



*cutting through complexity*™

# New international relationships: Economic geo trends and roles of energy dynamics

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The Future of Energy  
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# Navigating the sea of change



Economic



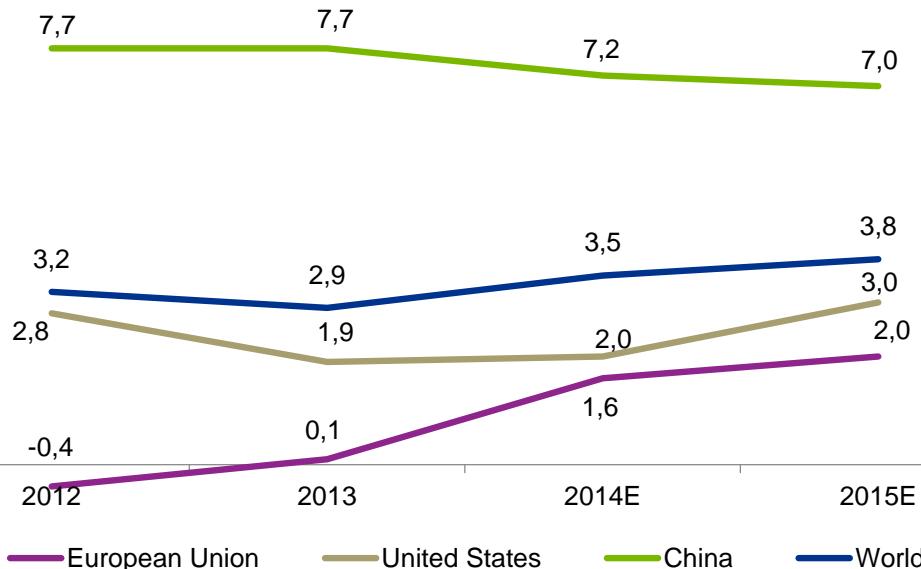
Geopolitical



Regulatory

# Economic uncertainty

## Real GDP Growth Rates (%)



**Europe / US - current moderate growth (1-2% EU, 2-3% US;), projected to grow further**

**Shift from mature to emerging markets – Europe's share of global GDP down to 16.7% in 2019 (from 24.8% in 2000); China up to 14.7 percent (from 7% in 2000)**

**EU business confidence at 105.8 percent in July 2014**

Sources: European Economy Forecast, European Commission, March 2014; "The Economy in 2013", The White House, <http://www.whitehouse.gov/blog/2013/12/19/economy-2013>, accessed May 2014; "United States Purchasing Managers Index (PMI)", Trading Economics, <http://www.tradingeconomics.com/country-list/business-confidence> accessed Jul 2014

# Geopolitical uncertainty



# Regulatory uncertainty

## How the EU's energy trilemma can be answered?



Energy efficiency

Investing in infrastructure

Energy price and Competitiveness

Shale gas exploration

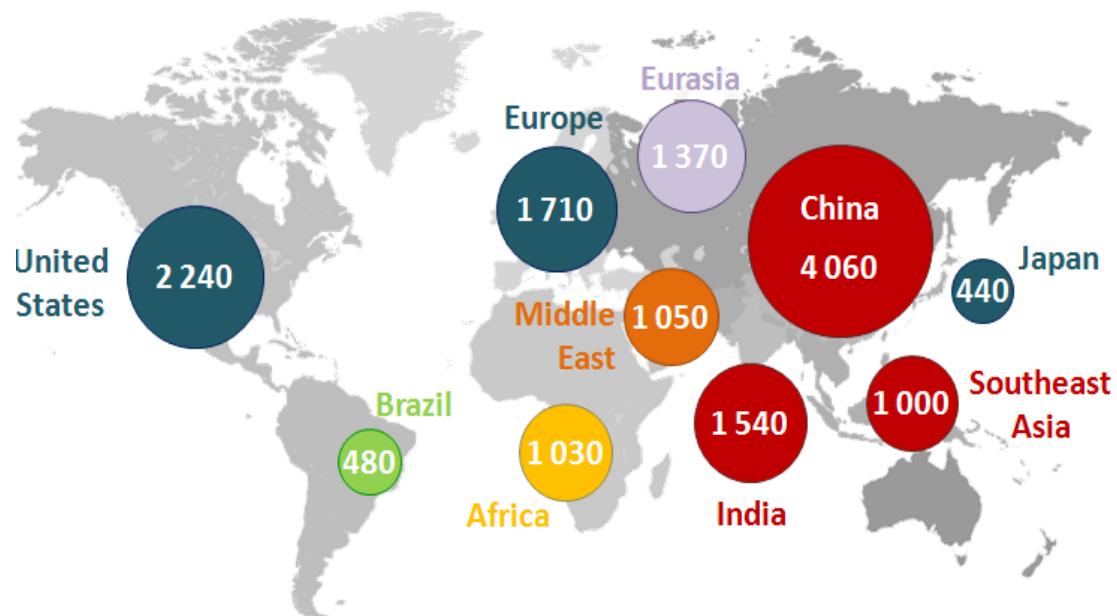
completion of the internal energy market

