



# World Energy Investment 2017

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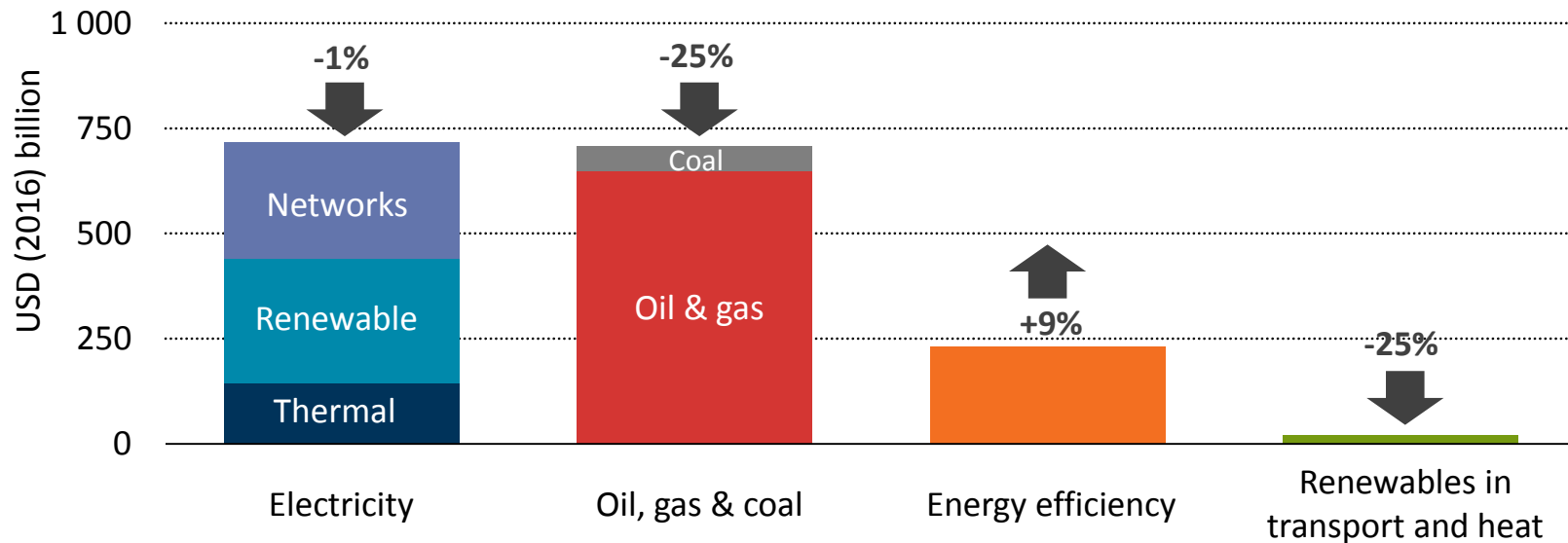
Laszlo Varro, Chief Economist, International Energy Agency

14 July 2017



# Global energy investment fell 12% in 2016, a second consecutive year of decline

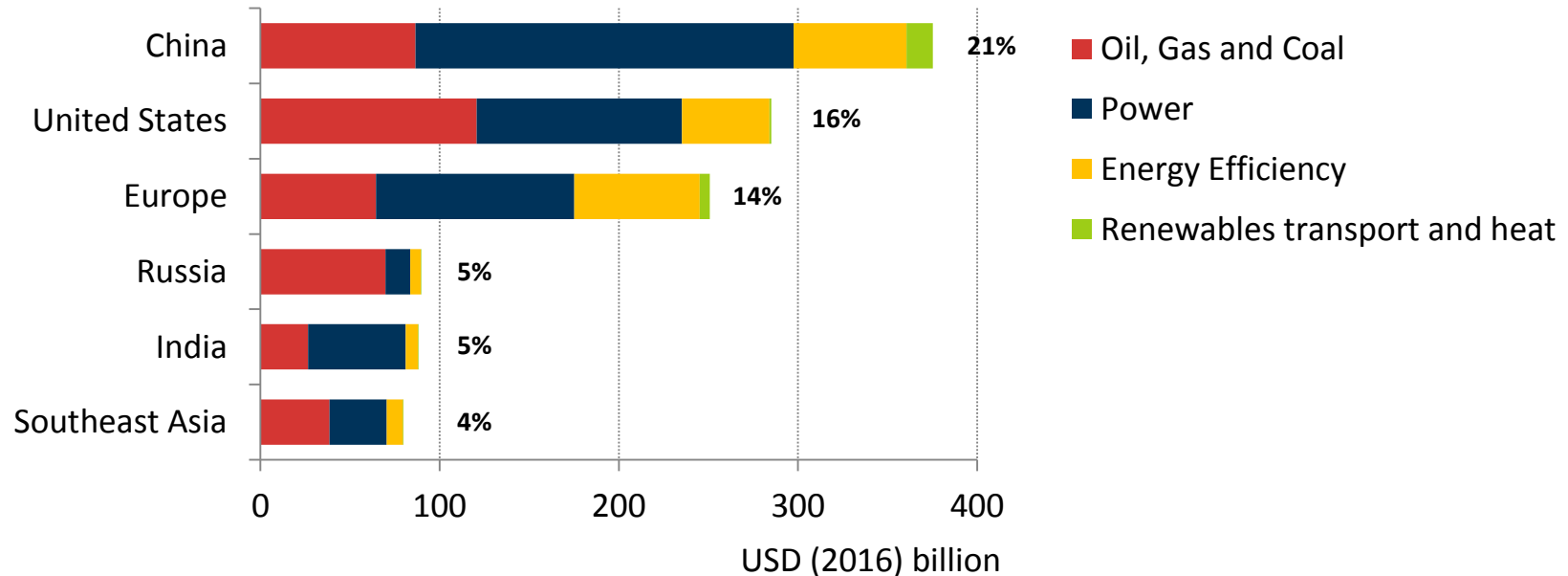
## Global energy investment 2016



**Electricity sector investment overtook oil and gas for the first time**

# China remains the first destination of energy investment in 2016

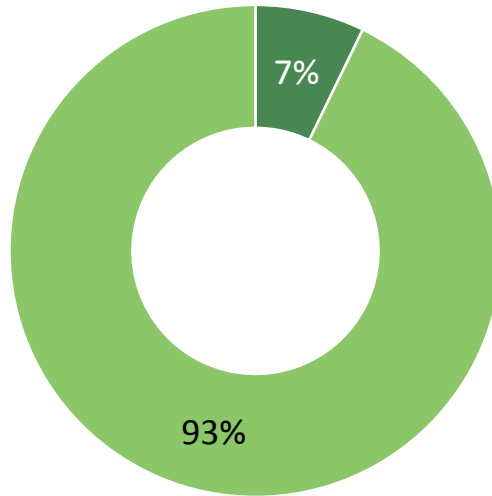
## Energy investment in selected markets, 2016



