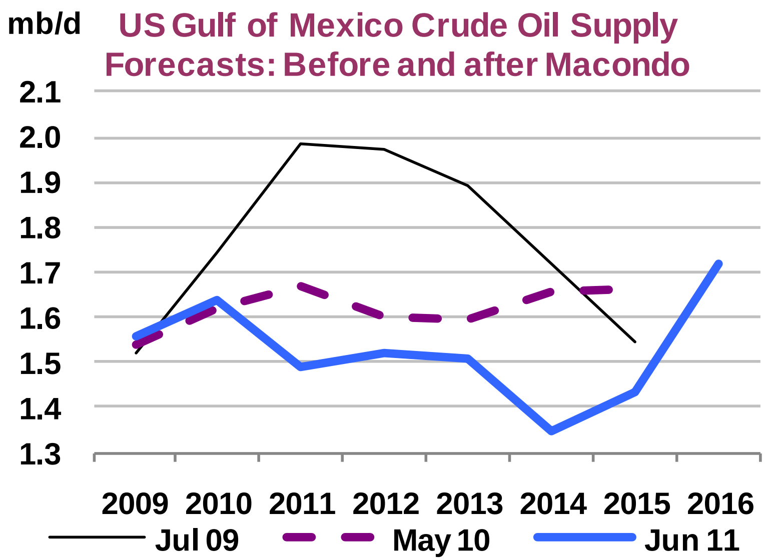
By as much as 1.1 mb/d in 2015

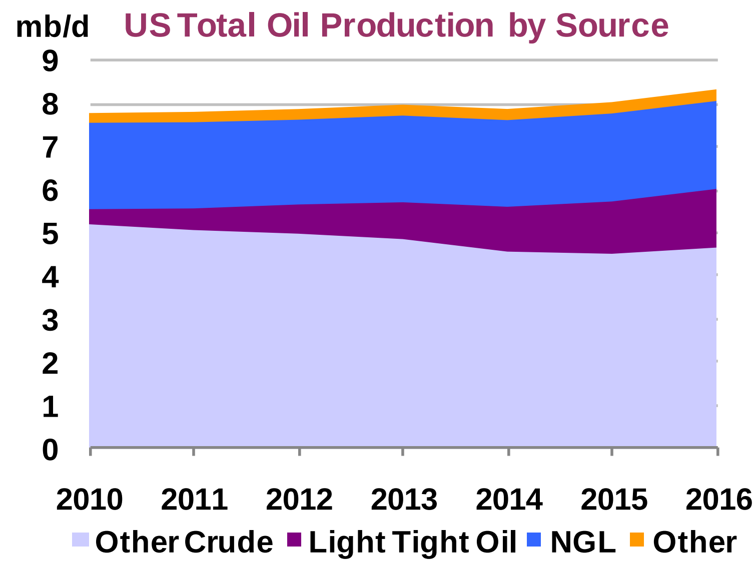




- Non-OPEC uplift in large part Americas-based, with US light tight oil, or shale oil, now generating 1 mb/d of growth
- Brazil, Canada, US, Colombia, Kazakhstan plus NGLs, biofuels and processing gains also rise strongly
- Sustained high prices see stronger late-forecast slate of new field start-ups...
- ...but higher prices are also helping to stem decline, which for non-OPEC slipped below 5% per year during 2008-2010