20-20-20 targets, efficient policy for cost-effective renewables

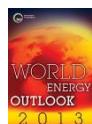
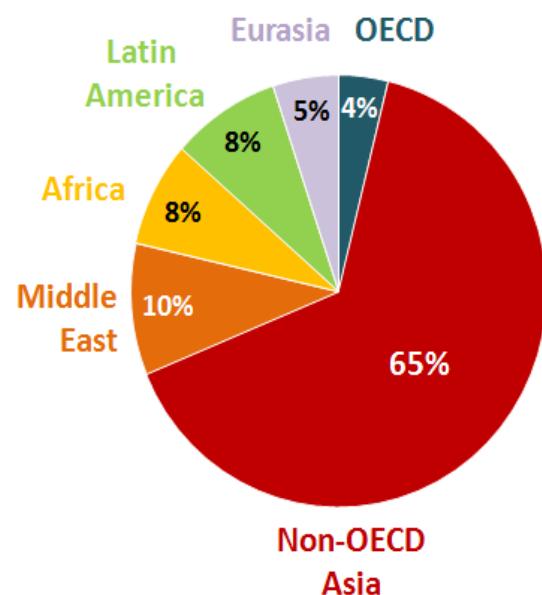
ETS reform

# The engine of energy demand growth moves to South Asia

## Primary energy demand, 2035 (Mtoe)



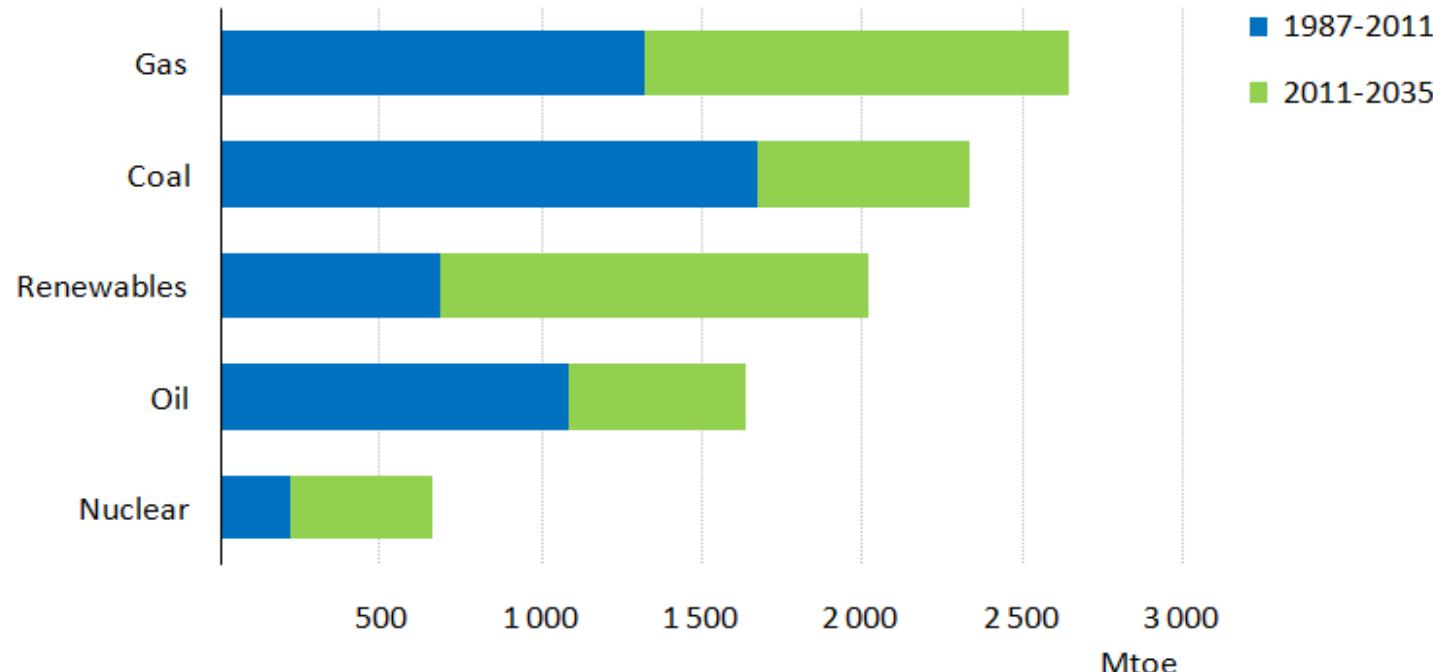
## Share of global growth 2012-2035



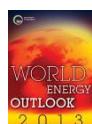