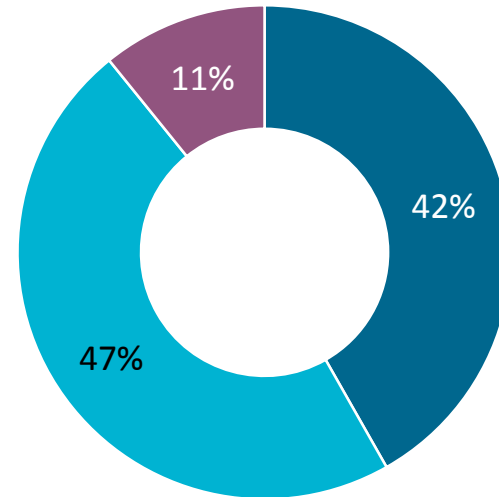
**Half of global energy investment is now concentrated in China, United States and Europe, backed by higher spending on electricity networks and efficiency in China**

# The role of state actors in energy investments has increased

Sources of finance by financing mechanism and type of organisation for world energy investment in 2016



- Project finance
- Balance sheet



- Government/SOEs
- Private sector
- Households, communities and self-consumption

**The share of state actors in total energy investment rose from 39% in 2011 to 42% in 2016, largely thanks to state-owned enterprises in electricity sector investment, notably in China, and NOCs in upstream oil & gas**

# Appliance standards lock in electricity end use efficiency

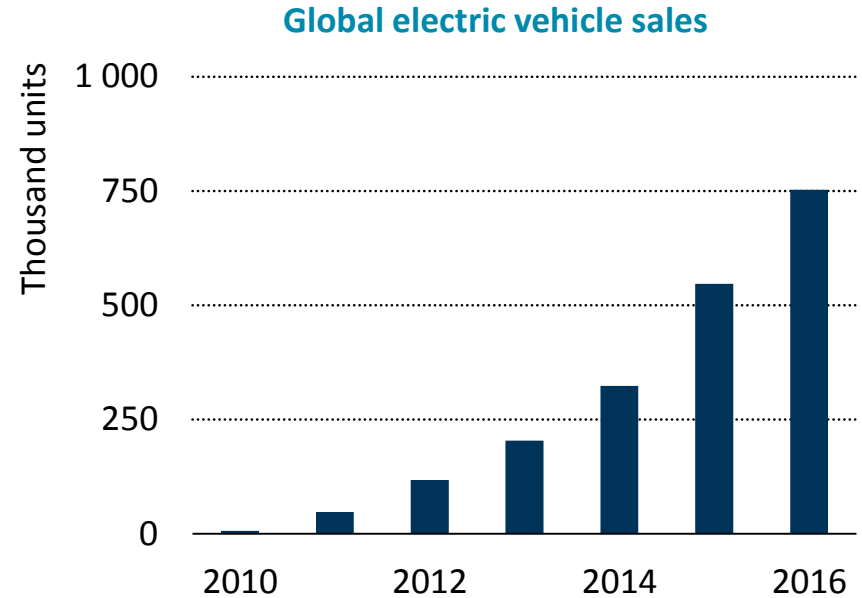
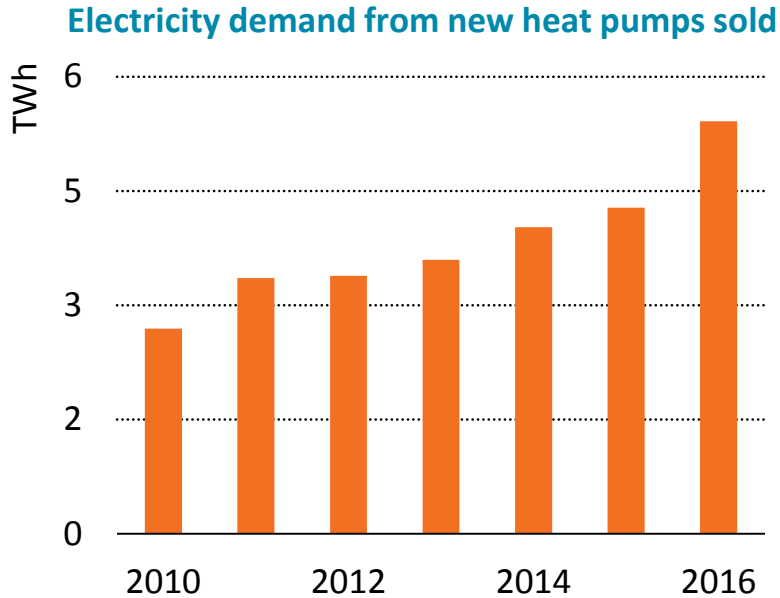