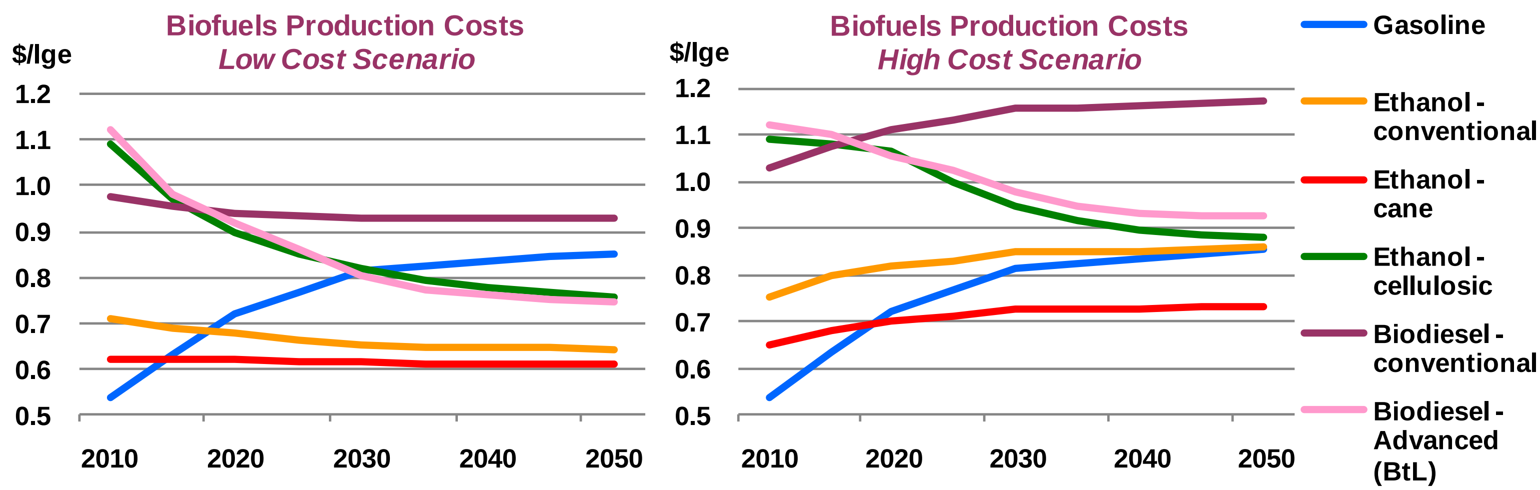
Focus on US Supply Prospects





- Total oil production rises 550 kb/d to 8.35 mb/d
- Light tight oil from shale formations adds 1 mb/d by 2016, on high oil prices, oil-gas prices, technology transfer from gas revolution
- Bakken formation provides over half of total volume by 2016. Potential also in Eagle Ford (S.Texas), Niobrara (Wyo/Col)
- Gulf of Mexico still struggling with new project permitting delays
- Nonetheless, global deepwater development continuing, and output rises from 6 mb/d in 2010 to 8.7 mb/d by 2016.

