



The global energy transition and the road to Paris

Dr Jeremy Leggett



Dramatic changes are beginning
to sweep global energy markets



Three emerging megatrends are particularly important

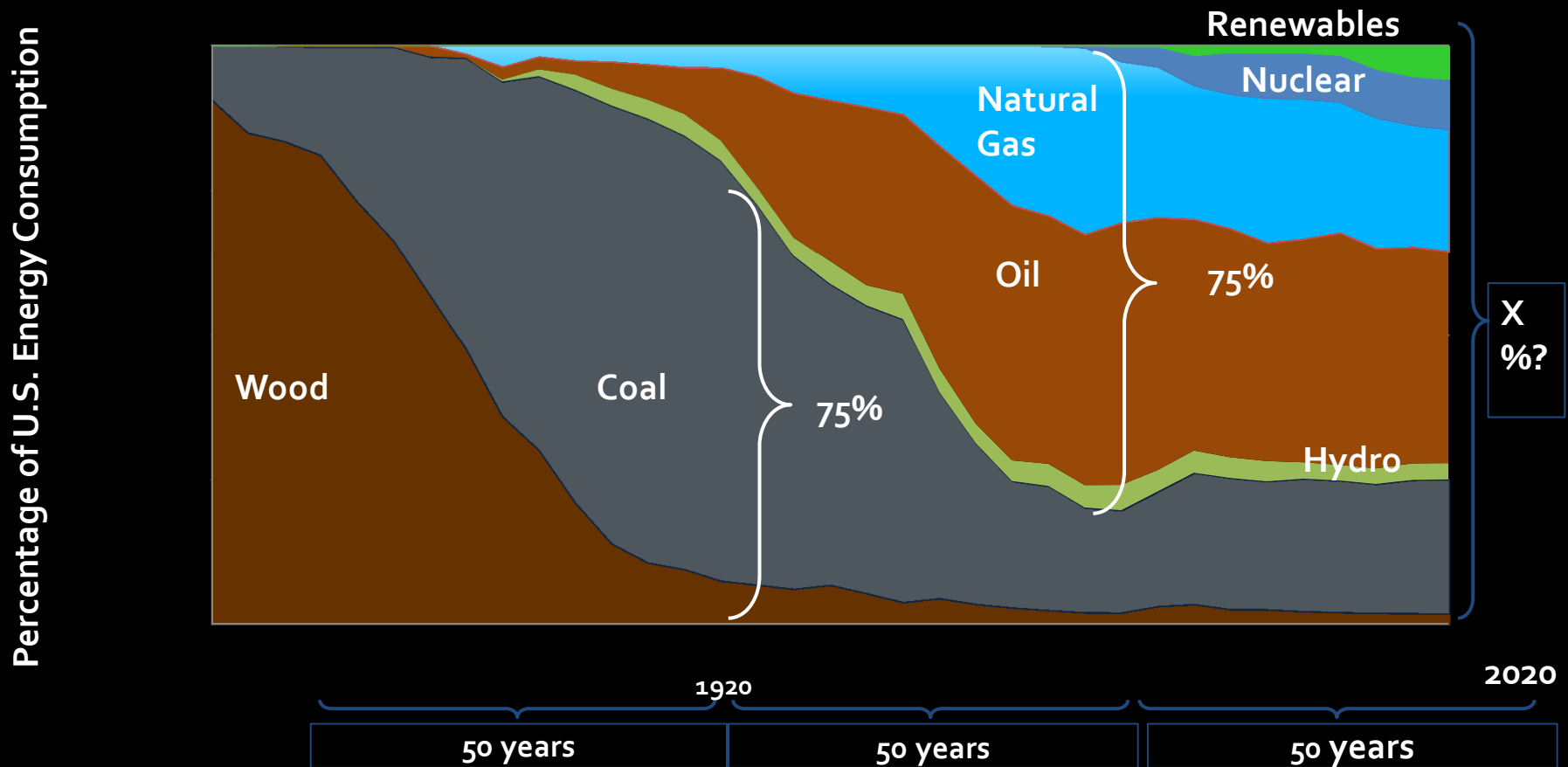
Insurgency
cost down

Incumbency
cost up

Carbon
action

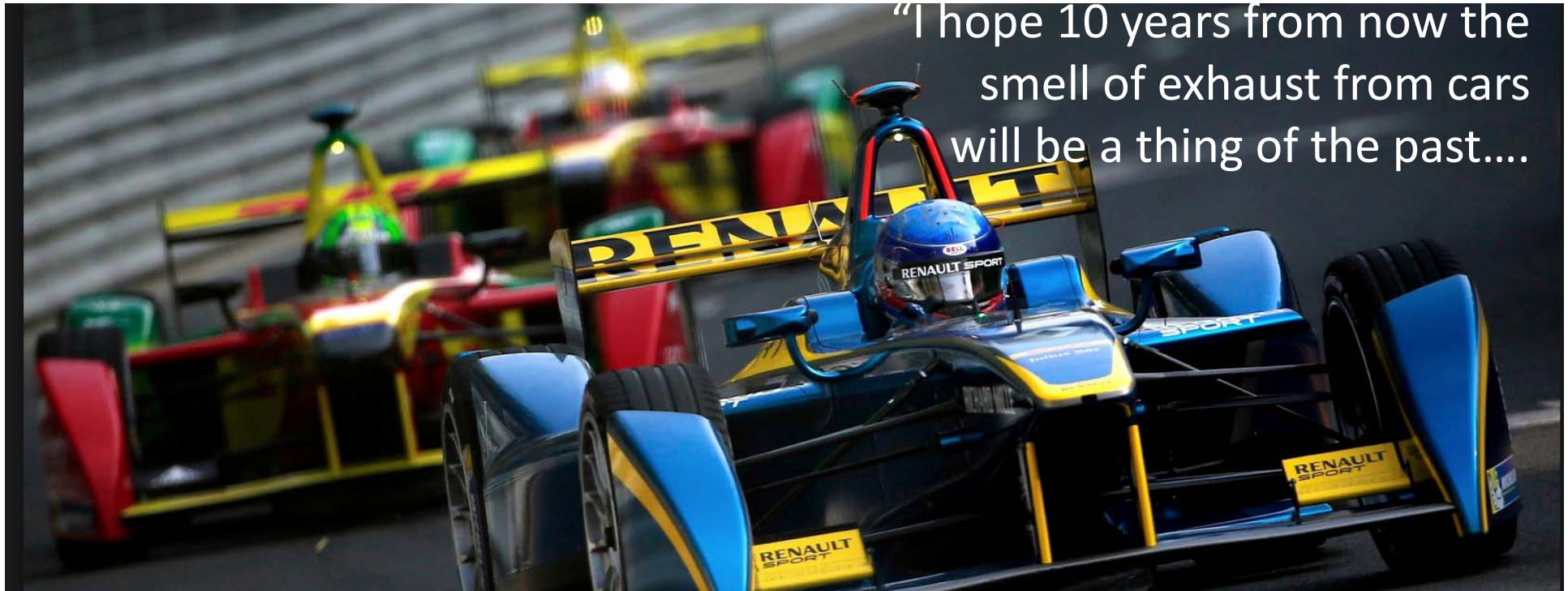


System change in energy is nothing new



Source: S Dolezalek

“I hope 10 years from now the
smell of exhaust from cars
will be a thing of the past....



.....much like the smell of
cigarettes in restaurants”
Richard Branson



...and disruption can indeed happen very fast

1900



Spot the car

1913



Spot the horse

The industrialised nations have declared the endgame on

FINANCIAL TIMES

TUESDAY 9 JUNE 2015

WORLD BUSINESS NEWSPAPER

UK £2.50 Channel Islands £2.80, Republic of Ireland €3.00

Tiger Mums tamed

China's rethink on pre-school cramming — NOTEBOOK, PAGE 12



Why is Isis winning?

How coalition air strikes have failed to deter the jihadis — BIG READ, PAGE 11

Wired workers

Using wearable gadgets to keep tabs on staff — PAGE 14

G7 in historic accord to phase out fossil fuel emissions this century

◆ \$100bn pledge to poor countries reaffirmed ◆ Huge challenge for energy companies

PILITA CLARK — LONDON
STEFAN WAGSTYL — KRÜN

The Group of Seven industrial powers has agreed that the world should phase out fossil fuel emissions this century, in a move hailed as a historic decision in the fight against climate change.

G7 leaders meeting in Bavaria, Germany, said that in line with scientific findings, "deep cuts in global greenhouse gas emissions are required with a decarbonisation of the global economy over the course of this century".

The leaders of the US, Germany, France, the UK, Japan, Canada and Italy said they supported cutting greenhouse gases by 40-70 per cent by 2050 from 2010 levels — the first time they have backed such a precise long-term target.