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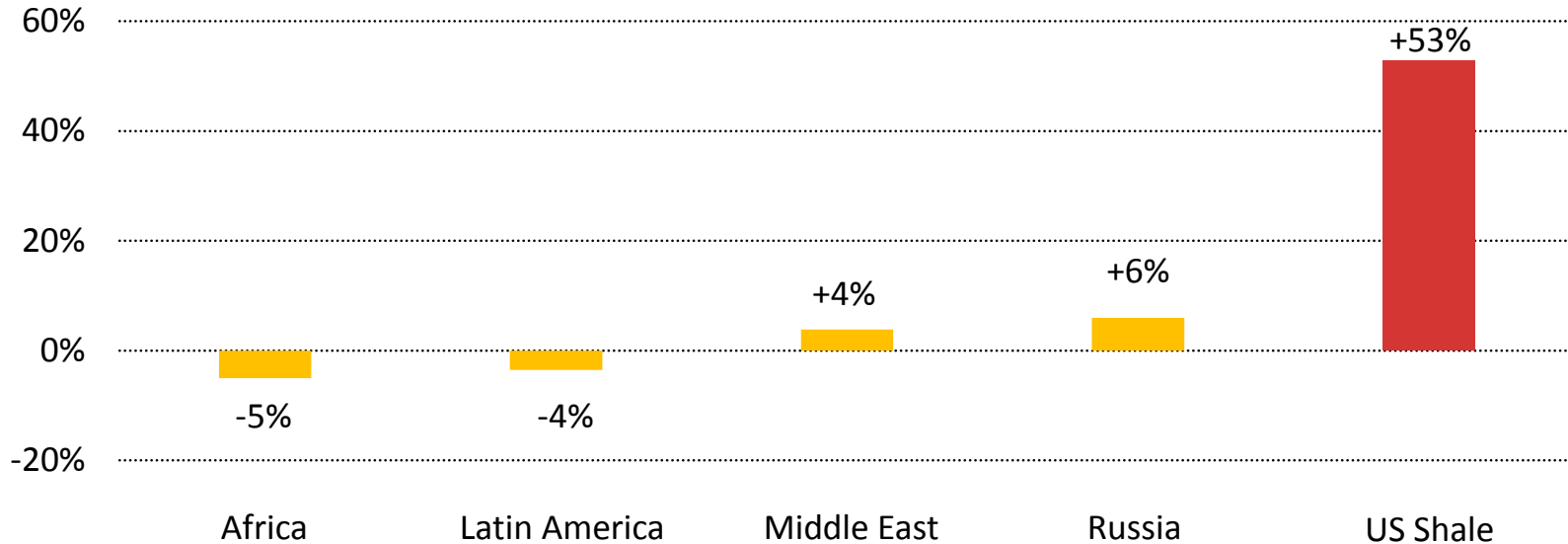
But cheap oil shifts consumer preferences towards big cars

# Electrification of transport and heat is progressing



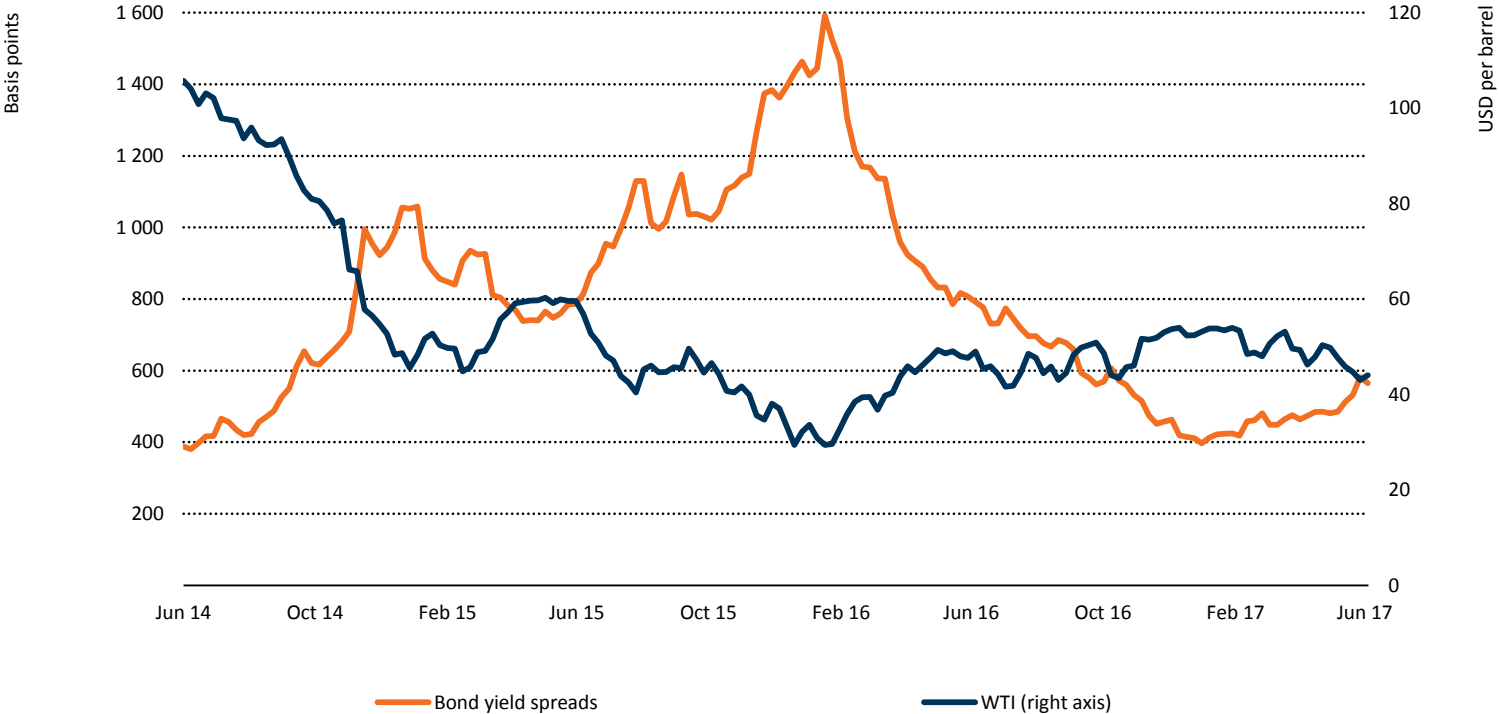
**Electric vehicle (EV) sales grew 38% in 2016 and, at \$6 billion, now represent 10% of all transport efficiency spending. Another \$6 billion was spent globally on EV charging stations.**

## Change in Upstream investment, 2017 vs 2016



**After two years of unprecedented decline, global upstream investment is expected to recovery modestly by 3% in 2017, but downside risks remain**