Source: *World Energy Outlook 2013* presentation made by Dr. Fatih Birol,  
IEA's Chief Economist at the KPMG Global Power & Utilities Conference  
2013 in Berlin, Germany

# A mix that is slow to change

## Growth in total primary energy demand

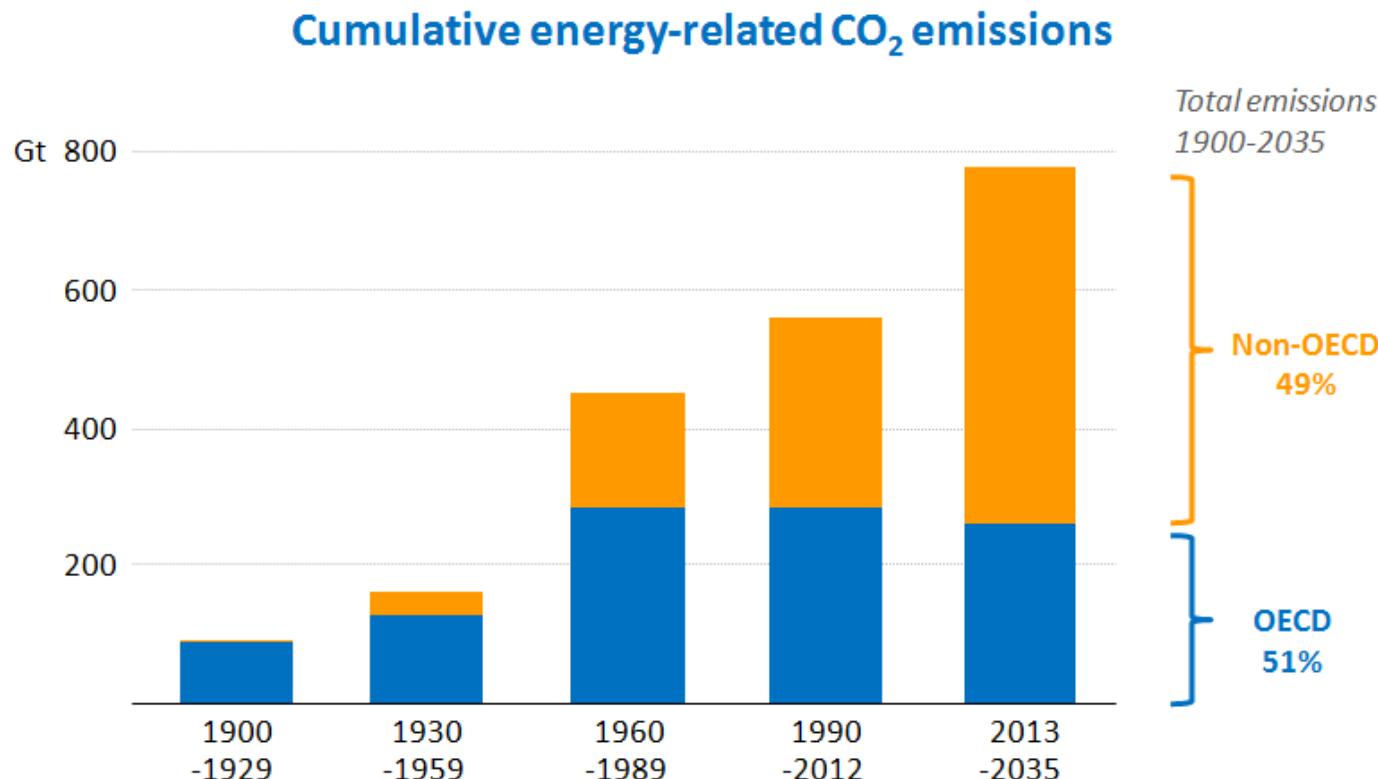


*Today's share of fossil fuels in the global mix, at 82%, is the same as it was 25 years ago; the strong rise of renewables only reduces this to around 75% in 2035*