Angela Merkel, the German chancellor, said that the cuts would have to be at the upper end of this target because "40 per cent is clearly not enough".

The leaders also reaffirmed a pledge to mobilise \$100bn a year from public and private sources by 2020 to help poorer nations tackle climate change.

Climate campaigners said the decisions taken by the wealthiest democra-



Briefing

► **Cameron U-turn on 'Brexit' vote**

David Cameron has retracted a threat to ministers that they would have to quit if they wanted to campaign to leave the EU, scuppering an apparent bid to force discipline on Tory eurosceptics. — PAGE 3; EDITORIAL COMMENT, PAGE 12; GIDEON RACHMAN, PAGE 13

► **Apple launches music streaming service**

Apple has made its biggest push into digital music since it began selling downloads on iTunes 12 years ago, launching a streaming service that will compete with the likes of Spotify. — PAGE 17

► **Ex-Centrica chief to lead oil and gas push**

Former Centrica chief Sam Laidlaw is to take the helm of a private equity push into oil and gas that is backed by Carlyle and CVC Capital Partners and is to spend up to \$5bn. — PAGE 17; LOMBARD, PAGE 22; NORTH SEA DEALS, PAGE 23



► **Relief as Tories shelve paid leave drive**

The prime minister's plans to revive his push to give bigger companies' employees three days of paid leave each year for voluntary work are being quietly axed, to the relief of some business leaders. — PAGE 2

► **Bids invited for military fire service**

Companies including Serco, Babcock and Capita have been invited to bid to run the military fire and rescue services, the latest Ministry of Defence outsourcing deal in its search for savings. — PAGE 4

► **Syngenta rejects fresh Monsanto move**

US agricultural seeds and chemicals company Monsanto's latest move in its pursuit of a "tax inversion" acquisition of Syngenta was rejected as "inadequate" by the Swiss group. — PAGE 17

► **Iceland poised for big step to recovery**

....not to mention up to 70% cuts by 2050, 35 years from now

Three emerging megatrends

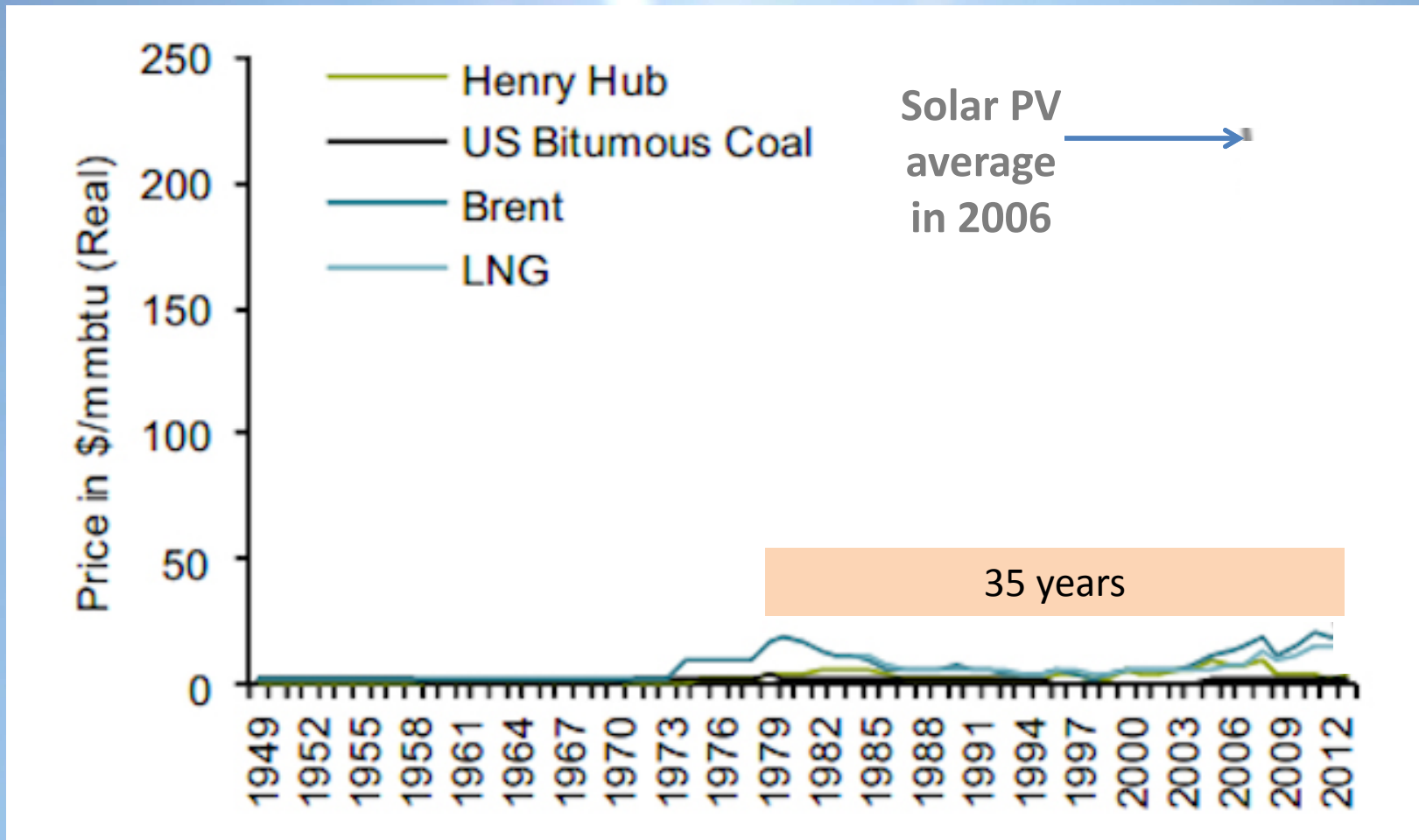
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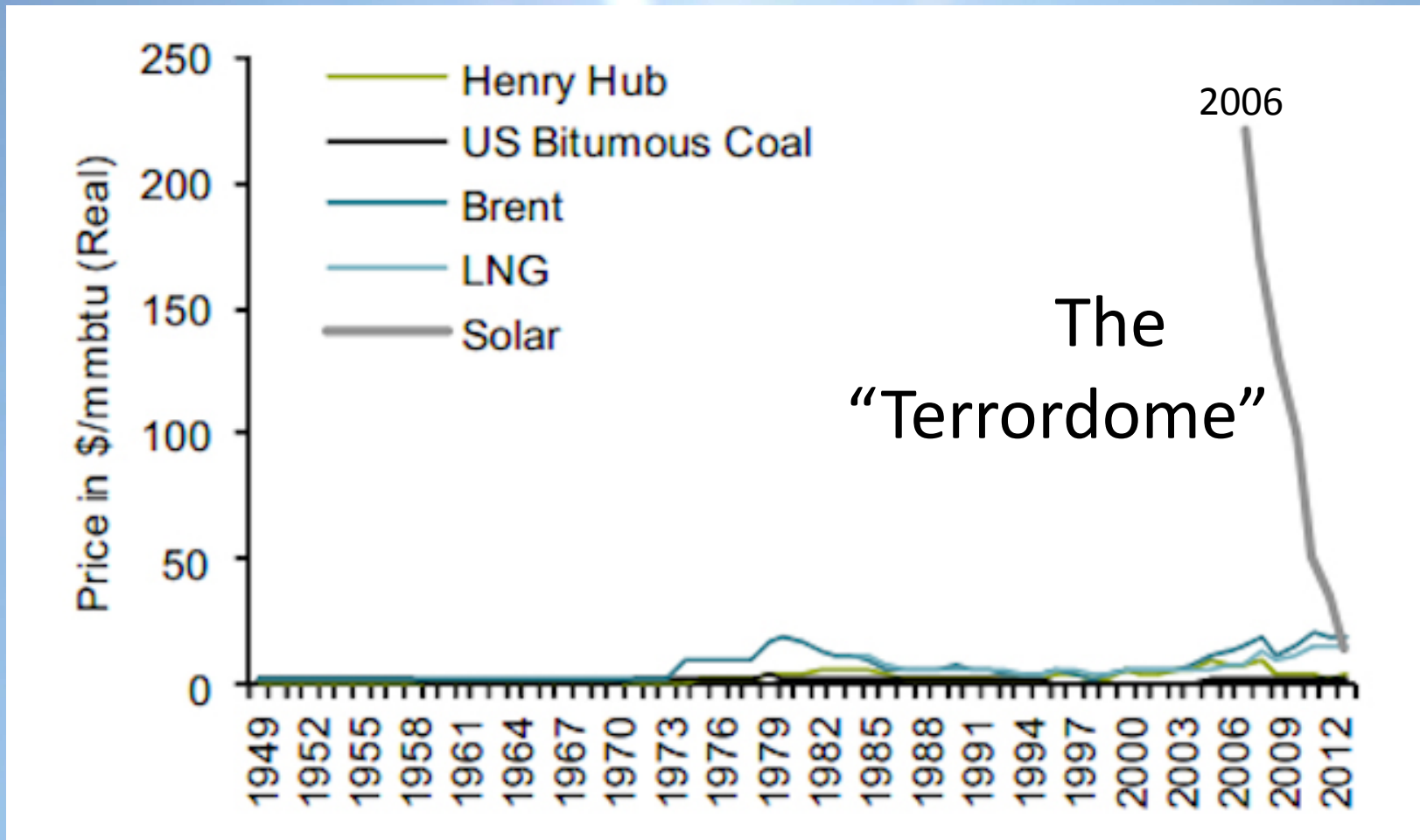
Fossil fuel versus solar: price



Source: Alliance Bernstein, April

2014

Fossil fuel versus solar: price



The
“Terrordome”

Alliance Bernstein, 14 April

2014

Big players
are smelling
the coffee

There are
some ideas
we want every
company
to copy.