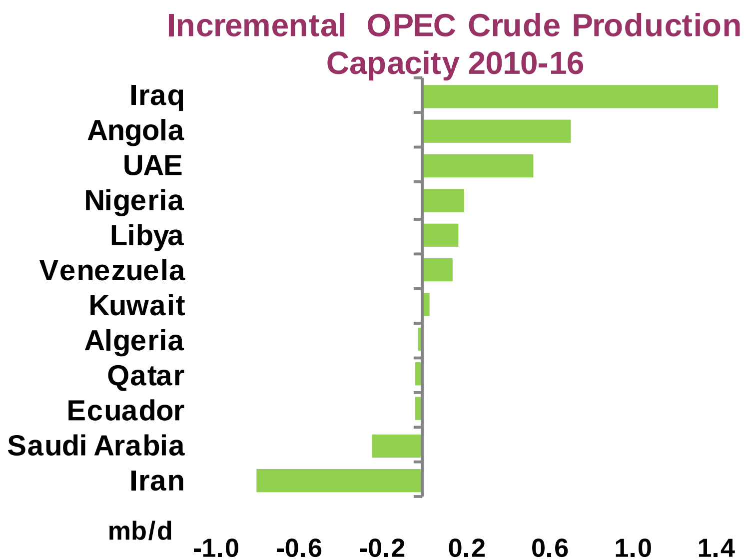
Biofuels' Star Wanes Slightly

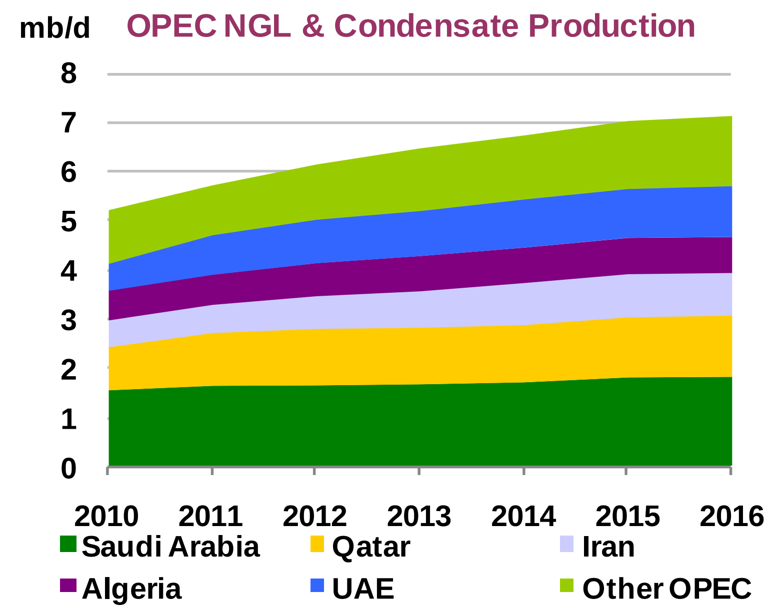


Source: IEA, *Technology Roadmap: Biofuels for Transport*, 2011 lge = litres per gasoline equivalent

- Global biofuels production rises from 1.8 mb/d in 2010 to 2.3 mb/d in 2016 (1.3 to 1.7 mb/d on energy content basis)
- Ethanol meets 24% of global gasoline growth and biodiesel 4% of gasoil growth
- Outlook shaved 100 kb/d lower than last year on tenuous economics, notably for Brazil, Europe and Asia
- US uncertainties also, on financial incentives and feasibility of advance biofuels mandate. But still grows 160 kb/d to 1.04 mb/d
- Global advanced capacity may rise from 20 kb/d to 130 kb/d

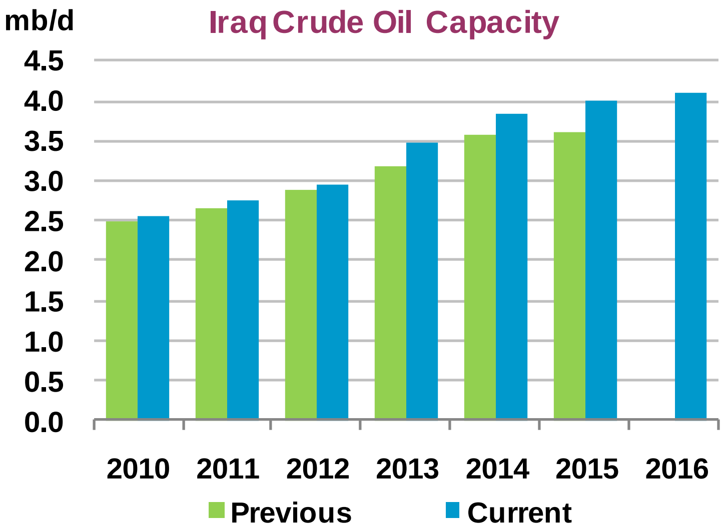
OPEC Adds 4 mb/d Productive Capacity by 2016

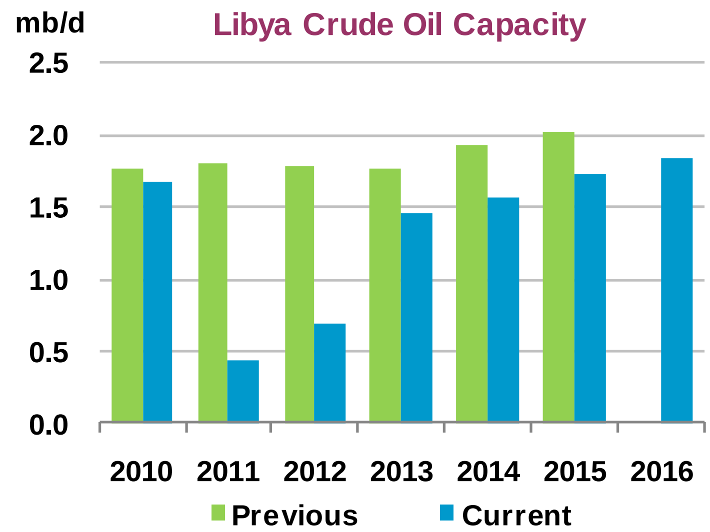




- Iraq, Angola and UAE drive a 2.1 mb/d OPEC crude capacity expansion (to 37.9 mb/d), with Iraq assumed at 4.1 mb/d by 2016
- OPEC also in midst of an NGL & condensate boom, supplies rising by 1.9 mb/d to 7.1 mb/d in 2016 (UAE, Qatar, Iran, Saudi Arabia)
- Expansion based on burgeoning local gas growth (re-injection, power, desalination) plus LNG exports
- Iranian growth (+340 kb/d) contrasts with crude oil picture, as long-running gas projects reach completion

