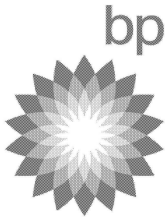
Tuesday, June 21, 2016

11:30 am – 1:30 pm

Climate: Group Context

- Paul Jefferiss presents new BP Group Carbon and Climate Update Slide Deck.
- Seymour Khalilov discusses US data on carbon emissions.
- Attachment: Group Slide Deck.

BP Confidential



Carbon and climate update

UEC

April 26th 2016

BPA_HCOR_00345098

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Climate science

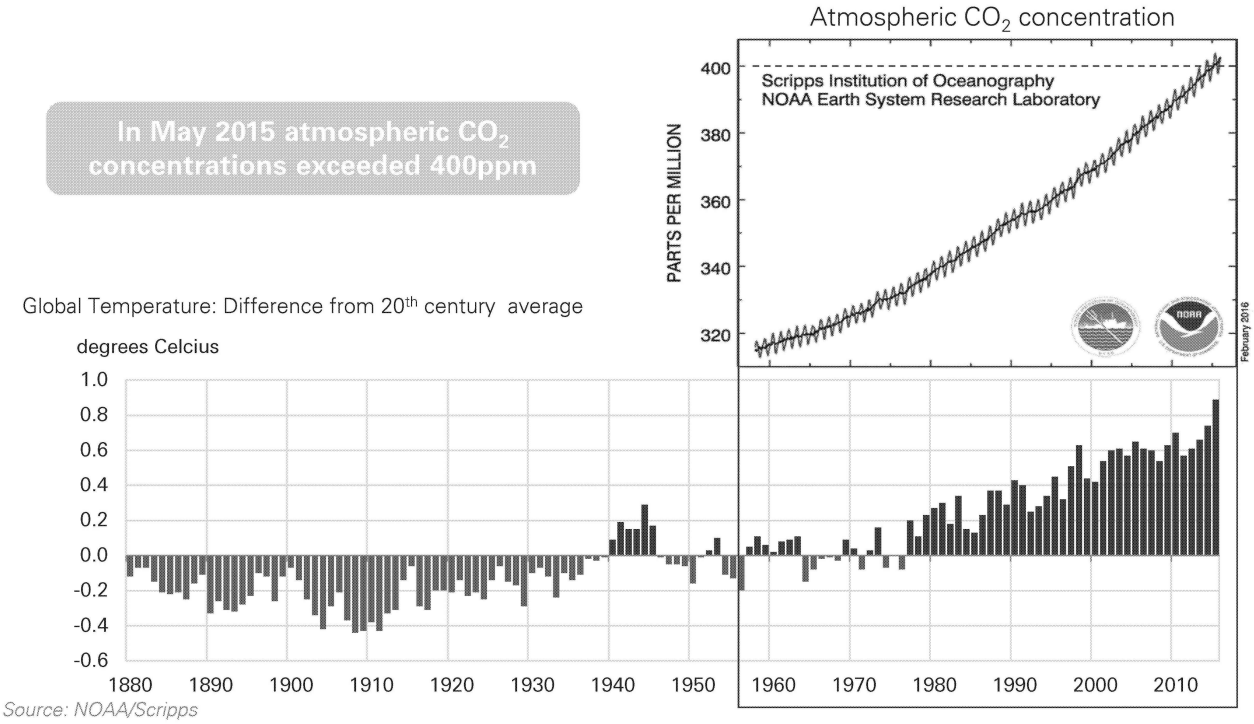
Climate policy

Climate and carbon risk management – 2015 shareholder resolution

Upstream performance

Man-made GHG emissions are rising…

In May 2015 atmospheric CO_2 concentrations exceeded 400ppm

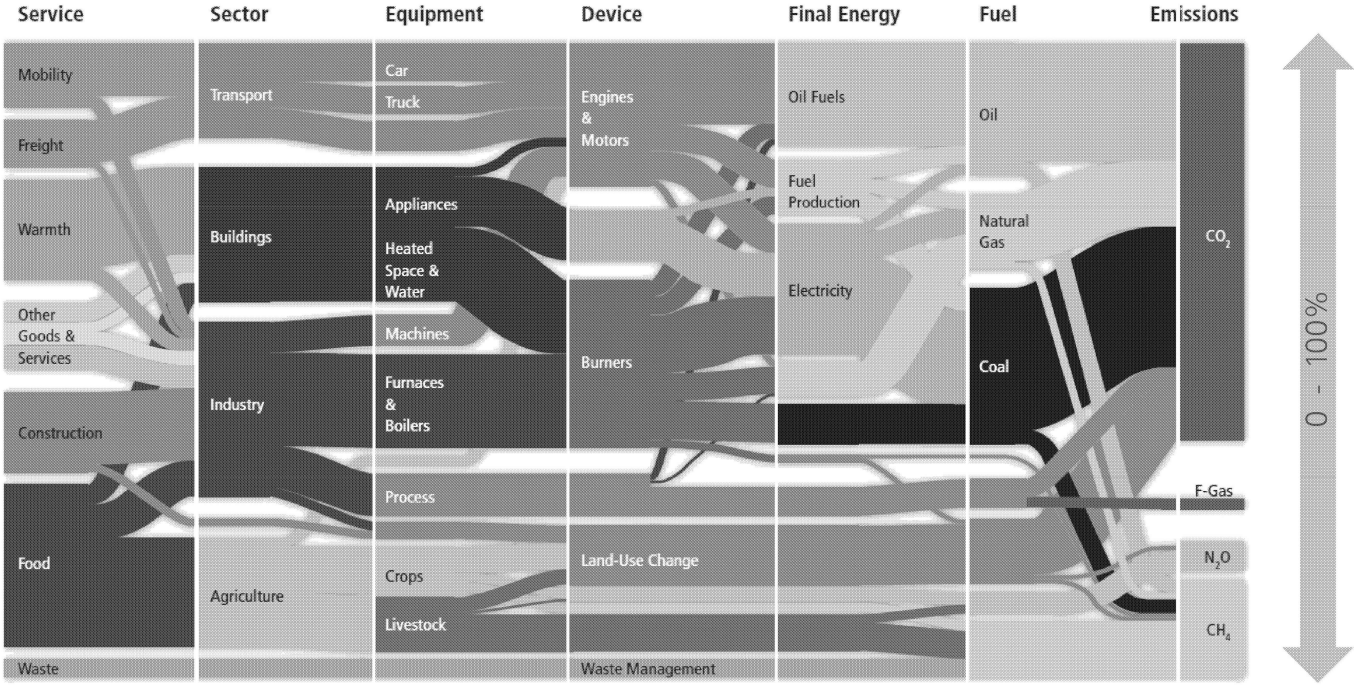


Source: NOAA/Scripps

...and linked to rising temperatures

- Increasing man-made emissions of the main greenhouse gases (carbon dioxide and methane) result in increasing GHG concentrations in the atmosphere
- This affects the earth's heat balance resulting in global warming, observed through:
  - Increasing global surface temperature – 2015 was the hottest year on record
  - Sea level rise – sea level is rising at the fastest rate for 28 centuries
  - Reduced glacier and Arctic sea ice
  - Altered levels of precipitation – drought and flooding
  - Increased frequency of extreme weather events
- The Intergovernmental Panel on Climate Change (IPCC) state that it is "extremely likely" that human influence (man-made emissions) has been the dominant cause
- Urban air quality is also a growing concern, notably NO_x, SO_x and particulates