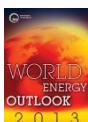


Source: World Energy Outlook 2013 presentation made by Dr. Fatih Birol,  
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# Emissions off track in the run-up to the 2015 climate summit in France



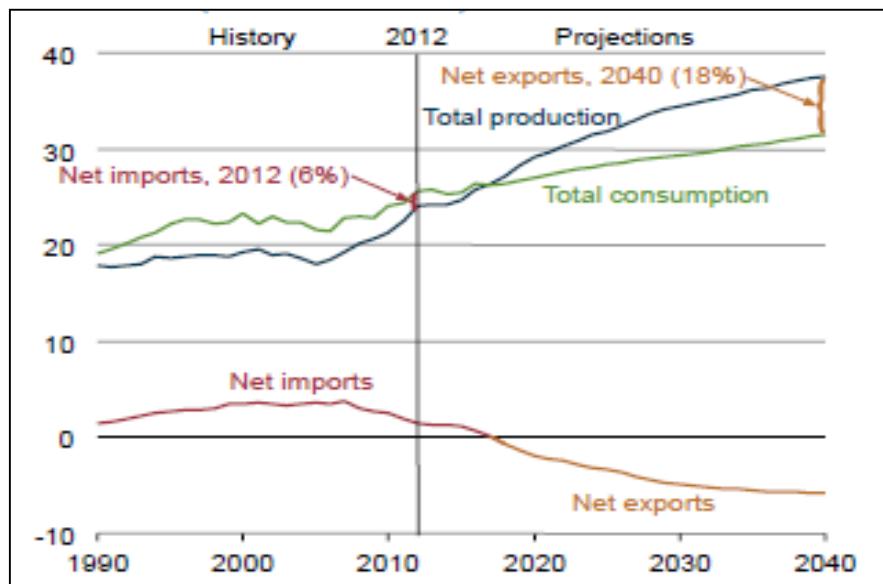
***Non-OECD countries account for a rising share of emissions, although 2035 per capita levels are only half of OECD***



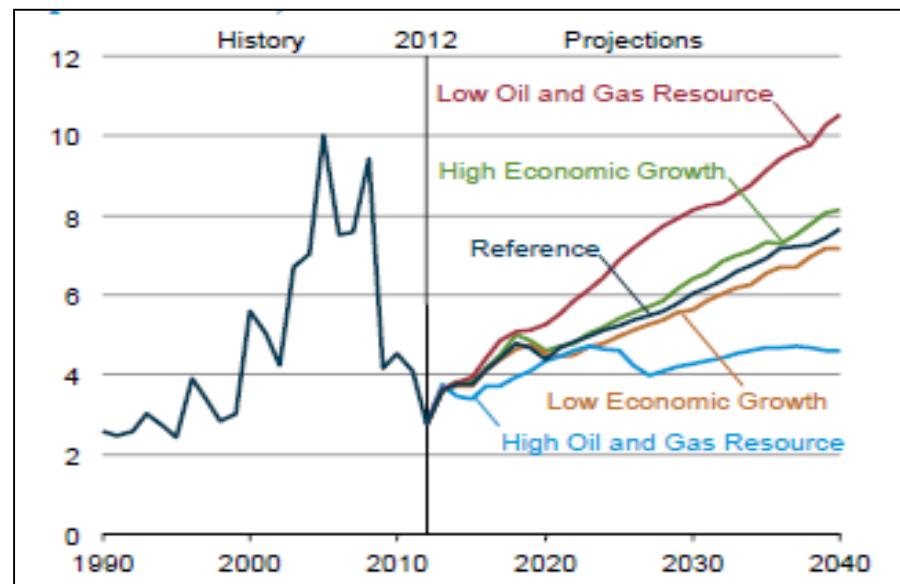
Source: World Energy Outlook 2013 presentation made by Dr. Fatih Birol,  
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# Ability to Anticipate and Respond: Gas Prices Stay Under \$6?

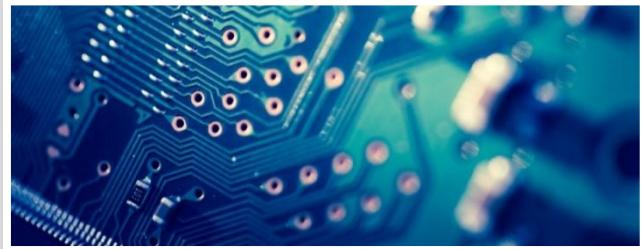
US natural gas production, consumption and net imports