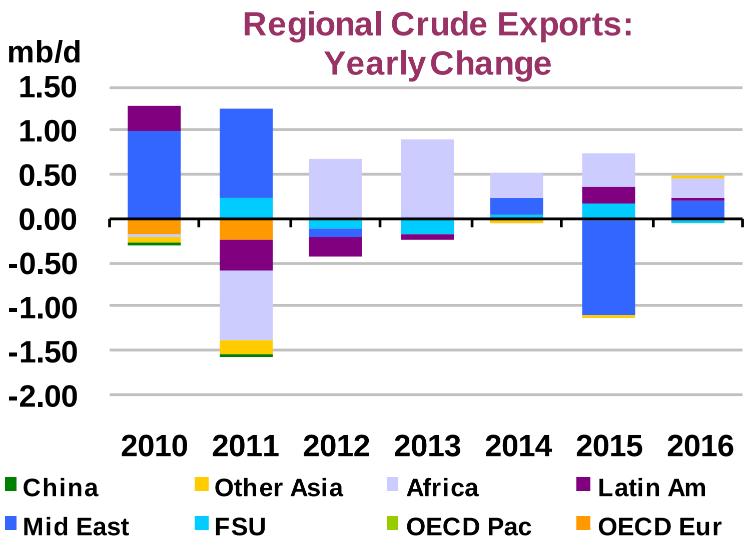
Iraq to the Fore in Expanding Crude Capability

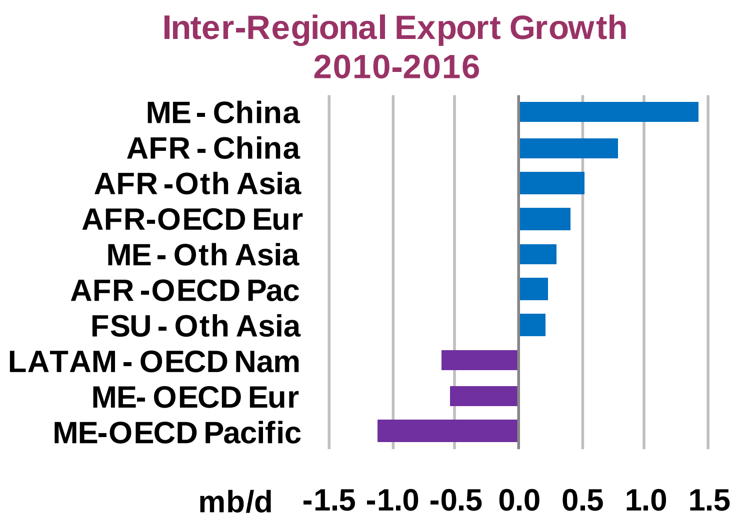




- Iraq's crude capacity assumed at 4.1 mb/d by 2016 amid progress on several of the 12 joint venture projects with IOCs
- Logistical constraints at southern ports cap production increases until early-2012, but exports rise thereafter
- Saudi Arabia's capacity to remain constrained in 11.5-12.0 mb/d range, but Kingdom fast-forwarding Manifa & publicly resurrected a list of potential further ~ 2.76 mb/d in new projects
- Libyan outages seen long lasting, and pre-crisis capacity only regained in 2015 - waxy crude, uncertain IOC return
- Re-basing Venezuelan supply adds 0.3 mb/d to 2005-2011, and suggests capacity circa 2.6 mb/d, reaching 2.8 mb/d by 2016

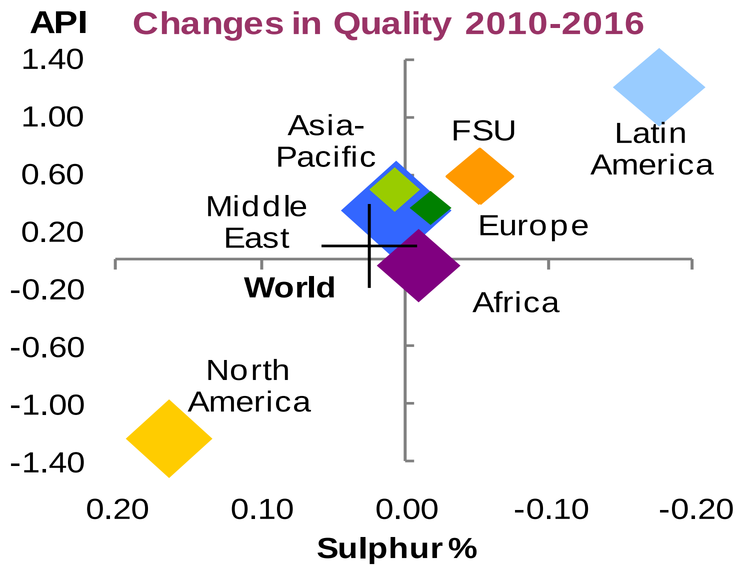
Inter-Regional Crude Trade to Reach 35.8 mb/d by 2016