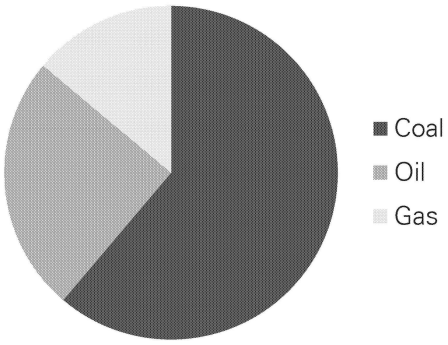
GHG emissions by source…



Source: University of Cambridge / Foreseer Tool

....show that there are many actors

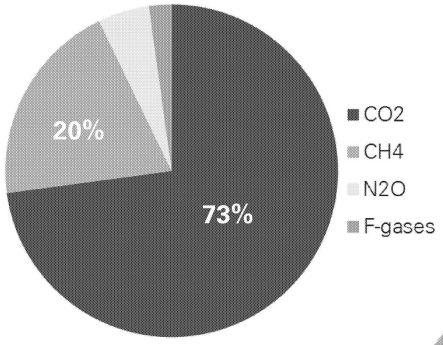
- Land use accounts for about a quarter of current GHG emissions
- Fossil fuels account for about two thirds of current global GHG emissions
- Coal accounts for the single largest share from fossil fuels
- This is even greater on a reserves basis (60% coal, 40% oil and gas)



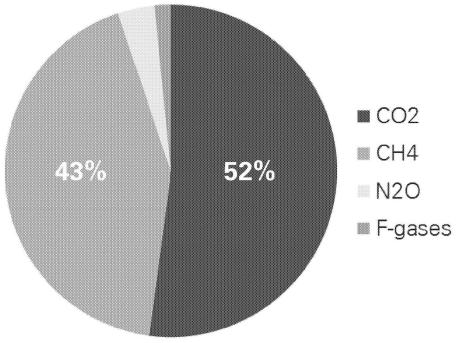
Potential GHG emissions from fossil fuel reserves

Source: BP sustainability review 2014

CO_2 and CH_4 are the main contributors....

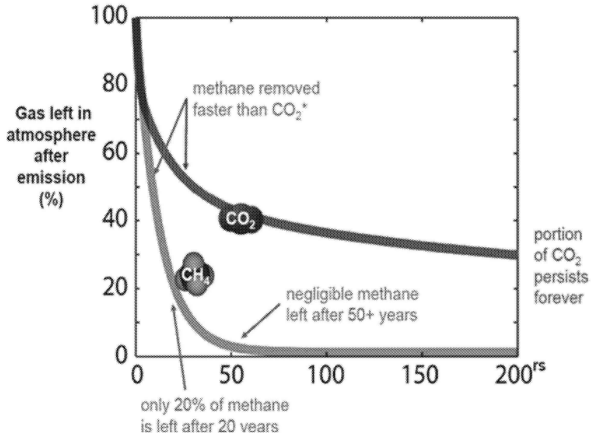


Contribution of different GHGs over 100 years



Contribution of different GHGs over 20 years

Source: IPCC AR5 based on 2010 emissions

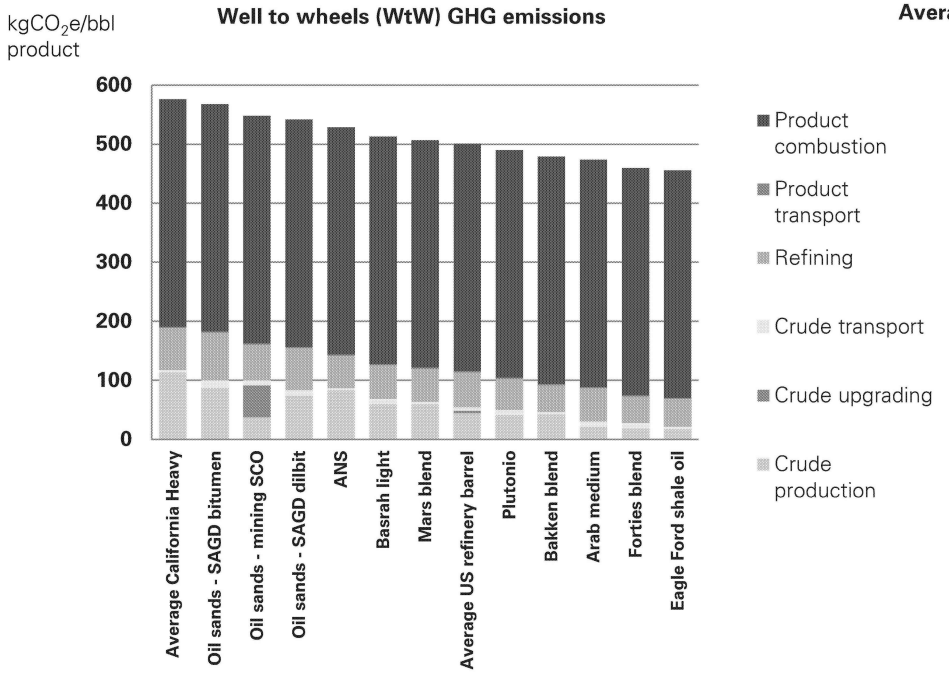


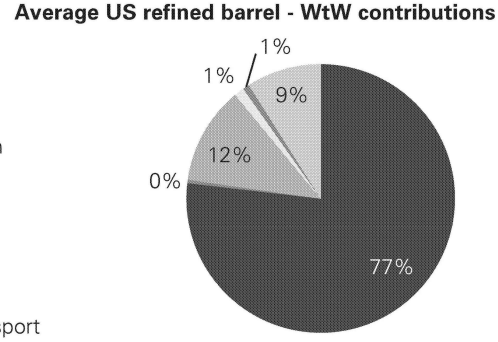
Source: Princeton CMI

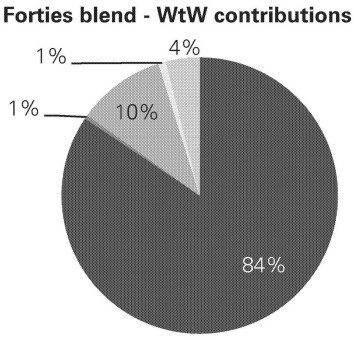
...but have a different impact

- CH_4 is about 100 times more powerful at trapping heat than CO_2, but emissions of CO_2 are about 100 times higher than CH_4
- CO_2 lasts a much longer time in the atmosphere – centuries compared to decades for methane
- This makes the immediate impact of current methane concentrations large – but the long term impact of emissions smaller
- Scientific uncertainty remains on the global warming potential (GWP) of methane, and GWP has been revised up this year, from 21 to 25
- To address climate change it is important to reduce both