Henry Hub Gas Price



# We Can't Predict the Future - 4 Things to Consider



**Technology**



**Talent**



**Risk**



**Delivery**

# Technology



**Renewables contribution to total power generation expected to be about ~33 percent for EU, ~15 percent for United States and ~10 percent for China by 2035**



**30 percent crude extracted from off-shore production**



**Electric vehicles will have range of over 500 miles within the next 10 years**



**Worldwide revenue from microgrids is expected to grow 400 percent by 2020 to over \$20 billion**

<b>50 percent over 45 years old</b>	The average age of Oil & Gas workers is 56
<b>50 percent retiring</b>	<b>More than 50% of the current industry workforce will be eligible to retire in 2015</b>
<b>40 percent pessimistic</b>	Over 40 percent (ages 46–55) note themselves as pessimistic re: company ability to address knowledge gap
<b>Competition #1</b>	<b>Losing employees to competitors is the #1 reason identified for attrition</b>
<b>Generation gap</b>	<b>Significant motivational difference between Gen Y and Boomers</b>



## Cyber

Target stores data breach cost the CEO and CIO their jobs

30,000 websites each day are hacked



## Aging Infrastructure

\$100 billion in T&D investment needed over the next 15 years



## Weather

Increasing frequency of extreme weather events

Total economic losses related to 296 natural disaster events reached \$192 billion in 2013

True understanding  
of end-to-end enterprise risk  
is critical

# Delivery



*Urban population growth*

**Approximately two-thirds of the total global population will live in cities by 2050 compared to 50 percent today**

**More than 90 percent increase in urban growth in underdeveloped regions**



*Pipeline infrastructure*

**More than 100 years of recoverable gas now exists in North America**

**Up to \$200 billion is needed in U.S. natural gas infrastructure over the next 15 years**

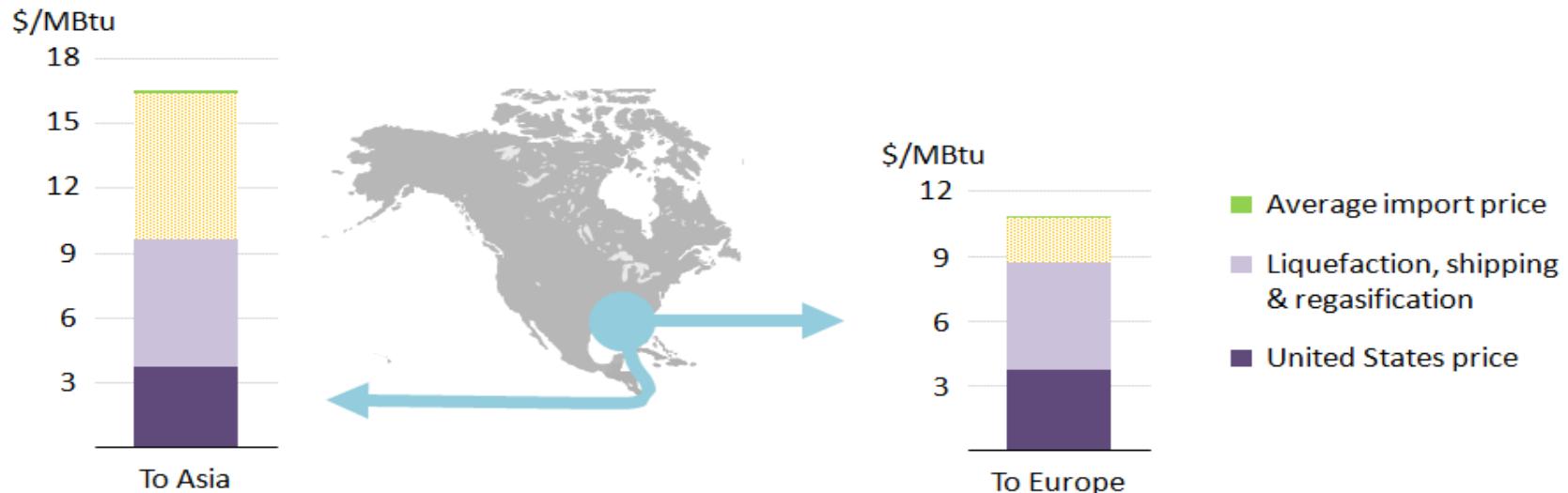


*LNG capacity*

**86 liquefaction trains and >420 regasification storage terminals are operational worldwide**

**\$300 billion needed in investment globally to exploit resource base**

## Indicative economics of LNG export from the US Gulf Coast (at current prices)



**New LNG supplies accelerate movement towards a more interconnected global market, but high costs of transport between regions mean no single global gas price**



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# Thank you for your attention



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