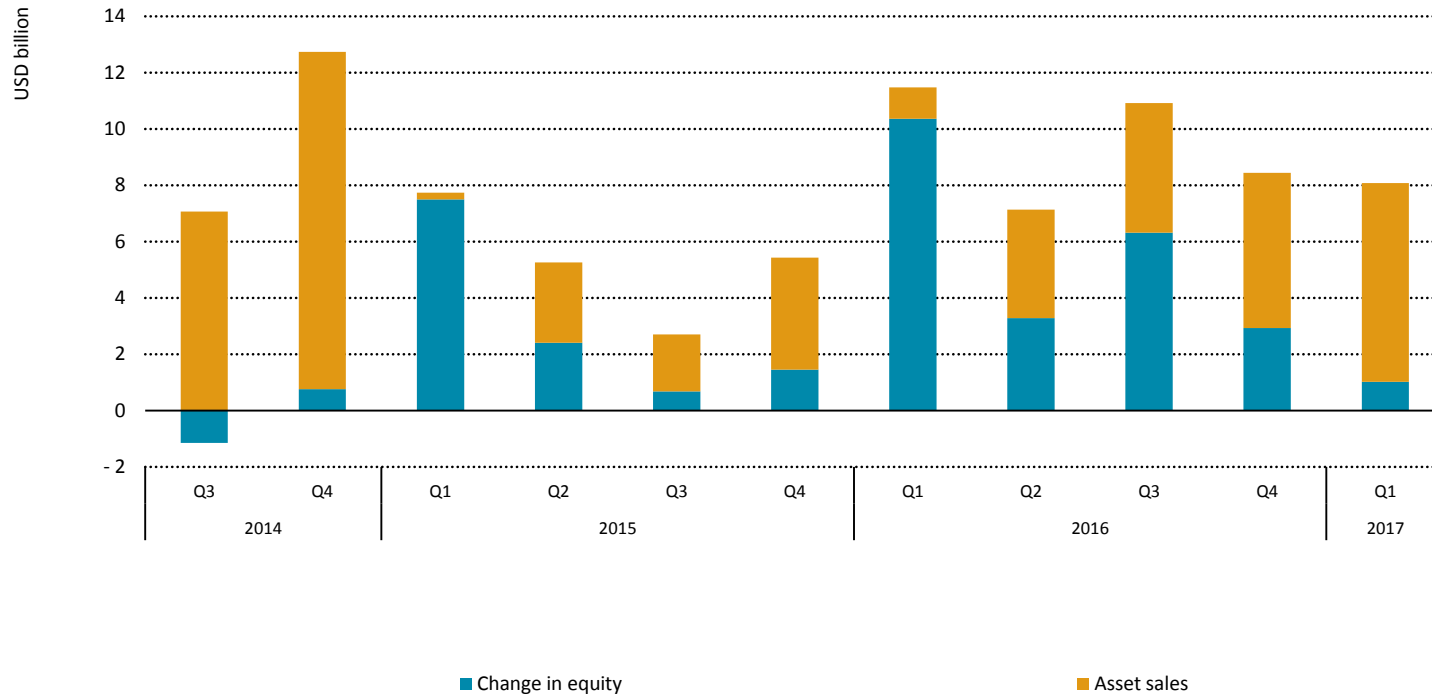
# Corporate bond markets amplify shale investment volatility



**Access to and cost of bond pricing is directly influenced by the oil price**



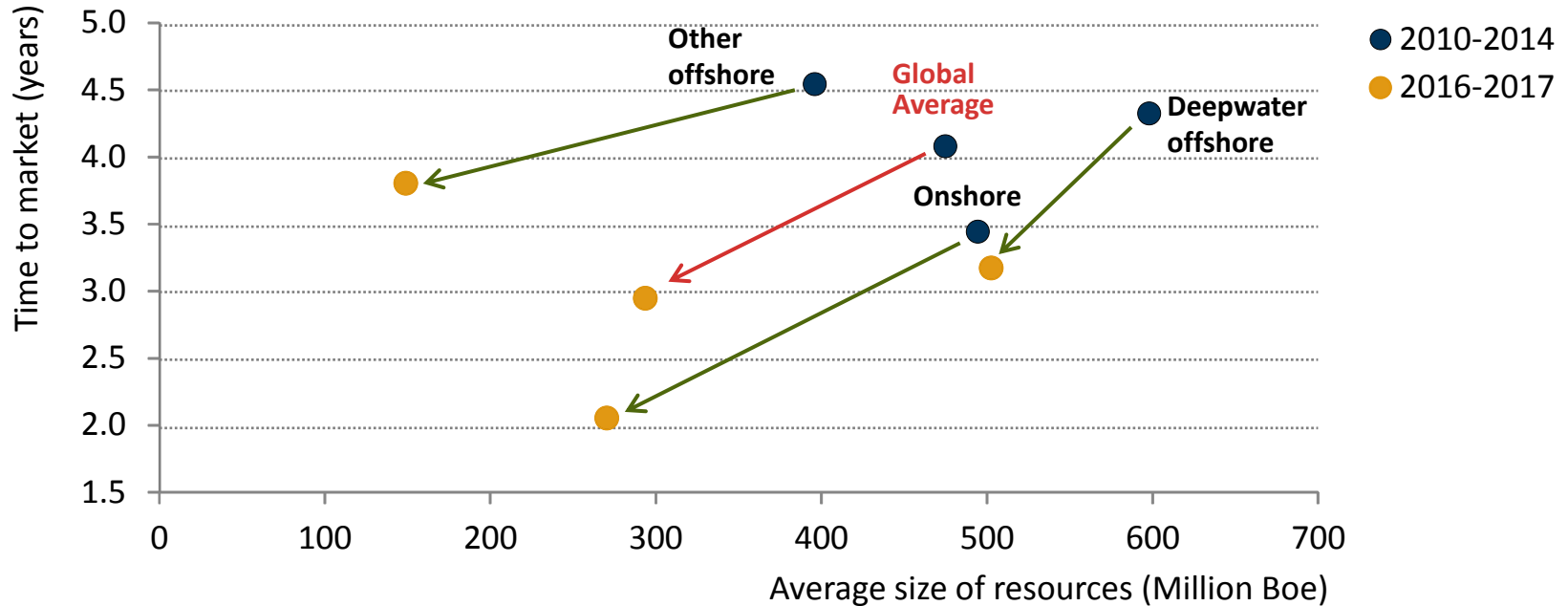
# US shale: equity market interest and assets sales to new entrants keep independents going