Life cycle GHG emissions for oil…





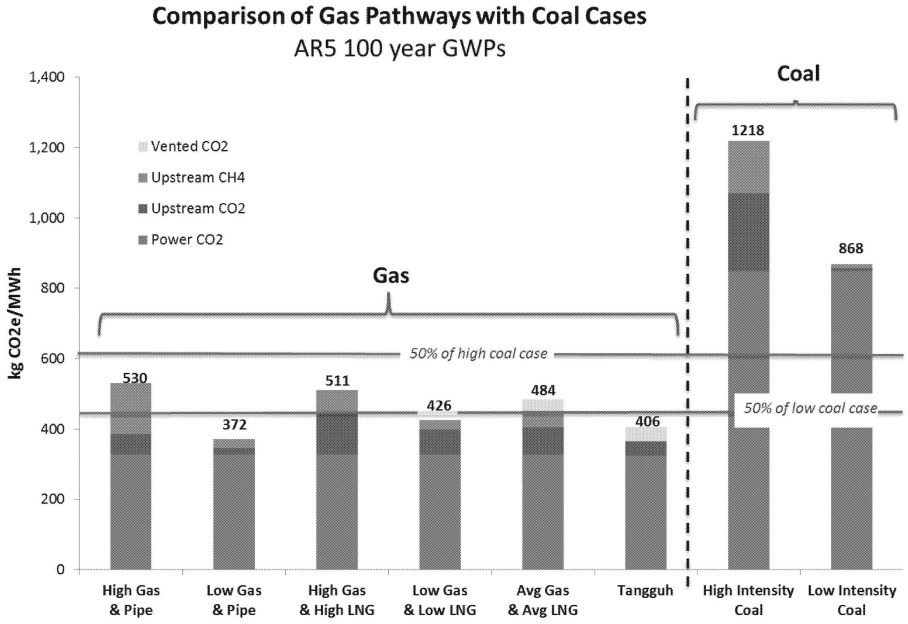


Source: BP internal analysis

...are dominated by product demand

- For fuels from all crude types product demand (combustion) dominates carbon emissions:
  - Combustion emissions range from 67% to 84% of total value chain
- Upstream operational emissions:
  - Range from 4% for Eagle Ford to 15% for Oil Sands to 20% for Californian Heavy
- Crude upgrading:
  - Only material for mined Oil Sands, at 10% of value chain
- Refining:
  - Refining emissions have a relatively tight range from 10 – 14%
- Average US crude has higher Well to Wheels (WtW) emissions than Forties blend:
  - However, with increasing shale / tight oil production, US average WtW emission intensity is falling

Life cycle GHG emissions for gas…



Note: The Avg. gas & Avg. LNG pathway includes a nominal 10% vented reservoir CO_2 to illustrate the impact of high reservoir CO_2. The average reservoir CO_2 used is ~2%$_{vol}$.

Legend

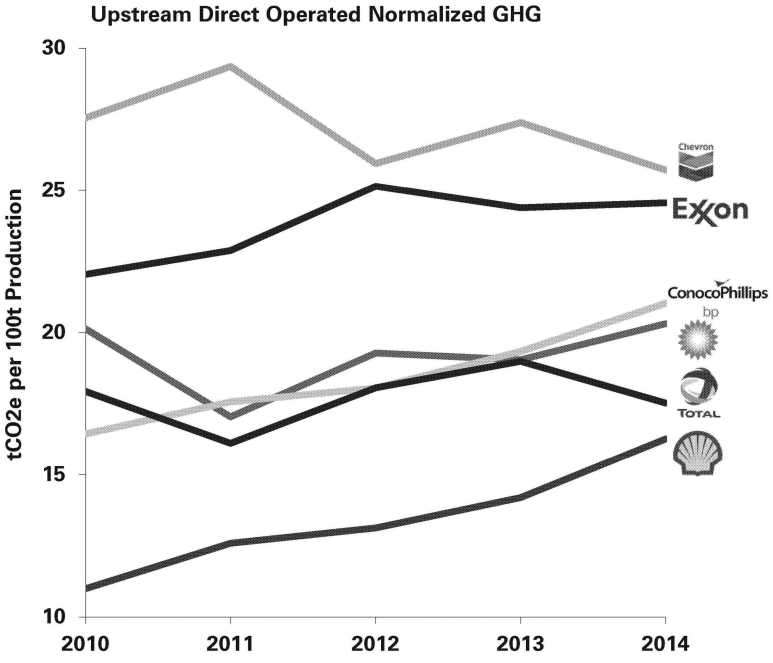
High Gas & Pipe	High CO_2 & CH_4 emission pipeline gas
Low Gas & Pipe	Low CO_2 & CH_4 emission pipeline gas
High Gas & High LNG	High CO_2 and CH_4 emission gas and high intensity LNG
Low Gas & Low LNG	Low CO_2 and CH_4 emission gas and low intensity LNG
Avg. Gas & Avg. LNG	Average CO_2 and CH_4 emission gas and average intensity LNG
Tangguh	Tangguh gas to Japan
High Intensity Coal	High CO_2 & CH_4 emission coal (China)
Low Intensity Coal	Low CO_2 & CH_4 emission coal (US PRB)

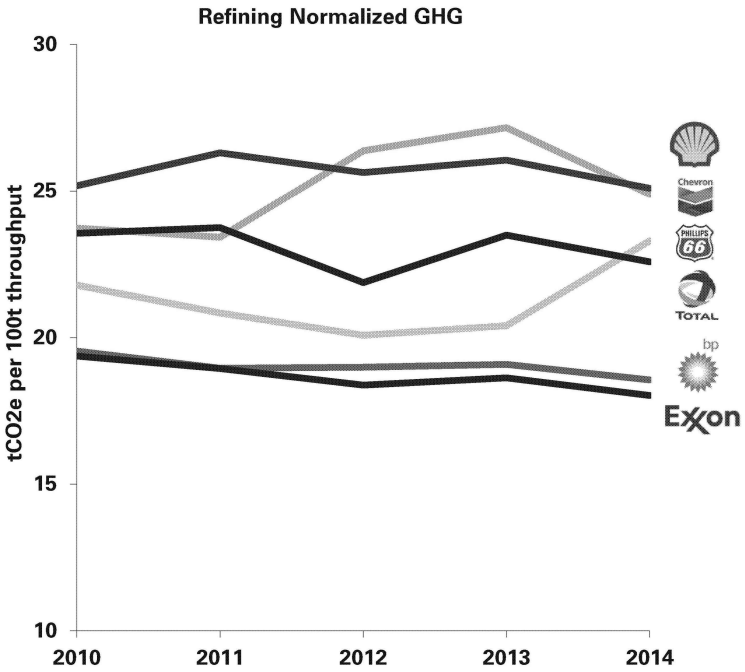
Source: BP internal analysis of many sources

...are significantly better than coal

- Gas via pipeline or LNG has materially lower life cycle GHG emissions than coal for power generation.
- Both CO_2 and CH_4 emissions from the gas supply chain influence lifecycle GHG emissions. LNG adds energy demand and emissions but not enough to offset the inherent advantages of gas over coal.
- CH_4 and CO_2 emissions and their relative importance vary widely between gas supply chains.
- CH_4 emissions from BP's Tangguh value chain are insignificant – and Tangguh's GHG emissions are less than half of coal even with venting of reservoir CO_2.
- In addition, natural gas offers very substantial air quality benefits over coal.