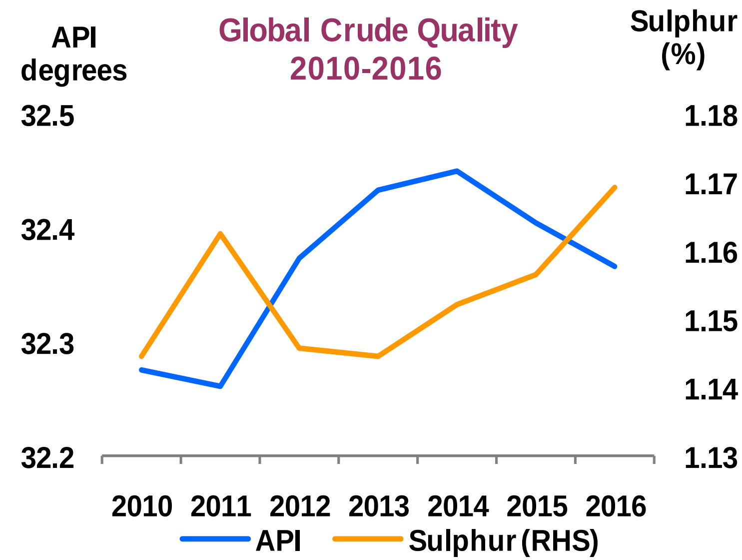




- Global trade to increase by 1 mb/d over 2010-2016, largely on rising volumes to Asia
- Less than envisaged last year, as producer refinery expansions absorb crude exports, but likely increase in product trade
- Middle East remains key swing supplier, Asian sales up 1.7 mb/d
- African exports also rise 1.6 mb/d
- Non-OECD imports rise while OECD volumes decline
- Despite rising long haul trade, tanker markets to stay relatively weak on strong fleet growth