There's one area where we encourage others to appropriate our ideas. Because when everyone makes the environment a priority, we all benefit. We'd be more than happy to see every data center fueled by 100% renewable energy sources. And we eagerly await the day when every product is made without the harmful toxins we have removed from ours.

To be sure, we know we can continue to do better. We've set some pretty ambitious goals for reducing our impact on climate change, making our products with greener materials, and conserving our planet's limited resources. So the next time we come across a great idea that can help leave the world better than we found it, we look forward to sharing it.



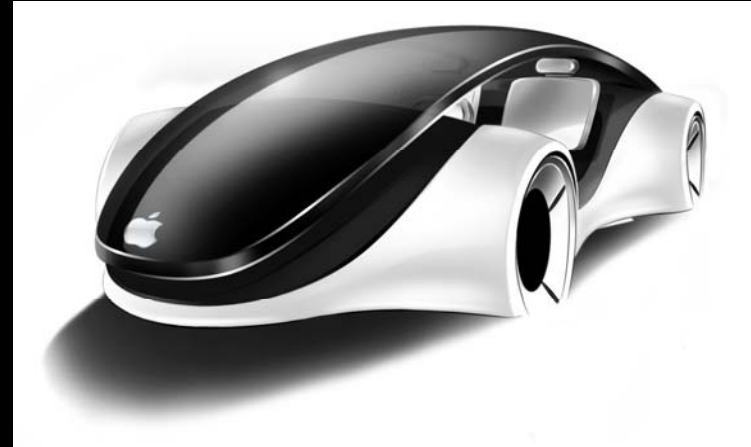
Apple Data Center, Maiden, North Carolina

apple.com/environment

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Apple global
ad campaign
April 2014

Why would Apple want “every company to copy” boring and design-lite solar farms?



Apple Wants to Start Producing
Cars as Soon as 2020 18 Feb 2015

Bloomberg



SSE project with Solarcentury rooftiles 2010

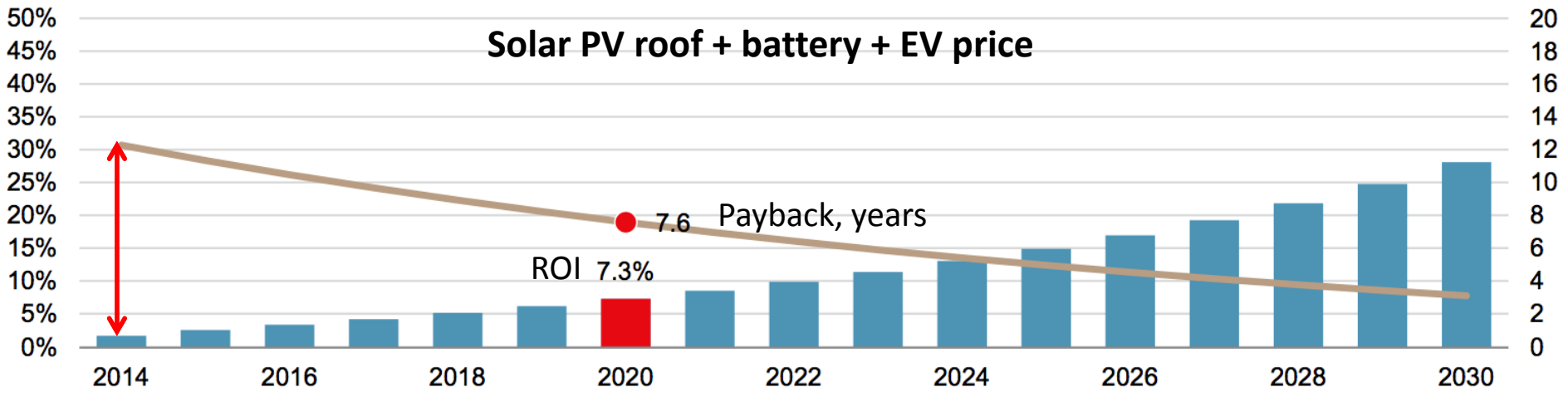
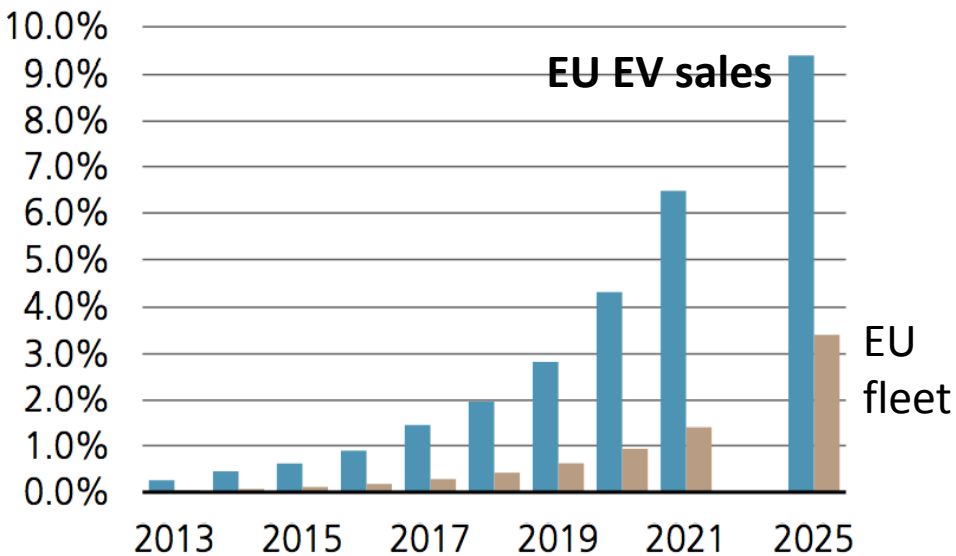
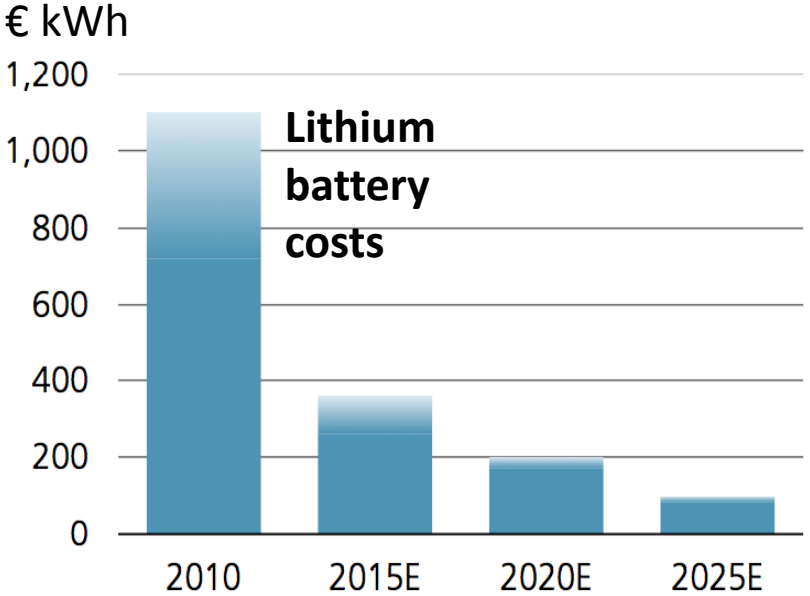
The power of solar and storage



UBS Urges Investors to Join Solar Revolution

Guardian, 27 August 2014

The power of solar and storage



27 August 2014

“This will change the face of energy markets”