BP's operational GHG performance…





Source: Global Benchmarking Group 2014

...compares well with our competitors

- Our Upstream GHG intensity is "in the pack"
- Our Refining GHG intensity is better than most competitors
- Shell's increase in Upstream due to Pearl Gas to Liquids (GTL) plant coming online in 2013, and elevated flaring in line with increased oil production in Iraq in 2014
- Exxon's GHG intensity reduction in refining due to improvements in energy efficiency and reliance upon co-generation
- Chevron Upstream emissions intensity reduced through increased utilisation of previously flared gas in Angola and Nigeria, but future emissions will rise
- Sharp rise in ConocoPhillips Upstream due to change in reporting criteria for upstream operations

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Climate science

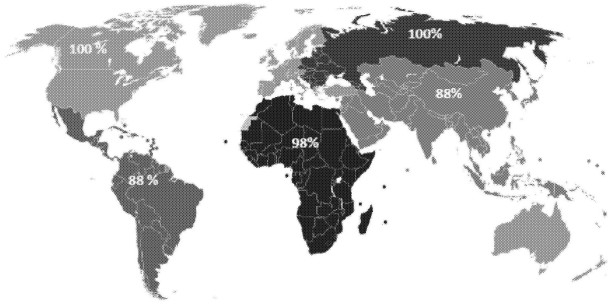
Climate policy

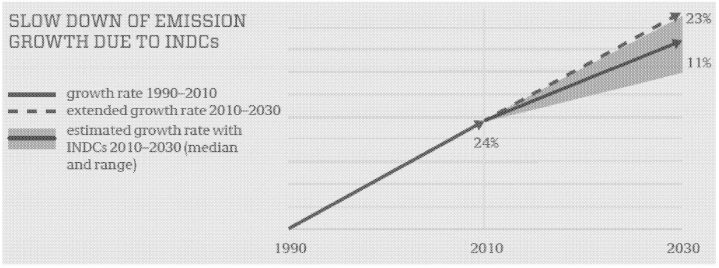
Climate and carbon risk management – 2015 shareholder resolution

Upstream performance

The Paris agreement…

% GHG emissions covered by INDCs by region



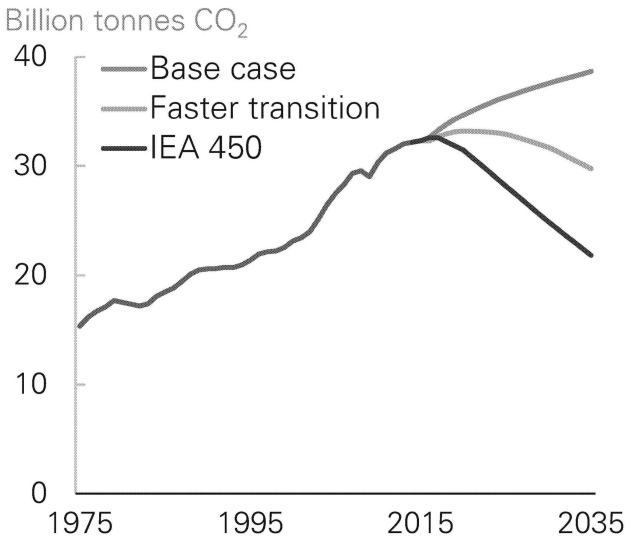


…may be a significant response to climate change

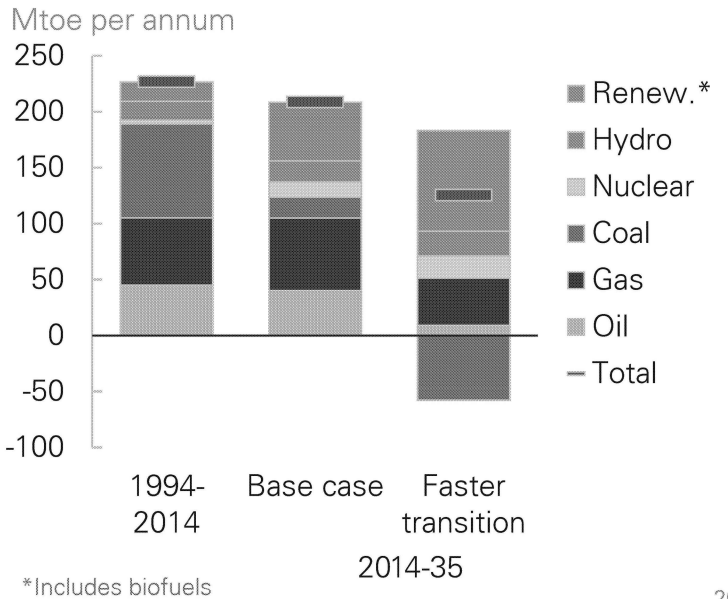
- With ambitious long term goals:
  - Aim to hold temperature rise to well below 2°C, pursue efforts for 1.5°C.
  - Peak emissions asap and balance emission sources and sinks 2050-2100.
  - Allows for emissions trading and possible carbon pricing
  - Official signing of the agreement on the 22nd April
- And bottom up short-term climate pledges. Countries must:
  - Submit "nationally determined contributions" (NDCs)
  - Report every 5 years from 2023 and ramp up ambition each time
  - The NDCs do not meet 2°C (more like 2.7-3.5°C), and are not legally binding
  - Do NOT have any near-term impact on BP's businesses

BP's Energy Outlook...

Carbon emissions



Annual demand growth by fuel



*Includes biofuels

...assesses likely and possible energy and emissions to 2035

- In the base case carbon emissions grow more slowly than over the past 20 years but they still increase by 20% – well above a 2°C emissions pathway.
- In the 'faster transition' case emissions peak in 2020 and by 2035 are nearly 8% below the 2014 level.
- That falls short of the IEA 450 Scenario, but goes well beyond the NDCs.
- Total energy demand still grows in the 'faster transition' case, but at a reduced pace (0.9% p.a. versus 1.4% p.a. in the base case). Non-fossil fuels supply all of the increase.
- Natural gas and oil still increase, while coal consumption suffers the most, falling by more than 30% to its lowest level since 2002.
- The big winner in the 'faster transition' case is renewables, with an almost six-fold increase in output (nearly 9% p.a.) and a 15% share of energy by 2035.

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Climate science

Climate policy

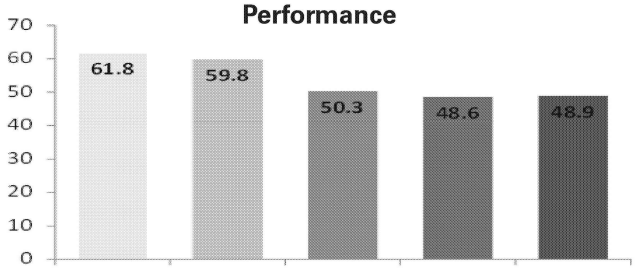
Climate and carbon risk management – 2015 shareholder resolution

Upstream performance

Group GHG emissions have decreased …

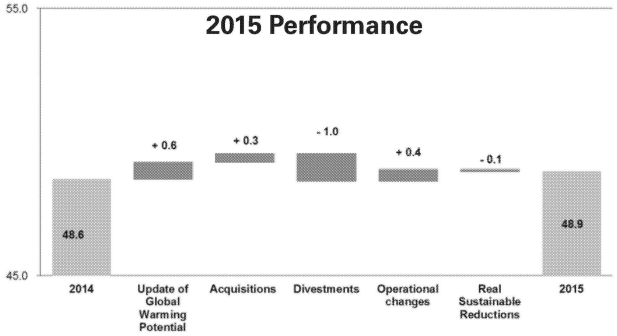
GHG Equity Emissions: Group
million $teCO_2$ eq

Historic Performance

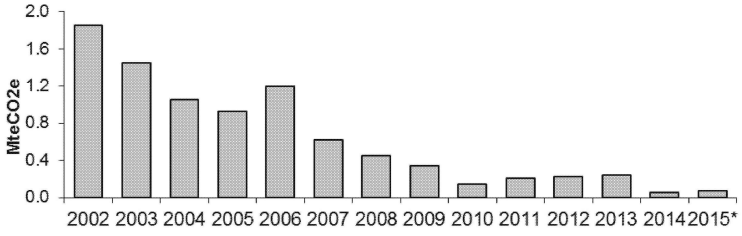


*2015 data calculated using a revised global warming potential of 25 instead of 21