Refinery Crude Feedstock Lighter/Sourer by 2016 *but in 3 distinct phases*

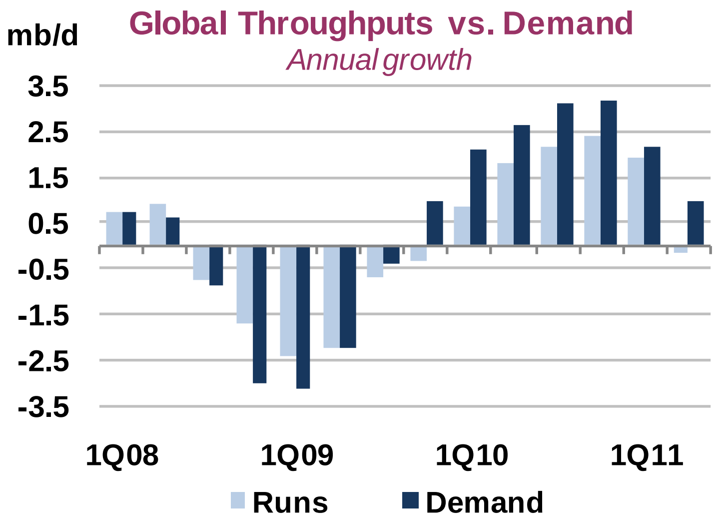


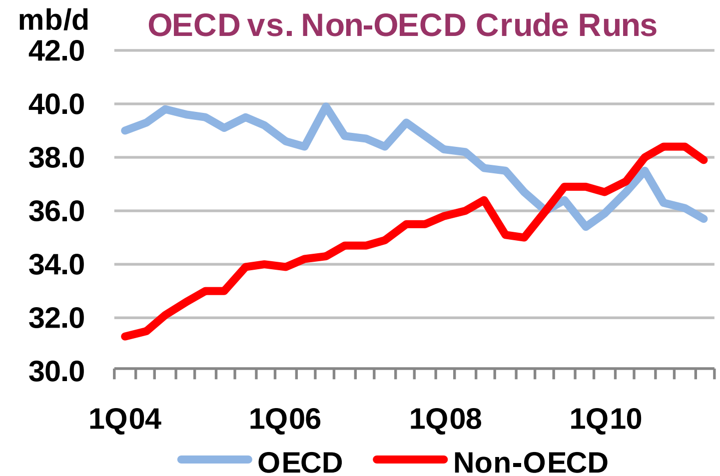


- **2011 volumes become <u>heavier & sourer</u> on lost Libyan supplies**
- **2012-2014 <u>lighter & sourer</u> with increased African, Latin American and Middle Eastern supplies**
- **2015-2016 output to become <u>heavier & sourer</u> as Canadian bitumen production is ramped up**

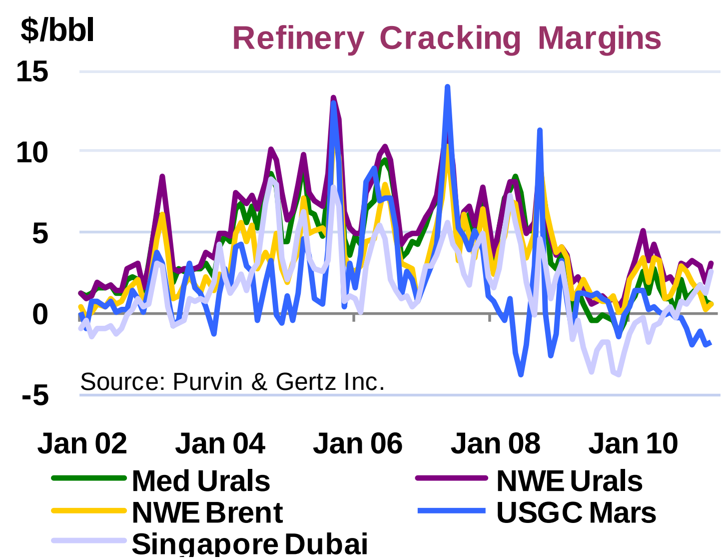
Global Refinery Runs Recovered in 2010

Improvement in Refinery Margins More Muted



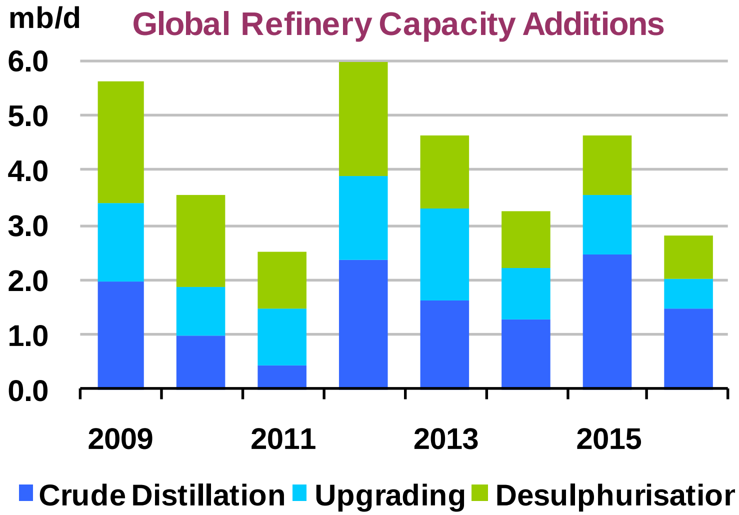


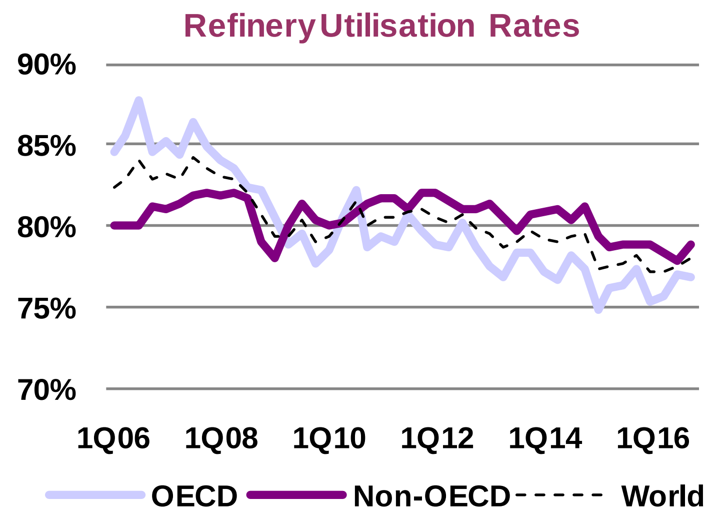
- Global refinery runs recovered in 2010, in line with strong demand rebound from recessionary lows
- Growth centered in the Non-OECD, which surpassed OECD
- Refinery margins saw limited improvement, with cracking margins relatively stable and simple margins very weak