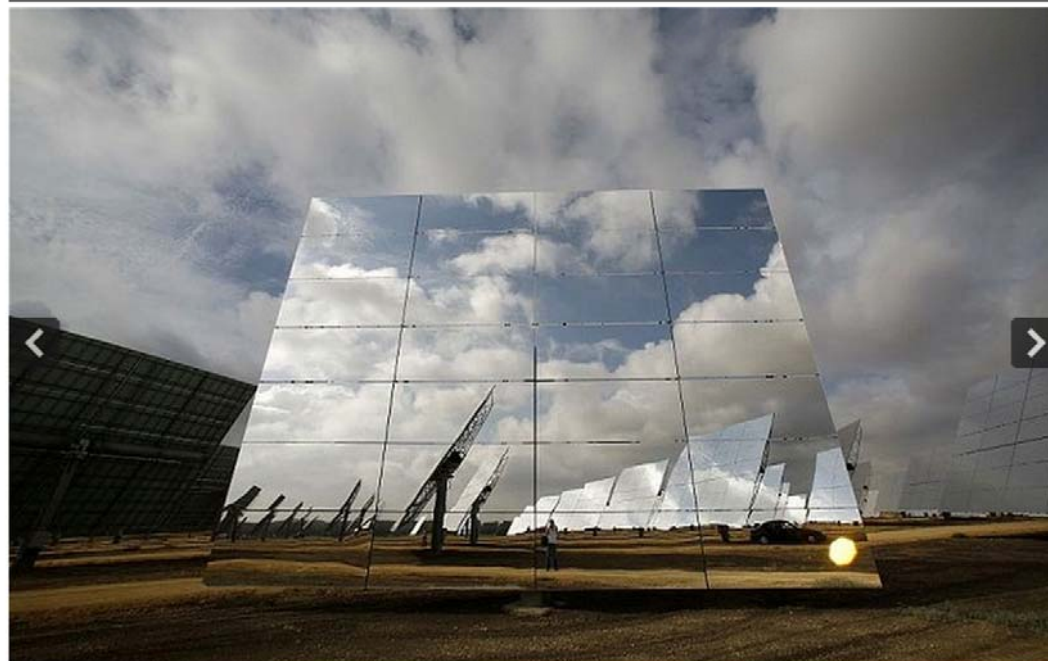
Source:  UBS

Unlikely
players
are paying
very close
attention

HOME » FINANCE » COMMENT » **AMBROSE EVANS-PRITCHARD**

Global solar dominance in sight as science trumps fossil fuels

Solar power will slowly squeeze the revenues of petro-rentier regimes in Russia, Venezuela and Saudi Arabia. They will have to find a new business model, or fade into decline



....er, run
that past
me again?

HOME » FINANCE » COMMENT » **AMBROSE EVANS-PRITCHARD**

Oil industry on borrowed time as switch to gas and solar accelerates

There may be little point battling icebergs to drill in the Arctic, or in trying to extract oil from the ultra-deepwater fields in the mid-Atlantic, beneath layers of salt, three kilometres into the Earth



The first U-turn has happened in the utility sector.
How long before the first oil & gas company?

German utility E.ON to split to focus on renewables, grids

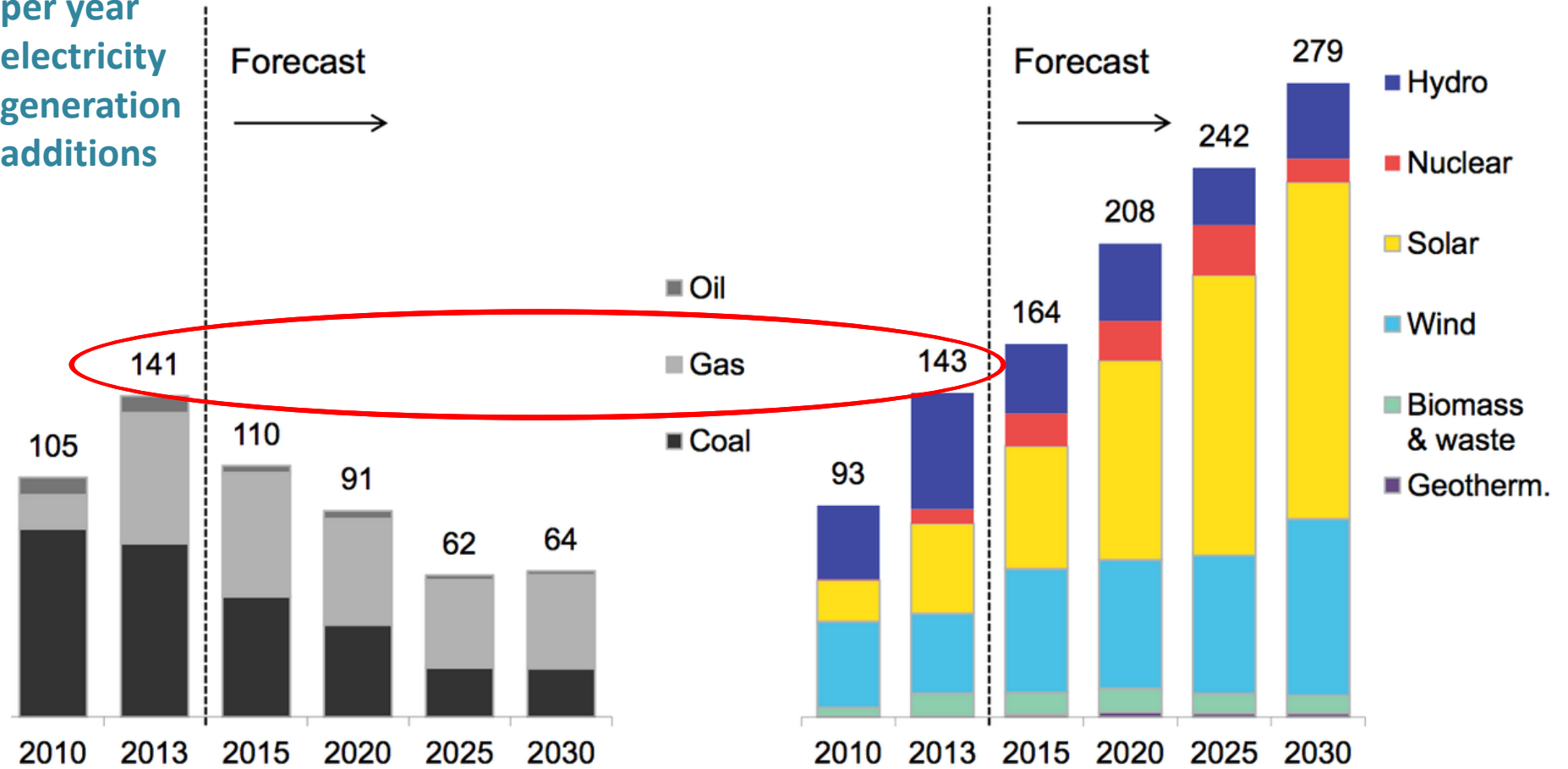
BY CHRISTOPH STEITZ

FRANKFURT | Mon Dec 1, 2014 11:00am EST



The rise and rise of renewables

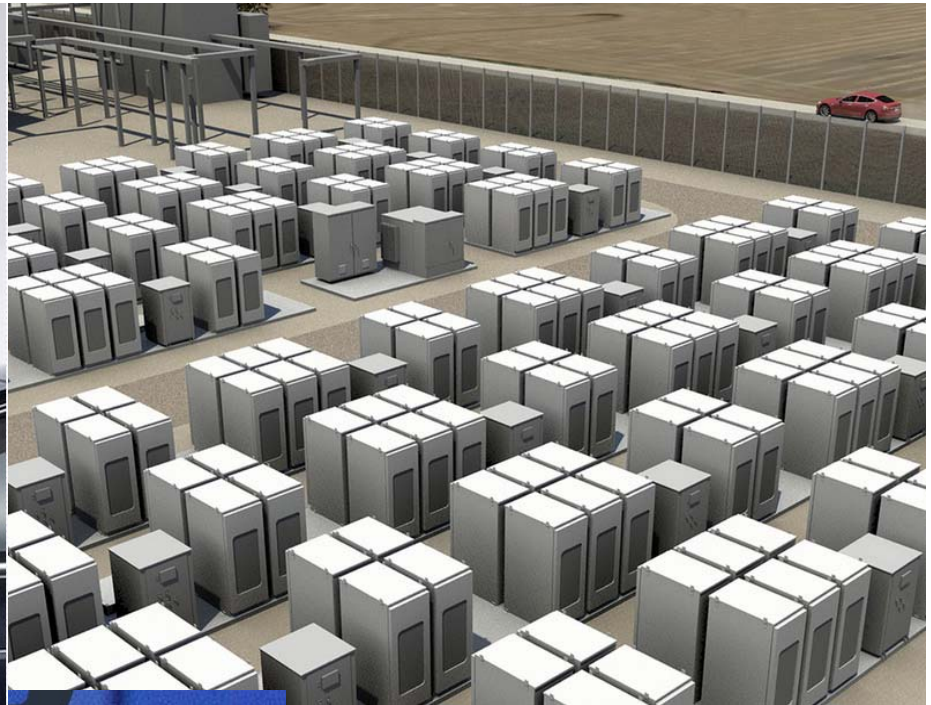
GW
per year
electricity
generation
additions



Source: Bloomberg NEF



May 1 2015
Launch of Tesla Energy




Week 1: \$800 million
of indicative orders

And as for energy efficiency....