2015 Performance



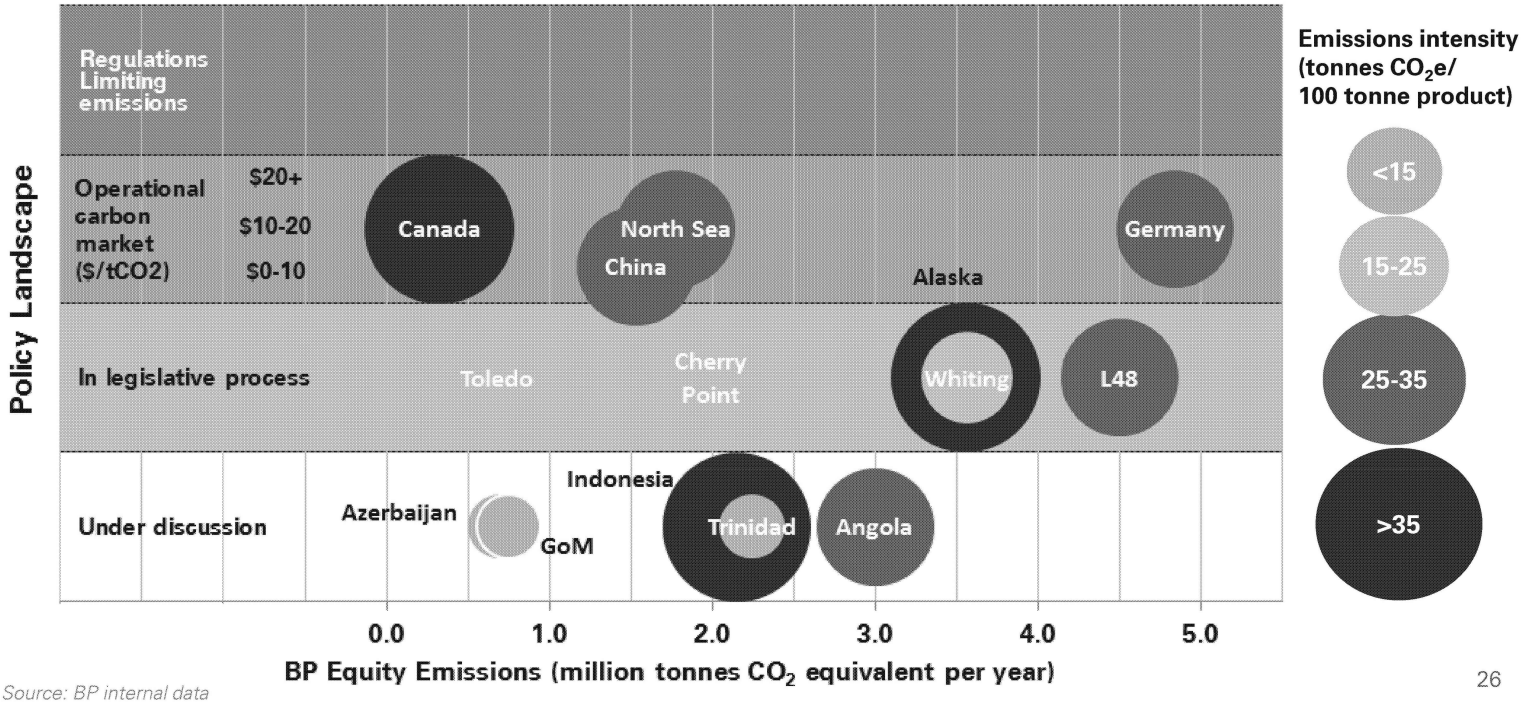
Annual real sustainable reductions 2002 - 2015



...but mainly due to divestments

- Group GHG have fallen by 25% since 2010 but almost entirely due to divestments
- GHG emission intensity has increased over the same period, both in Upstream (18%) and in refining (3%), reflecting increasing intensity of operational activities specifically including Prudhoe Bay
- Real Sustainable Reductions (RSRs) have declined in recent years as the easier opportunities for reduction have been realised .
- Methane is a smaller percentage of total group emissions – mostly from Upstream. 2015 GHG data includes a higher GWP for methane (25 up from 21) to align with IPIECA guidelines.

BP's major businesses (2015 data)…



Source: BP internal data

...have widely varying carbon exposure

- Exposure varies according to business-specific emissions and geography-specific policy
- Operational emissions vary according to the scale and emissions-intensity of the business
- Emissions intensity (tonnes of CO_2 per 100 tonnes of product) varies significantly across our portfolio
  - Alaska (66) – gas compression and processing
  - Germany (27) – refinery process heat and power
  - North Sea (34) – production facilities and transportation (Forties Pipeline, Sullom Voe Terminal)
  - Canada (135) – steam raising for oil sands
  - Indonesia (49) – Tangguh LNG liquefaction and reservoir CO_2 venting
  - GoM (6) – production facilities and water flood
- Some businesses are in already highly regulated areas (EU, Canada), others are emerging (US), and some are in areas where regulation is not yet mature (Angola)

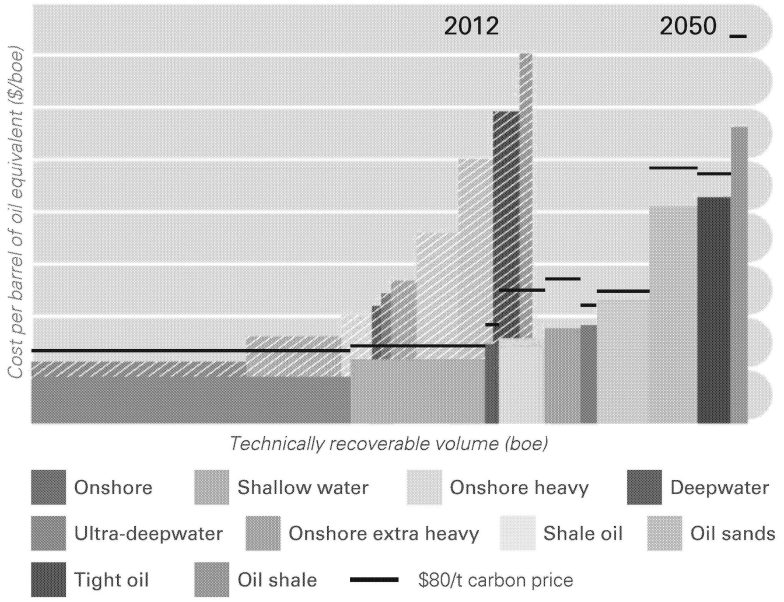
Portfolio choices are impacted by…

Technology

- Grows recoverable volumes
- Reduces cost of supply
- Changes rank

Carbon price

- Increases cost of supply
- Price impact varies by asset class
- Changes rank



Source: BP Technology Outlook

...technology and carbon risk

- Technology advances could increase the supply and reduce the cost of upstream resource types, changing their rank order
- Next-generation enhanced oil recovery, seismic imaging, and well construction and intervention could increase recoverable oil and gas resources by 2 trillion boe (~35%) by 2050
- Subsurface imaging, drilling and completions, facilities and digital technologies could all contribute to reducing today's cost of supply by as much as 25% - with the greatest impact being on unconventional resources
- Applying a carbon price at $80/te also changes to the rank order.
- Shale oil and ultra deepwater become less costly to produce than heavy and ultra-heavy onshore oil, which are more energy intensive to produce
- In general, technology trumps carbon price

BP has joined external initiatives that ....