**Cost deflation and stronger balance sheets keep investment robust despite low oil prices**

# Conventional oil and gas projects becoming faster and smaller

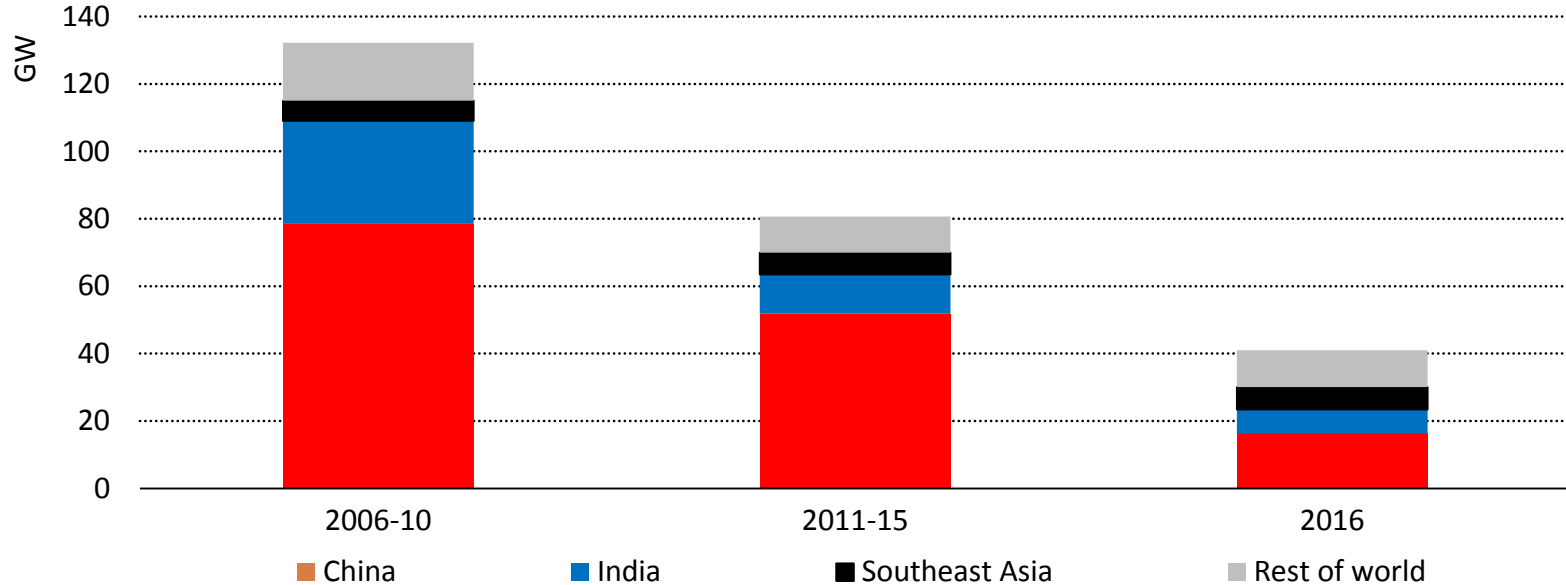
Average size of conventional resources sanctioned and time-to-market



A shift in company strategies and technology developments leads to shorter project cycles across all the oil and gas industry

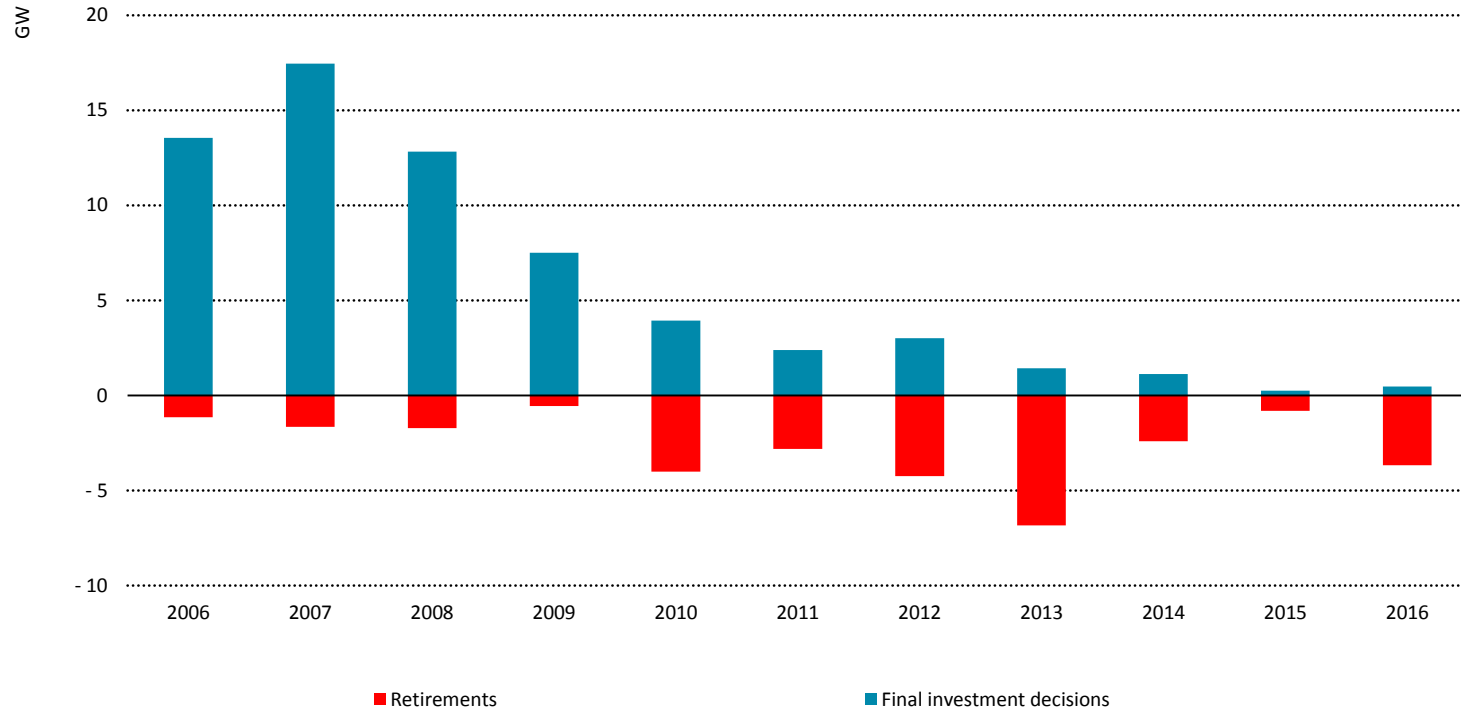
# A wave of coal power investment is coming to a pause