The best way to shrink the mountain of transition....

....and the best way to create energy jobs

Energy	
Manufacturer Model	Fridge-Freezer
More efficient	A
A	
B	
C	
D	
E	
F	
Less efficient	
G	
Energy consumption kWh/year (Based on standard test results for 24h)	325
<small>Actual consumption will depend on how the appliance is used and where it is located</small>	
Fresh food volume l	190
Frozen food volume l	126
Noise (dB(A) re 1 pW)	
<small>Further information is contained in product brochures</small>	
<small>Norm EN 153 May 1990 Refrigerator Label Directive 94/EC</small>	



A Green New Deal
Joined-up policies to solve the triple crunch of the credit crisis, climate change and high oil prices

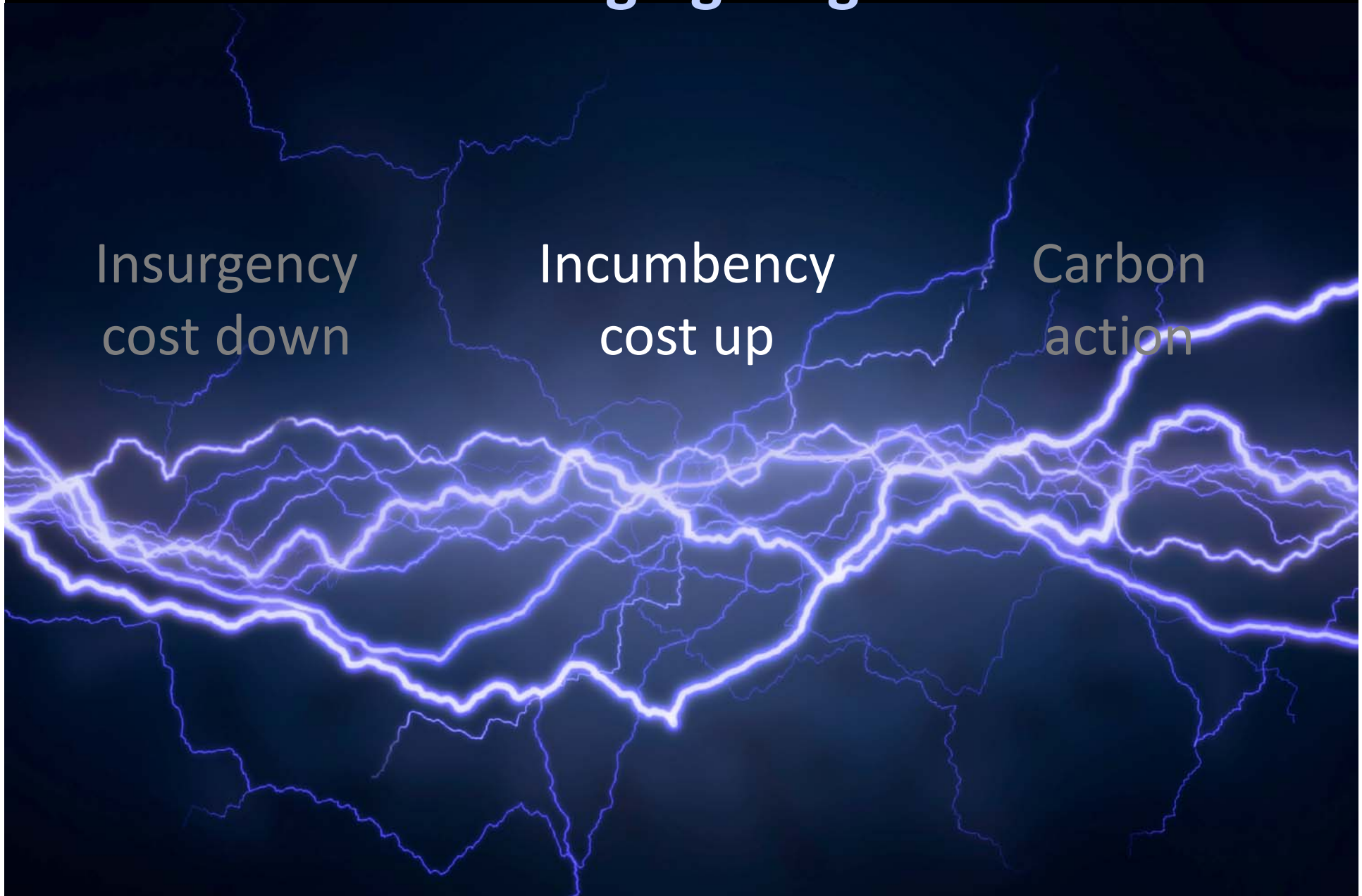
The first report of the Green New Deal Group

Three emerging megatrends

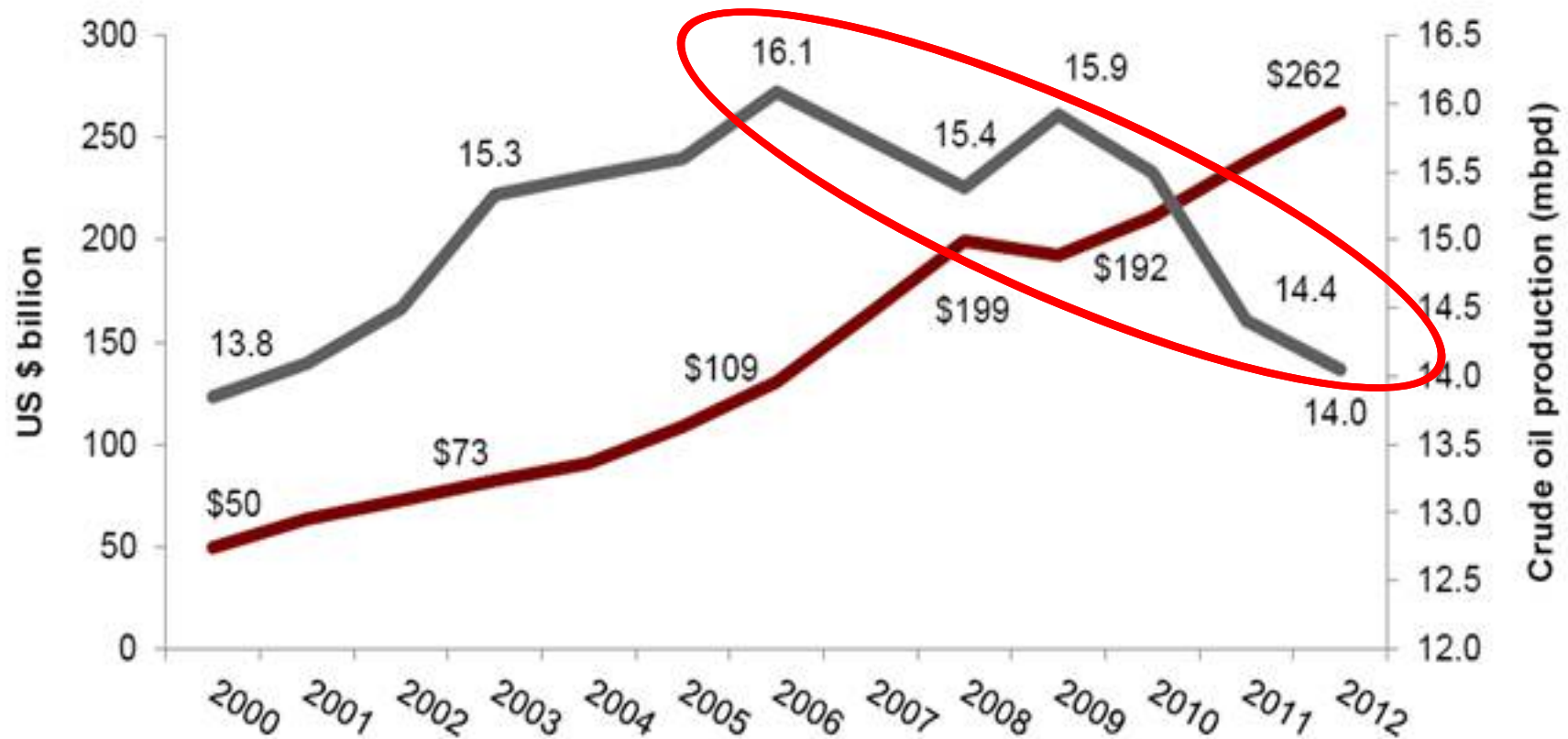
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Capex versus oil production