	CCAC CLIMATE AND CLEAN AIR COALITION TO REDUCE SHORT-LIVED CLIMATE POLLUTANTS	WORLD BANK GROUP	CPL CARBON PRICING LEADERSHIP	OGCI OIL AND GAS CLIMATE INITIATIVE
Aim	O&G methane reduction	Eliminate routine flaring by 2030	Support carbon pricing advocacy	O&G climate collaboration
Companies	Includes BP, Total, Statoil, ENI and country actors	Includes BP, Shell, Total, Statoil and country actors	Includes BP, Shell, Total, and a range of other business actors	BP, Total, Shell, ENI, Repsol, Statoil, Pemex, Aramco, Reliance

… support existing activity plans

- Provide an opportunity for industry collaboration and agreement for using consistent methodologies
- WB2030: Momentum building with numerous additional signatories to the World Bank routine flaring initiative e.g. Angola, US, Canada
- CCAC: Improve methane identification and mitigate sources where economic
- CPLC: Creates a broader platform for carbon pricing advocacy, supported by many governments and other businesses
- OGCI: A vehicle for collaborative industry solutions, moving from forming / reporting in 2015 to action in 2016

Group key messages

- Some things may change as a result of the Paris agreement – but not everything, and not overnight
- We will strengthen our engagement with climate change, both as BP and via partnerships like OGCI
- We will develop our understanding in key areas including:
  - The short to medium term business implications of specific country pledges
  - The long term implications for energy supply and demand and technology innovation
  - The resilience of our own portfolio and product demand to plausible outcomes
  - Potential opportunities to improve operational efficiencies, especially for energy, methane, flaring and products
  - Potential low carbon opportunities

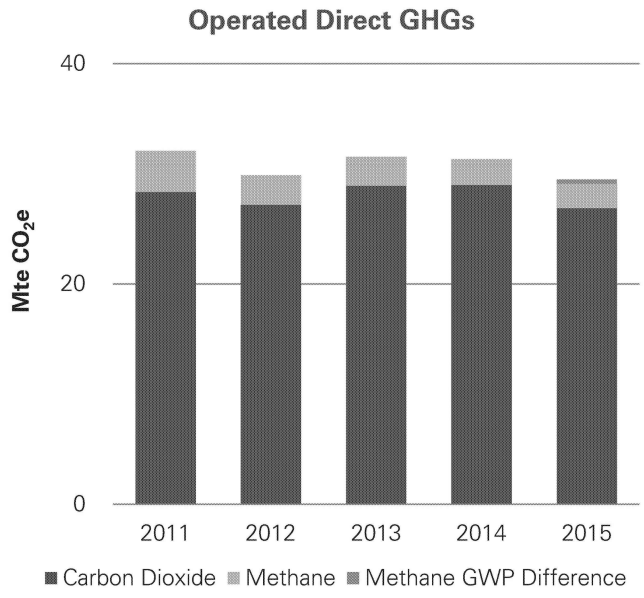
Climate science

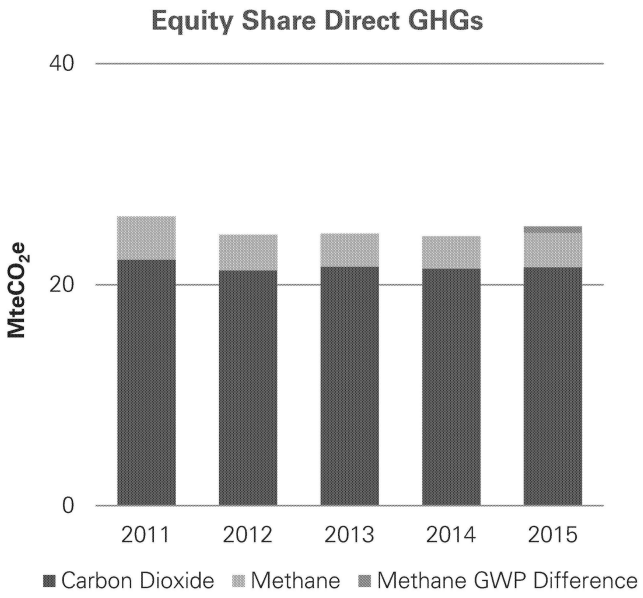
Climate policy

Climate and carbon risk management – 2015 shareholder resolution

Upstream performance

Upstream Operated GHG emissions reduced in 2015...



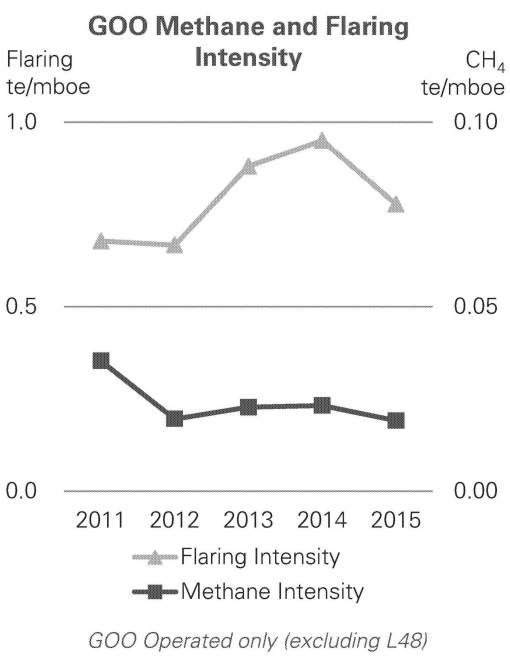


Operated means 100% of GHG Emissions for all sites we operate (including L48).
GWP = Global Warming Potential

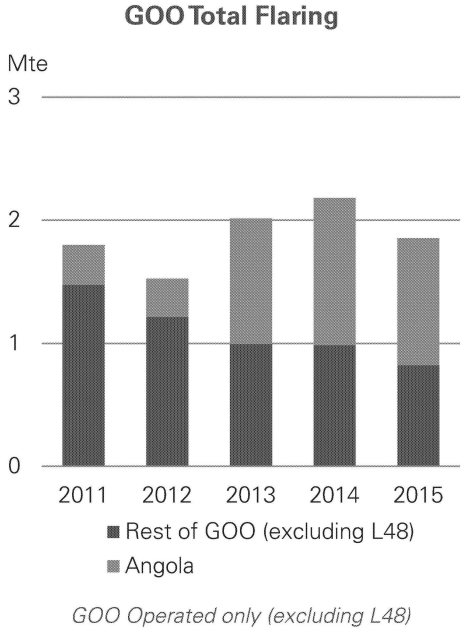
...but equity GHG emissions have risen

- Upstream operated GHG emissions fell by 6% in 2015 driven by operational emission reductions in AGT, Angola and GoM, together with divestments in Alaska.
- Upstream's equity GHGs increased by 3.6% in 2015, largely due to:
  - Increases in non-operated emissions: Angola (Exxon Block 15), Canada Oil Sands (Sunrise) and non-operated L48 (South Texas and San Juan);
  - A calculation methodology change: BP Group is now using a methane Global Warming Potential (GWP) of x25, compared to x21 previously – this is the multiplier that is used to calculate total GHG emissions on a CO_2 equivalent basis.