Capacity Additions in 09-10 kept Utilisation Low

A Further 9.6 mb/d Crude Distillation Planned for 11-16





- New capacity completed in 2009-2010 kept a check on global utilisation rates - fell from 83% in 2006-2008 to 80% in 2009-2010
- OECD rates fell more sharply, in line with demand growth patterns, and are expected to remain weaker in the medium term
- A further 9.6 mb/d of crude distillation additions are planned by 2016, exceeding expected demand growth
- NB only 70% of demand growth to be met by refineries – rest met by NGLs, direct crude, biofuels, processing gain etc
- Upgrading, desulphurisation add 6.9 mb/d & 7.3 mb/d respectively

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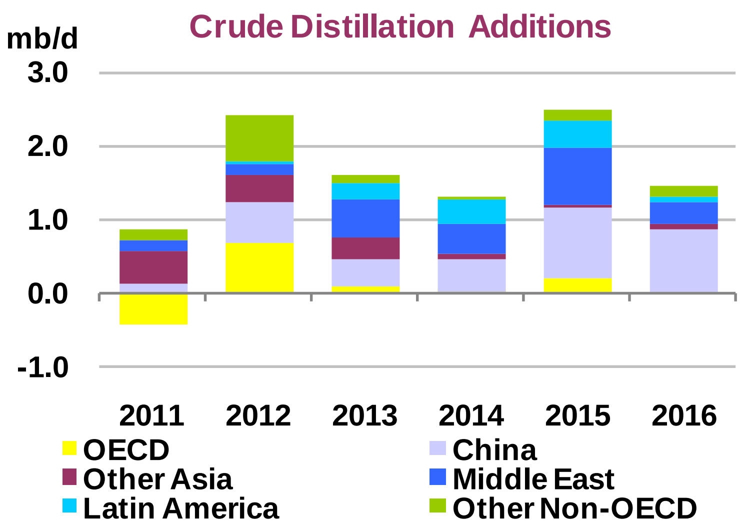
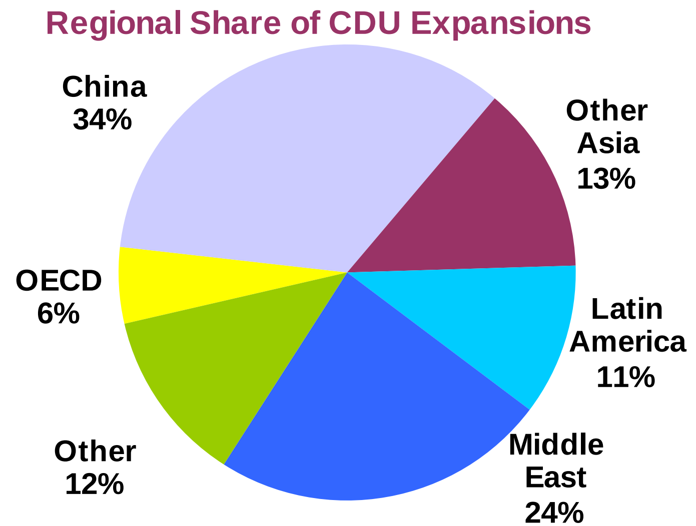
95 % of Expansions Planned in the Non-OECD





- Non-OECD Asia account for almost 50% of all refinery additions
- China alone could add 3.3 mb/d of distillation capacity by 2016
- Investments in the Middle East and Latin America also significant, not always purely economically motivated
- OECD refinery closures since 2009 now amount to 1.8 mb/d
- Firm closures for the 2011-2016 period fail to offset additions in the US, Mexico, Spain and Turkey, leaving a net 0.5 mb/d increase
- OECD refining under pressure from new capacity, although some silver lining via middle distillates and potential IOC purchases

Which Way Ahead for Oil Market Fundamentals?