Selected listed international oil companies' upstream capex and crude-oil production

BG, BP, COP, CVX, ENI, OXY, PBR, RDS, STO, TOT, XOM

Source: Douglas Westwood, from Bloomberg

Capex trials & tribulations



Kashagan
\$50 bn & counting



Shell in the Arctic:
\$5 bn & floundering

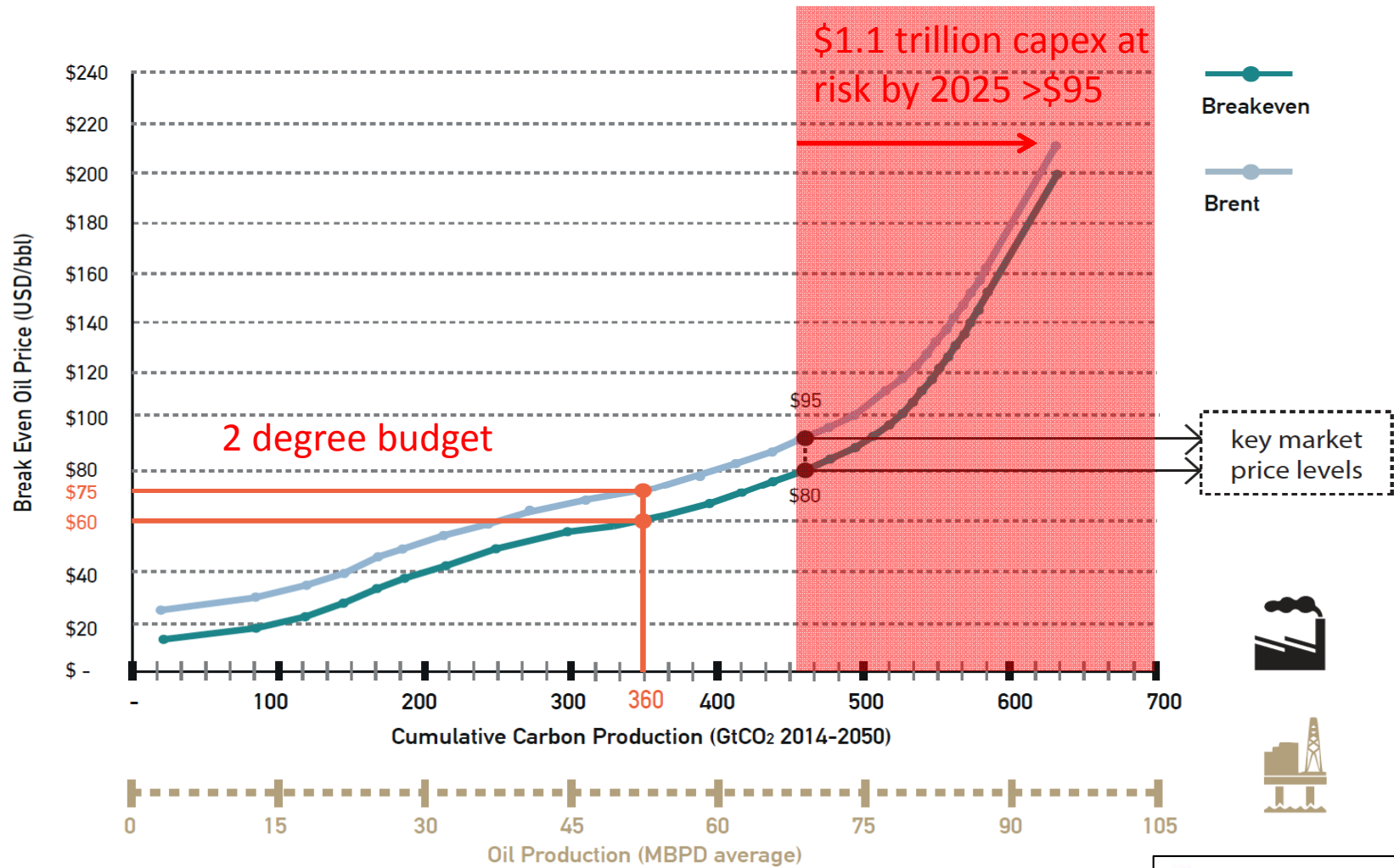


Petrobras & the sub-salt:
\$221 bn over 5 years pleeeeeease



Canada & the tar sands:
50 year financing? Really?

Break-even oil price: assessing danger of stranding





Goldman
Sachs



“A trillion dollars of zombie investments”

in planned future oil projects above \$70

December 2014

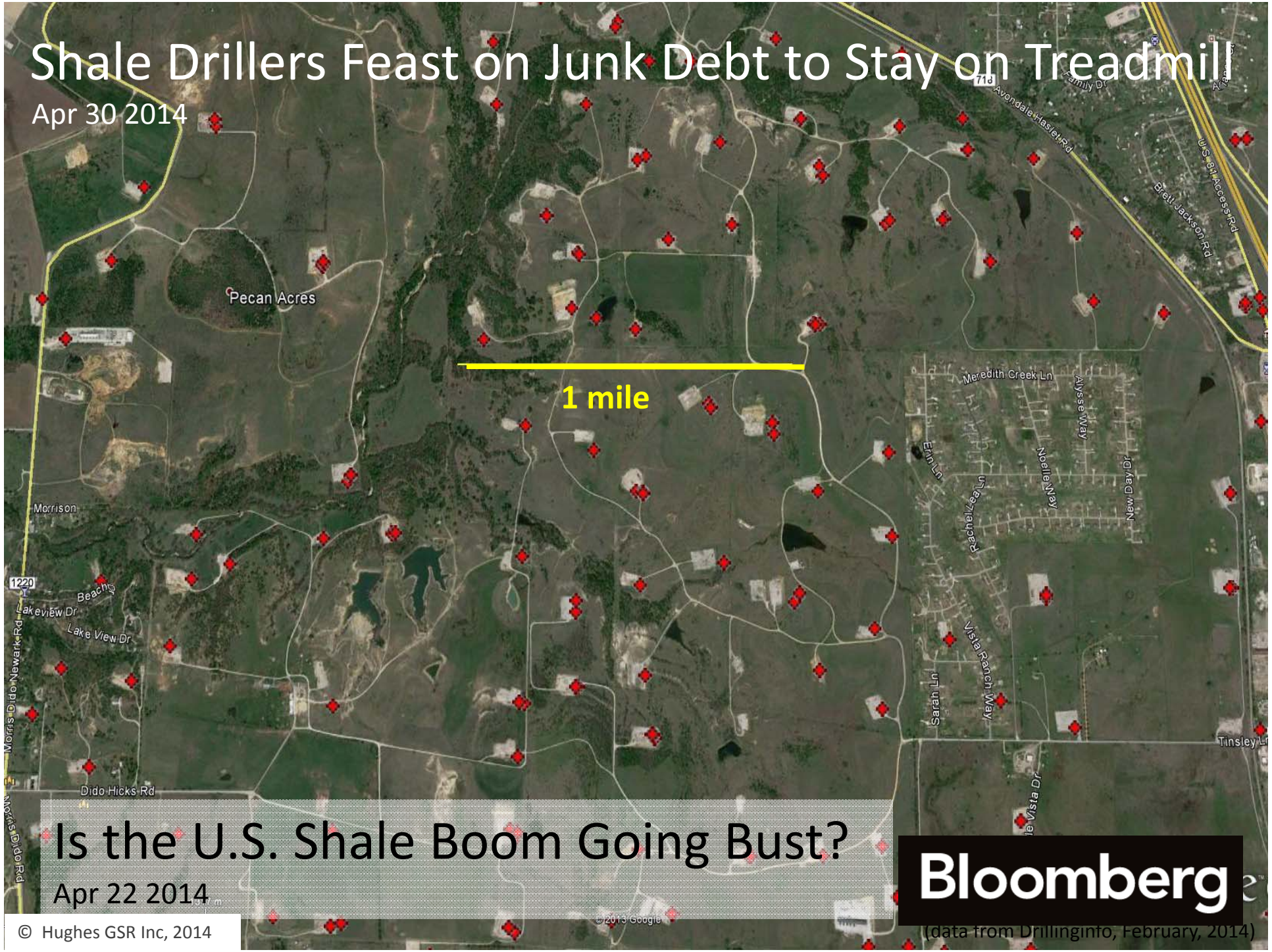


“The Shale Industry Could Be Swallowed By Its Own Debt” Jun 17 2015

Bloomberg

Shale Drillers Feast on Junk Debt to Stay on Treadmill

Apr 30 2014



1 mile

Is the U.S. Shale Boom Going Bust?