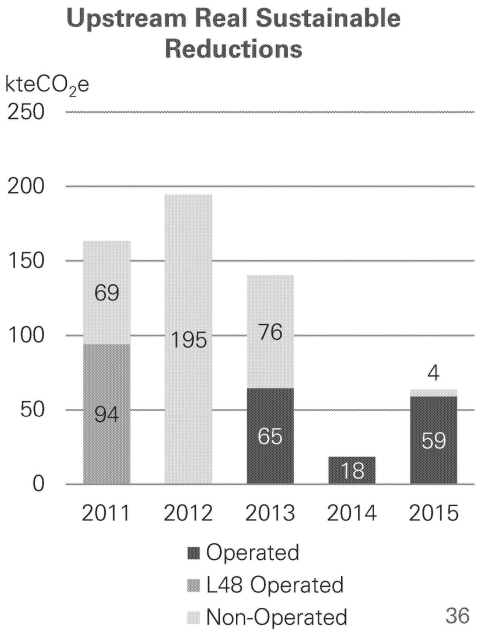
The 3 new GOO GHG KPIs have all improved…



GOO Operated only (excluding L48)



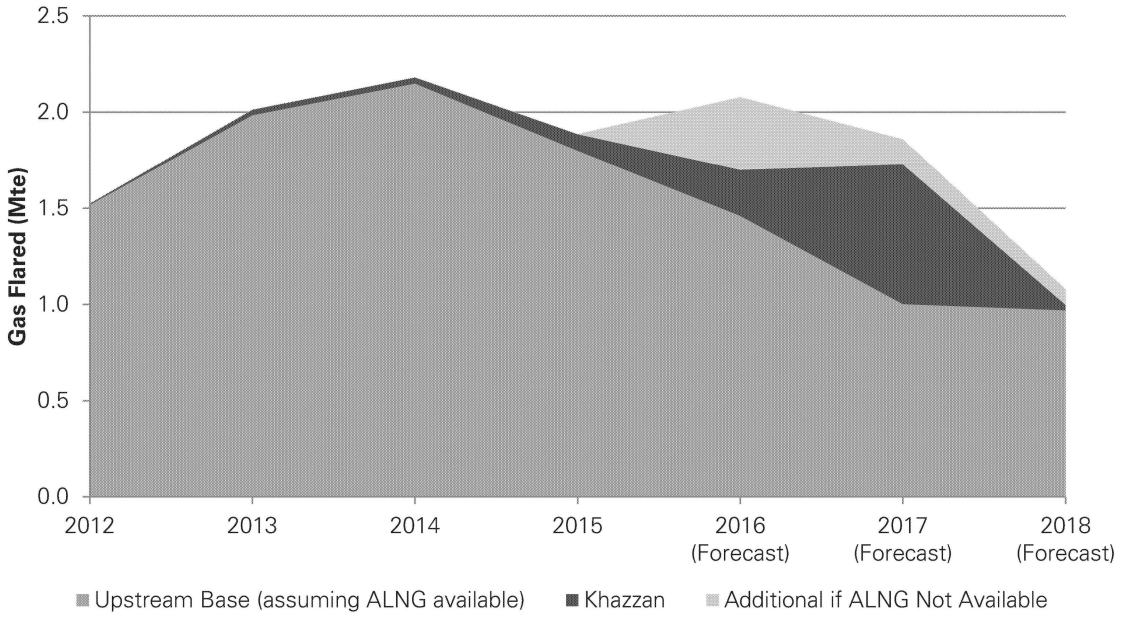
GOO Operated only (excluding L48)



...due to improved operational focus

- Flaring intensity and methane intensity have fallen as a result of:
  - Flare reductions in Angola, Tangguh and AGT;
  - Production increases in the North Sea due to higher operating efficiency.
- Angola achieved significant flaring reductions in 2015 – but still accounts for over 55% of Upstream flaring.
- Reporting of real sustainable reductions has increased for first time in 4 years as a result of renewed focus.
  - RSRs achieved at Angola PSVM, Tangguh, Sangachal Terminal, Chirag-1 and Prudhoe Bay.

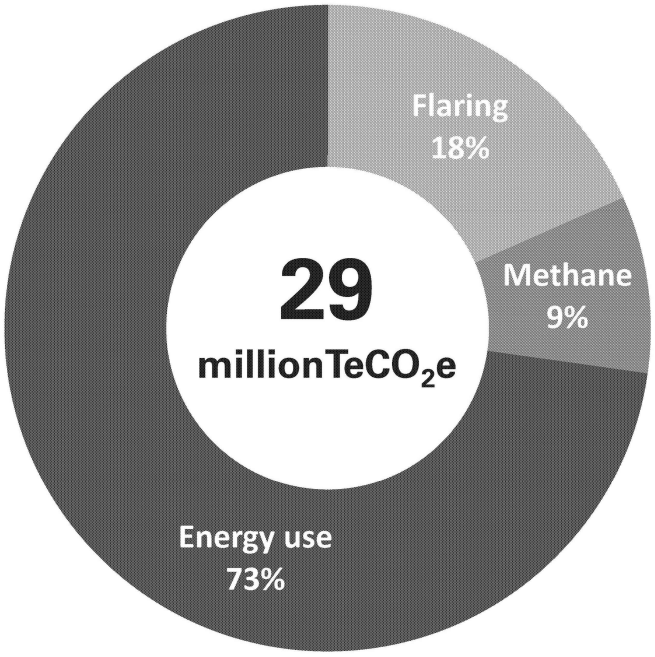
Future Upstream flaring…



...is expected to rise

- Even assuming flaring in existing operations continues to decrease this will be offset by flaring from Khazzan start-up in 2017, before returning to a lower level from 2018.
- Angola remains a significant contributor – uncertainties remain around Angola LNG, but self-help can offset this.
- What can be done to reduce total flaring?
  - Work with UEC and Upstream Technology leveraging planned activities to reduce flaring and methane emissions.
  - Khazzan: focus on minimising flaring during CPF start-up in 2017.
  - Angola: cannot rely solely on ALNG – continue to focus on self-help projects.

Our GHG sources are…



Upstream Operated Emissions (including Lower 48)

...and continued operational focus is key to managing them

All GHGs

- **8Q activity plans** (identify RSRs)
- **GOO GHG KPIs** (performance management)
- **Reliability and Maintenance** (operating efficiency)
- **Inherent Environmentally Robust Design (IERD)** (GCD)

Flaring

- **Operational Flaring Guide**
- **Flare system design** (UEC)

Methane

- **Plant integrity** (leaks & seeps)
- **Methane reduction** (implement survey learnings)
- **Compressor seal design** (UEC)

Energy use

- **Upstream SORC Recommendations** on OMS 6.2 as high-priority and adoption of EPI
- **Energy Value Improvement Practice** (eVIPs)

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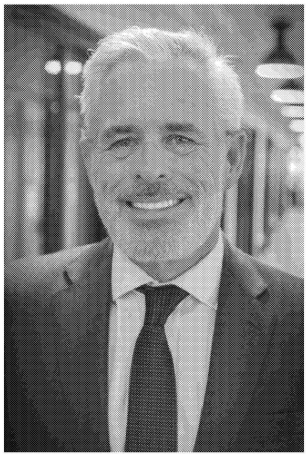
Tuesday, June 21, 2016

3:30pm – 4:30pm

Climate: Meeting with Jerry Taylor

- Jerry is the President of the Niskanen Center, a libertarian think tank established in 2014.
- Attachments: Biography of Mr. Taylor and Niskanen-sponsored letter to Congress opposing anti-carbon tax resolutions.