Average annual final investment decisions for new coal-fired power capacity



In 2016 the sanctioning of new coal power fell to the lowest level in nearly 15 years, hampered by competition from renewables and environmental challenges. Gas power FIDs surpassed coal for only the second time in the past decade.

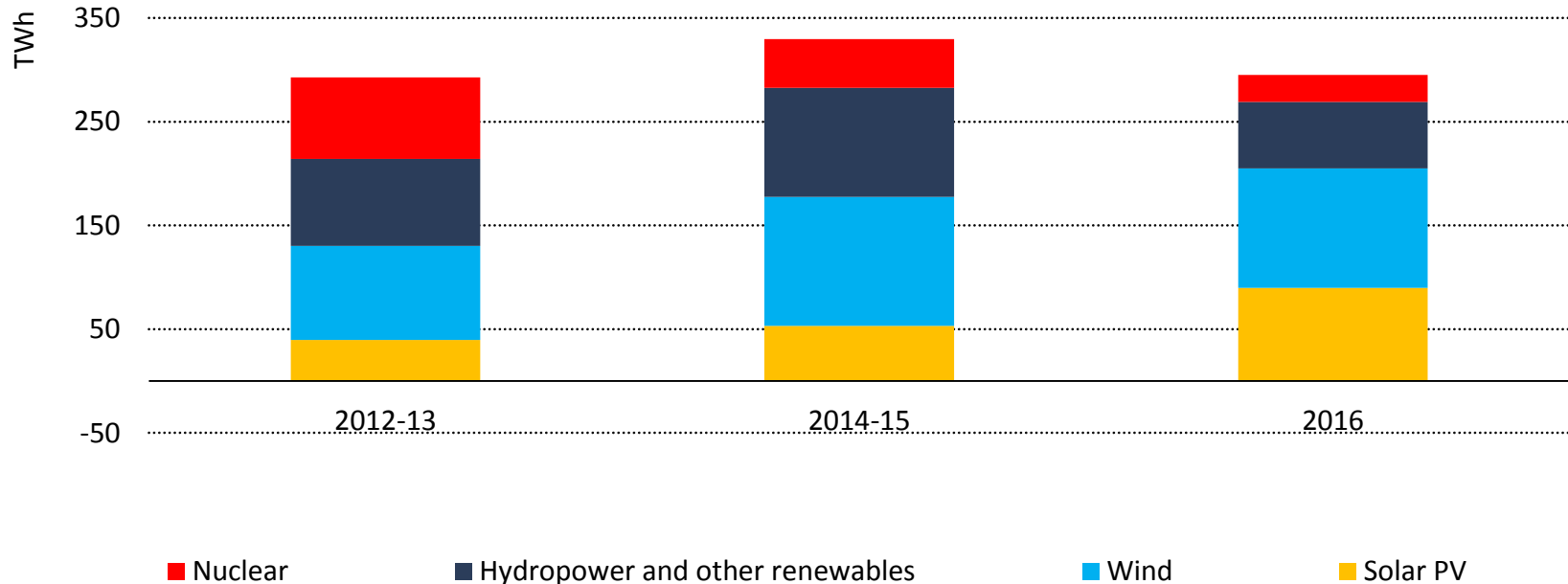
# Europe: gas retirements exceed FIDs by a wide margin



**Compressed load factors, low wholesale prices and market design uncertainty disrupt the investment model of gas plants**

# Investment in low-carbon electricity is not keeping pace with demand

Expected annual power generation from final investment decisions for new low-carbon generation