Apr 22 2014



© Hughes GSR Inc, 2014

© 2013 Google

(data from Drillinginfo, February, 2014)



The Weald, UK: fracking welcome?





Balcombe, August 2014

It gets worse....

FINANCIAL TIMES

Bank of England to examine financial risks linked to fossil fuels

Pilita Clark, Environment Correspondent 1 December 2014

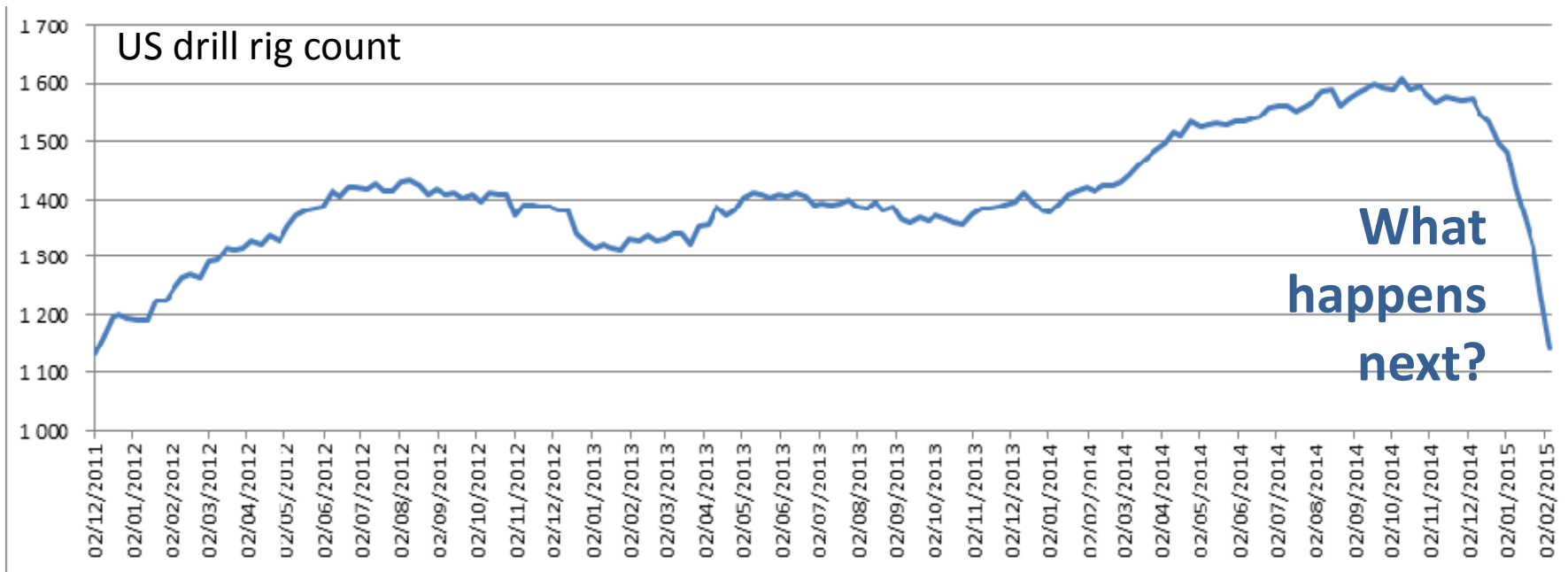
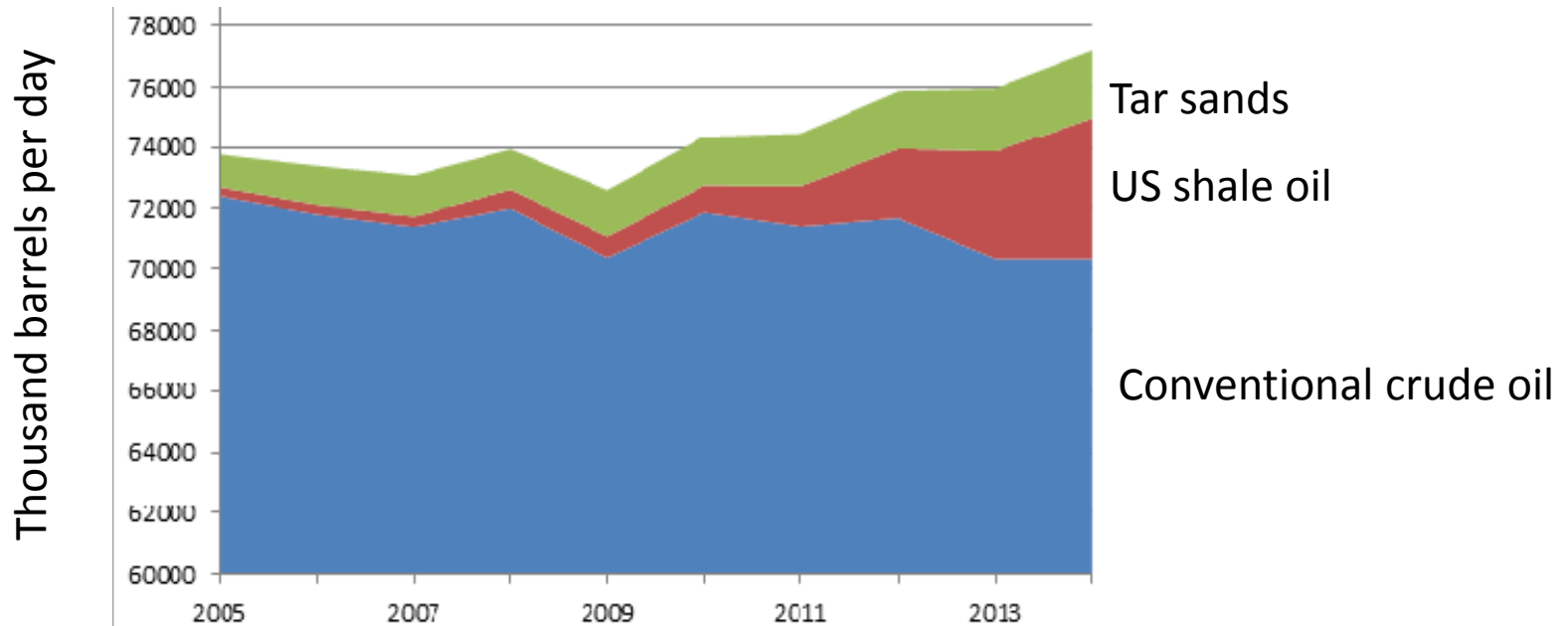


The [Bank of England](#) has revealed it is to examine formally for the first time the risks fossil fuel companies pose to financial stability.

In a shift from the bank's past statements, Mark Carney, its governor, has written to MPs informing them that his officials have discussed the idea that most of the world's proven coal, oil and gas reserves may be "unburnable" if global warming is to be kept within safe limits.