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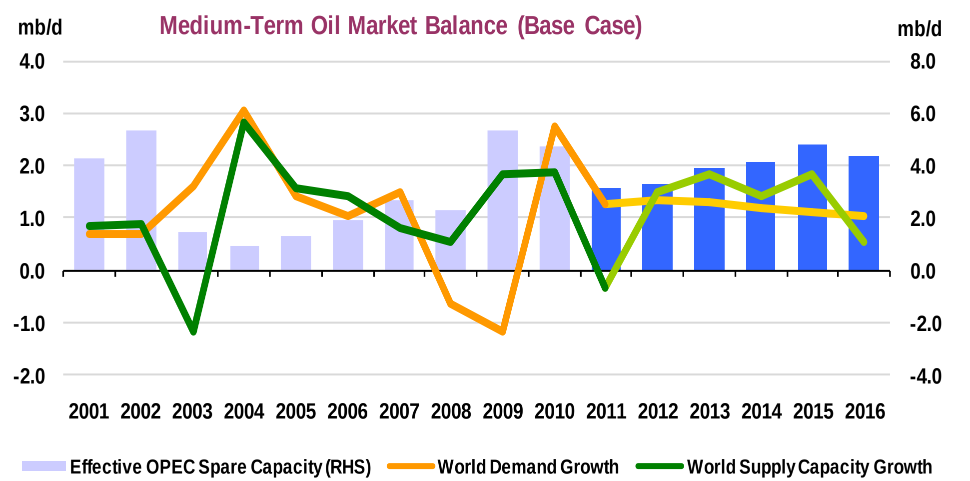
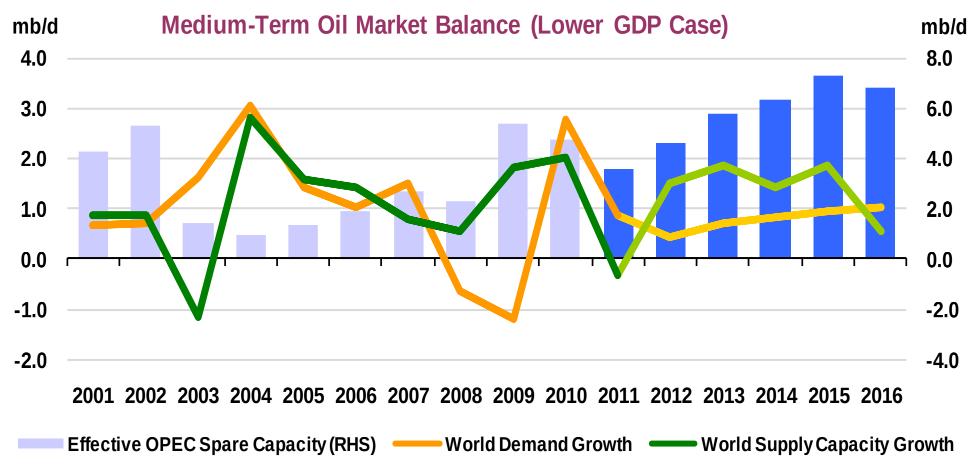
- Squeezed spare capacity in 2011
- Impact of Libyan crisis & lull in OPEC new capacity
- 2010-2012 market tighter than previous outlook..
- But higher prices unlocking new supplies..
- ..so market easing in 2013-2016
- Lower GDP case - temporary relief from rising prices?
- But only if upstream investment sustained





Key Takeaways for Oil

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- Price assumption is $20/bbl higher this year, with tighter 2010-2012 fundamentals
- Market fundamentals remain the key to price direction
- High crude prices and strong economic/oil demand growth can co-exist - for a while – as oil remains inelastic short term
- But economic risks skewed to the downside with $100-plus oil, which will also spur efficiency gains
- Oil demand is an Asia/Mid.East, transport & gasoil/diesel story
- Income growth trumps prices in emerging markets with subsidies
- Higher prices are also bringing forth new oil supplies and helping stem mature field decline
- The Americas are the focus of non-OPEC growth, with Iraq and NGLs major contributors from OPEC
- OECD refining will remain a challenging business amid major capacity additions in emerging markets
- Market will find a new equilibrium, but where depends partly on today's investment in new capacity and end-use efficiency