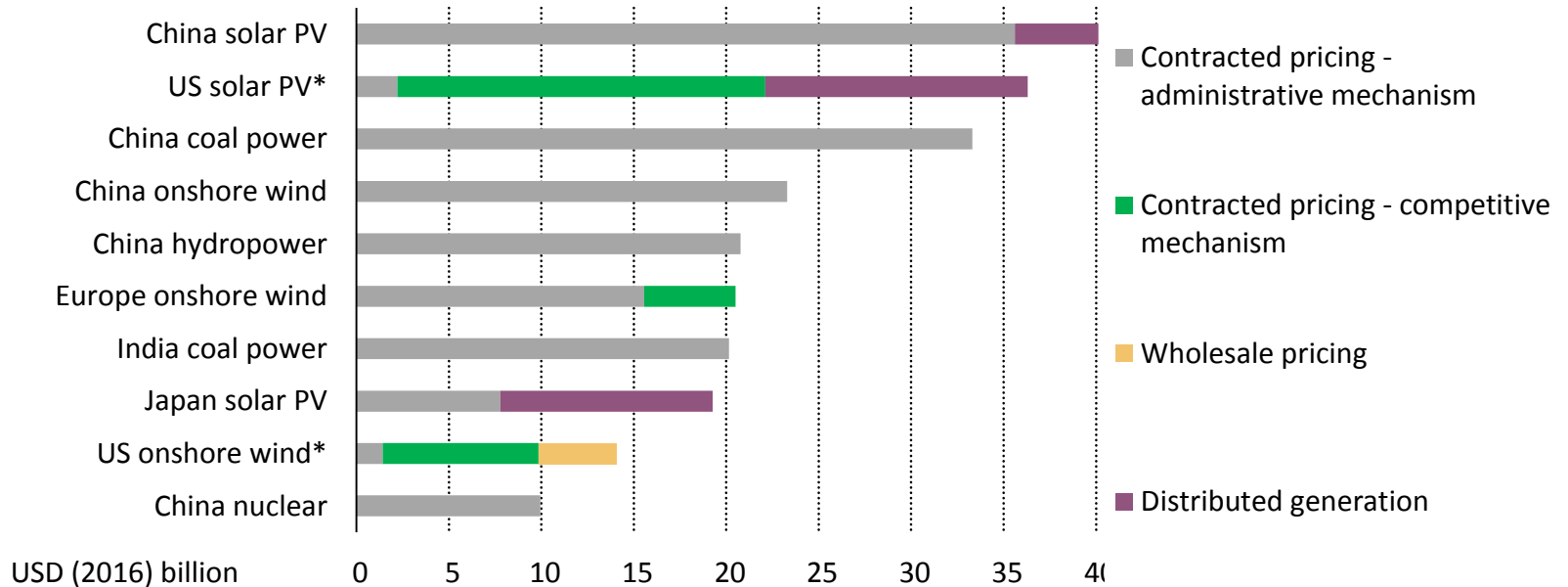


While the annual contribution of new solar PV and wind has grown by three quarters, FIDs for nuclear and hydropower have sharply slowed, leaving expected low-carbon generation 35% short of average demand growth the past five years.

# Policies play an important role in electricity sector business models



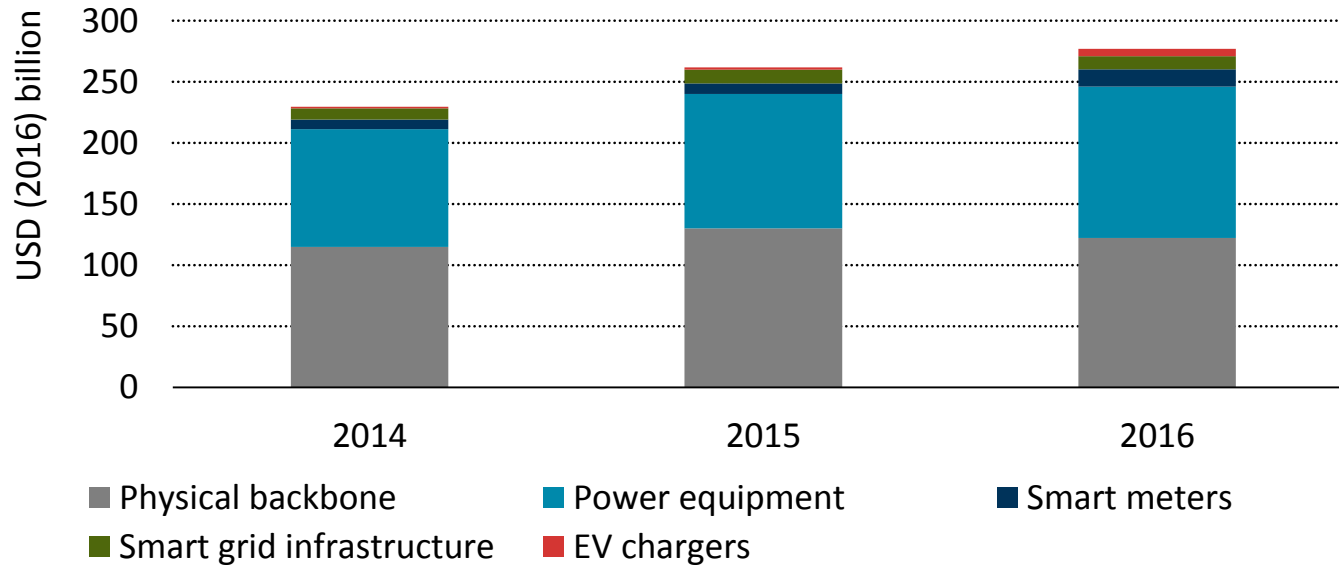
## Top 10 areas of generation investment and their main funding models, 2016



\*US renewables benefit from federal tax credits in addition

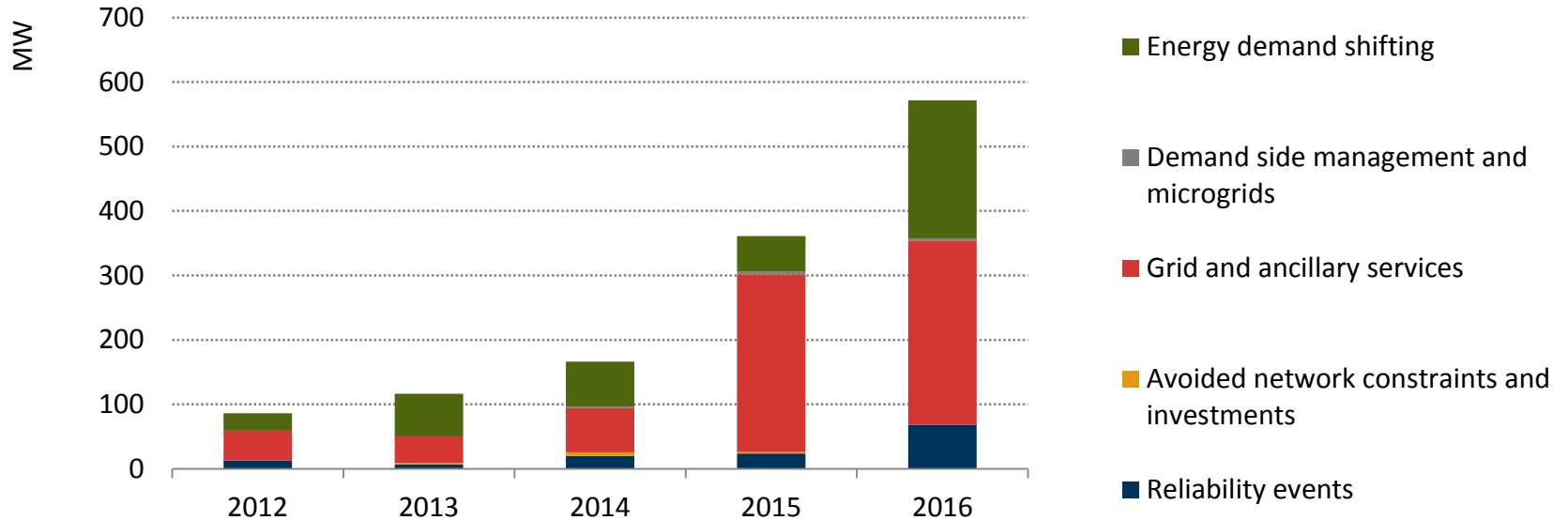
**Generation investments mostly have contracted pricing that allows for long-term cost recovery of assets. Competitive mechanisms play growing role in setting renewables remuneration, at 36% of utility-scale investment vs 28% in 2011.**