.....an enquiry now being emulated by the G-20, as of April 2015

Global crude production 2005 – 2014 and US rig count



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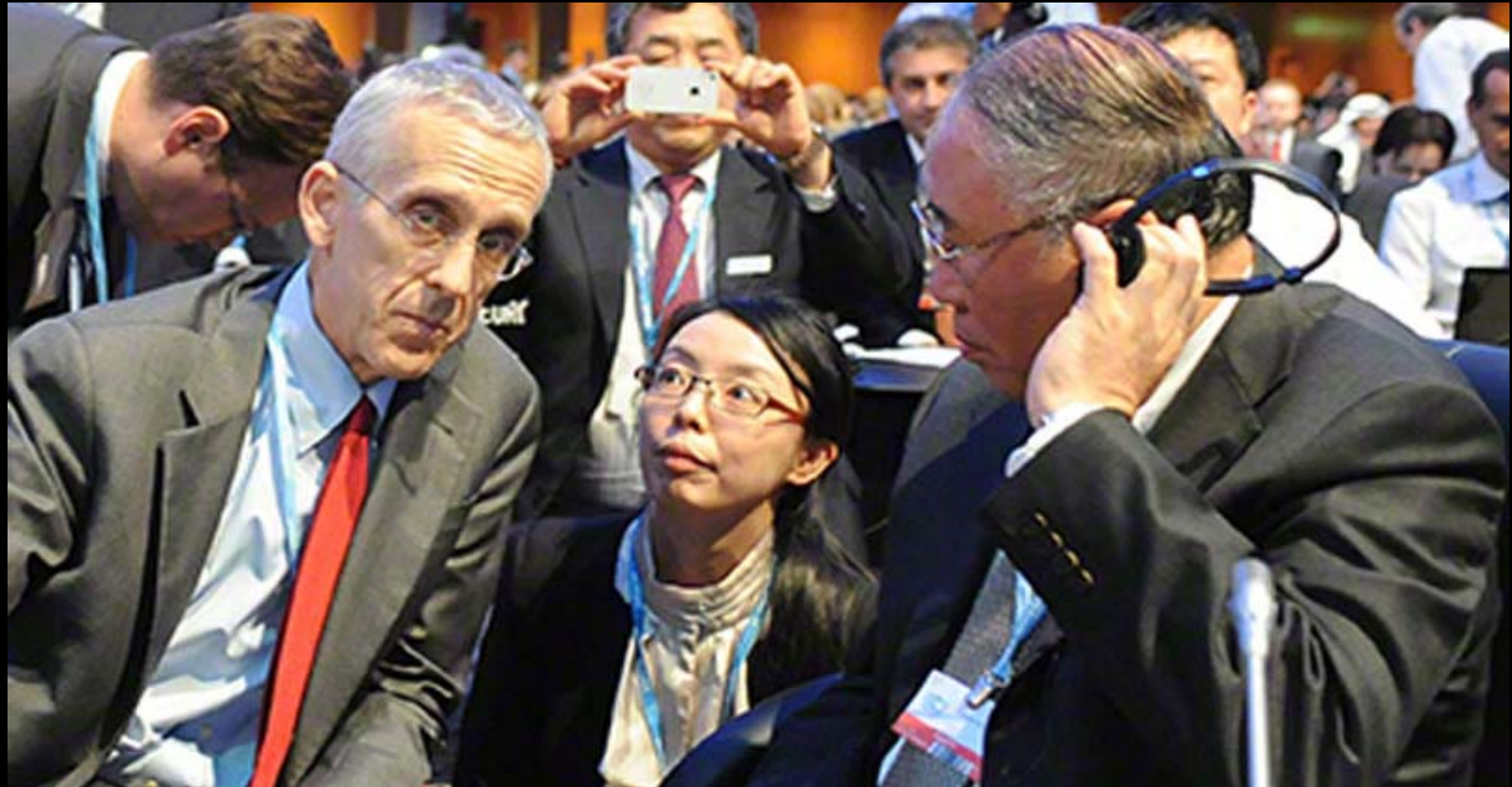


Copenhagen, Dec 2009



Our leaders may have failed in 2009, but.....

.....circumstances are different now



US & China envoys work together at the Lima climate summit, December 2014

And:

c. 100 nations for zero
net carbon by 2050

66% of emissions are
down to 90 companies



Coal is entering structural decline



The ethical case has a new champion

“It is our marching orders for advocacy. It really brings about a new urgency for us.”

Joseph Kurtz, president
US Conference of Catholic Bishops

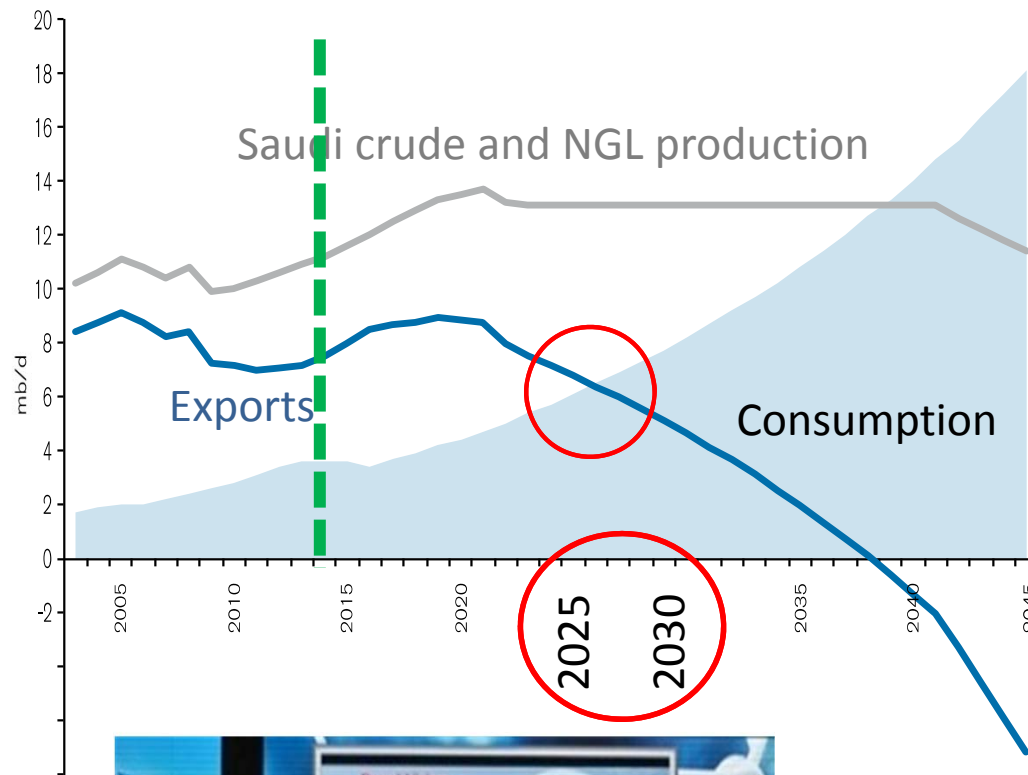




Saudi Arabia is focussing on oil *consumption* as well as production

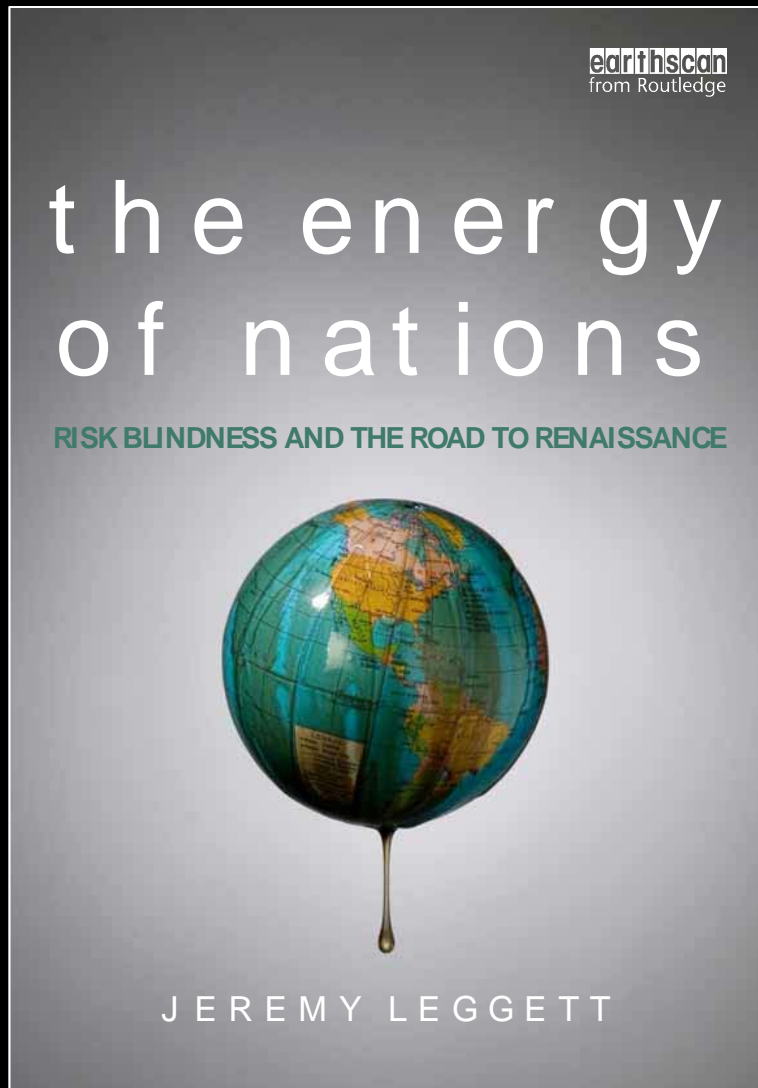


Saudi Arabia: not a drop to export by before 2030 on current trends



....and the proposed solution?

...all the dramas are in my front-line eyewitness chronicles



Jan 2004 – May 2013



May 2013 – Dec 2015

Conclusions: Paris and transition

- We are heading for the right signal to be sent from the Paris climate summit
- For the incumbency, problems will grow & opportunities will diminish
- For the insurgency, opportunities will grow & problems will diminish



Thank you

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