## Investment in digital grid infrastructure and total electricity networks spending



**Networks spending is dominated by lines and power equipment, but digital grid infrastructure now accounts for over 10% of networks investment.**

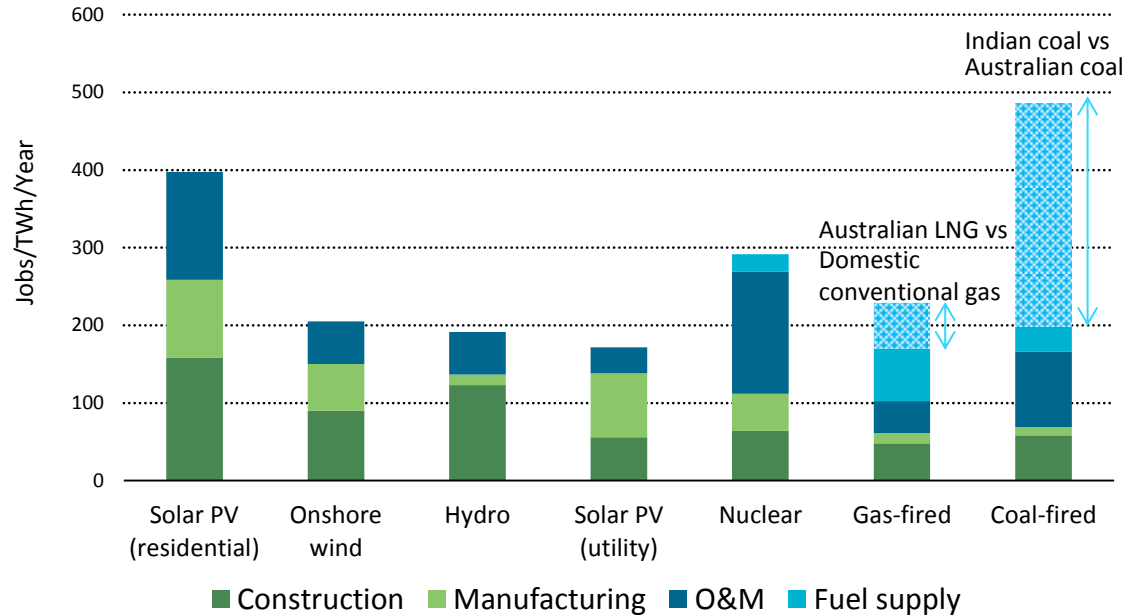
## Main applications of world battery storage investment



**The expansion of grid-scale batteries hinges on policies to reward multiple services.**



## Employment associated with 1TWh of new generation in 2016

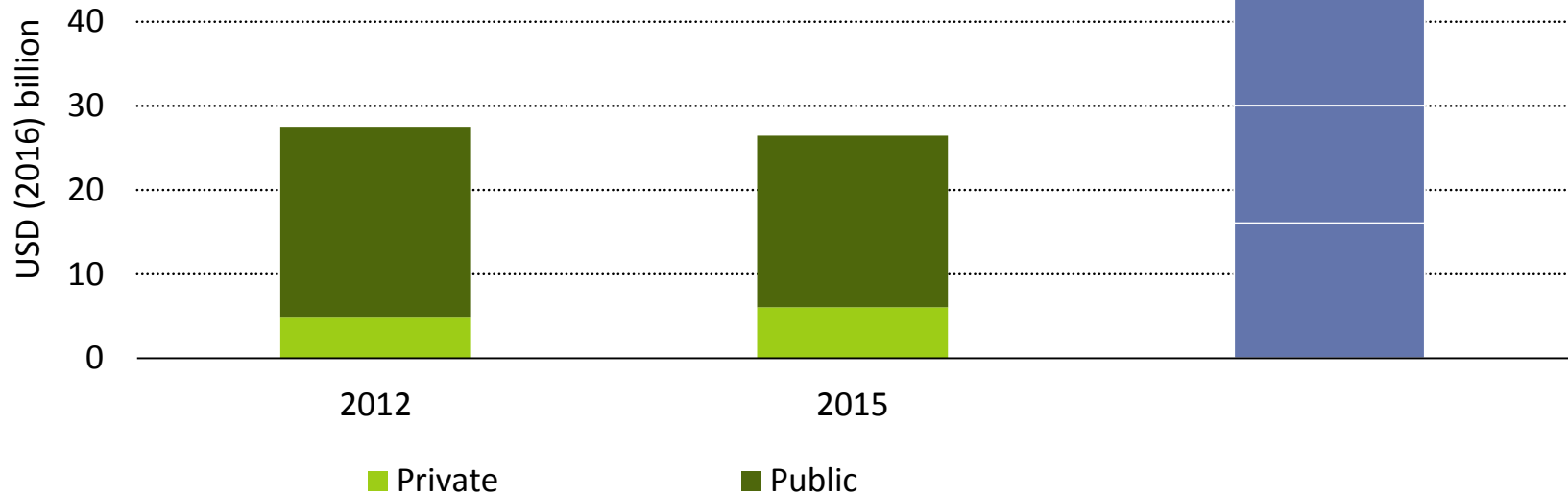


**Residential solar PV and coal-fired generation are most labour-intensive while regional differences can be significant.**

# Global clean energy R&D funding needs a strong boost

## Global clean energy R&D spending

## Top 3 IT company R&D spenders



Global R&D spending on clean energy plateaued at \$26 billion/year, with much room for growth from the private sector. As a share of GDP, China's leads spending on energy R&D, after overtaking Japan