JERRY TAYLOR, PRESIDENT, NISKANEN CENTER



Bio: Jerry Taylor is the president of the Niskanen Center. Prior to founding the Center in 2014, Mr. Taylor spent 23 years at the Cato Institute, where he served as director of natural resource studies, assistant editor of *Regulation* magazine, senior fellow, and then vice president. Before that, Mr. Taylor was the staff director for the energy and environment task force at the American Legislative Exchange Council (ALEC). Over the past two decades, Mr. Taylor has been one of the prominent and influential libertarian voices in energy policy in Washington. He is the author of numerous policy studies, has testified often before Congress, and his commentary has appeared in *The Washington Post, New York Times, Wall Street Journal,* and other prominent print and electronic outlets.

Organization Background: Established in 2014, the Niskanen Center is a libertarian 501(c)(3) think tank that works to change public policy through direct engagement in the policymaking process: developing and promoting proposals to legislative and executive branch policymakers, building coalitions to facilitate joint action, and marshaling the most convincing arguments in support of our agenda. The Center's main audience is the Washington insiders – policy-oriented legislators, presidential appointees, career civil servants in planning, evaluation and budget offices, congressional committee staff, engaged academics, and interest group analysts – who together decide the pace and direction of policy change. The Niskanen Center's focus on policy change complements the work of existing libertarian organizations, most of which are engaged in other activities such as analyzing or criticizing public policy, changing public opinion, blocking counterproductive regulation and legislation, and electing friendly politicians.

June 7, 2016

Coalition Letter Responds to Anti-Carbon Tax Resolution

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by Niskanen Center

This week, the House of Representatives will take up **H.Con.Res.89**, opposing carbon taxes in the United States, submitted by Congressman Scalise (R-LA). We previously **blogged about the Senate version of this resolution**, arguing that one could agree with many of the individual findings in the resolution and still find reason to support a carbon tax.

Last week, the Niskanen Center, joined by a group of conservative and libertarian colleagues, sent the following letter to Members of Congress responding to this resolution and making the affirmative case for a carbon tax as a least-cost mechanism for reducing greenhouse gas emissions and reducing climate risk.

Dear Representative,

Later this week Congress will take up a resolution sponsored by Congressman Scalise (R-LA1) that expresses the sense of Congress that a carbon tax would be detrimental to the economy of the United States. We are concerned that this resolution offers a limited perspective on carbon taxes and is blind to the potential benefits of market-based climate policy. Legislation that incorporates a carbon tax could include regulatory and tax reforms to make the United States economy more competitive, innovative, and robust, benefiting both present and future generations.

We recognize that a carbon tax, like any tax, will impose economic costs. But climate change is also imposing economic costs. This resolution falls short by recognizing the cost of action without considering the cost of staying on our present policy course. There are, of course, uncertainties about the future cost of climate change and, likewise, the cost associated with a carbon tax (much would depend on program design and the pace and nature of technological progress).[1] The need for action, however, is clear. A recent survey of economists who publish in leading peer-reviewed journals on these matters found that 93% believe that a meaningful policy response to climate change is warranted.[2]

The least burdensome, most straightforward, and most market-friendly means of addressing climate change is to price the risks imposed by greenhouse gas emissions via a tax. This would harness price signals, rather than regulations, to guide market response. That is why carbon pricing has the support of free market economists,[3] a majority of the global business community,[4] and a large number of the largest multinational private oil and gas companies in the world (the corporate entities among the most directly affected by climate policy).[5]

In reaching a conclusion, this resolution neglects the fact that the United States already has a multiplicity of carbon taxes. They are imposed, however, via dozens of federal and state regulations, are

invisible to consumers, unevenly imposed across industrial sectors, unnecessarily costly, and growing in size and scope.[6] The policy choice is not if we should price carbon emissions, but how.

Unfortunately, this resolution also fails to differentiate between proposals that would impose carbon taxes on top of existing regulations (chiefly the Obama Administration's Clean Power Plan), and proposals that would impose carbon taxes in place of those existing regulations.[7] Conservatives and free market advocates should embrace the latter, regardless of how they view climate risks.

An economy-wide carbon tax that replaces existing regulatory interventions could reduce the cost of climate policy and deregulate the economy. It could also provide revenue to support pro-growth tax reform, including corporate income or payroll tax cuts, which could dramatically reduce overall costs on the economy.[8] Revenues could be applied to compensate those who suffer the most from higher energy costs; the poor, the elderly, and individuals and families living on fixed incomes.[9]

Unfortunately, none of those options are presently available because Members of Congress have neglected opportunities to design and debate market-friendly climate policies in legislation. Instead, they have yielded authority in climate policy design to the Executive Branch. By discouraging a long-overdue discussion about sensible carbon pricing, this resolution frustrates the development of better policy.

Sincerely,

Jerry Taylor
President, Niskanen Center

Bob Inglis
Executive Director, RepublicEn

Aparna Mathur
Resident Scholar, American Enterprise Institute

Eli Lehrer
President, R Street Institute

The Rev. Mitchell C. Hescox
President, Evangelical Environmental Network

Alan Viard
Resident Scholar, American Enterprise Institute

1 For a good summary of the estimates, see Jonathan Harris et al., "**The Economics of Global Climate Change**," Global Development and Environment Institute, Tufts University, 2015,

2 Peter Howard and Derek Sylvan, "**Expert Consensus on the Economics of Climate Change**," Institute for Policy Integrity, New York University School of Law, December, 2015; The consensus among published economic specialists in favor of carbon pricing reflects the opinion of economists more

broadly. See IGM Economic Experts Panel, "**Carbon Taxes II**," University of Chicago, Booth School of Business, December 4, 2012.

3 Prominent economists on the Right who have embraced carbon pricing include Prof. John Cochrane (Stanford University and Senior Fellow at the Hoover Institution), Prof. Tyler Cowen (George Mason University and Chairman of the Mercatus Center), Douglas Holtz- Eaken (President of the American Action Forum and former Director of the Congressional Budget Office in the Republican 108th Congress), Prof. Martin Feldstein (Harvard University and former Chairman of the Council of Economic Advisors under President Reagan), Alan Greenspan (former Chairman of the Federal Reserve under Presidents Ronald Reagan, George H.W. Bush, and Bill Clinton), Kevin Hassett (American Enterprise Institute), Prof. Glenn Hubbard (Columbia University and former Chairman of the Council of Economic Advisors under President George W. Bush), Art Laffer (a founding father of supply-side economics and former member of President Ronald Reagan's Economic Policy Advisory Board), Prof. Greg Mankiw (Harvard University and former chairman of the Council of Economic Advisors under President George W. Bush), Aparna Mathur (American Enterprise Institute), George Shultz (former Secretary of Labor, Secretary of Treasury, and Director of the Office of Management and Budget under President Richard Nixon, Secretary of State under President Ronald Reagan, and presently a Distinguished Fellow at the Hoover Institution), Irwin Stelzer (Senior Fellow and Director of the Economic Policy Studies Group at the Hudson Institute and founder of National Economic Research Associates), and Alan Viard (American Enterprise Institute and former senior economist at the Council of Economic Advisors under President George W. Bush).

4 EY, "**Shifting the Carbon Price Debate: Emerging Business Attitudes Fuel Momentum for Global Climate Action**," 2015; See also The World Bank, "**73 Countries and Over 1,000 Businesses Speak Out in Support of a Price on Carbon**," September 22, 2014.

5 See, for instance, Ken Cohen, "**ExxonMobil and the Carbon Tax**," ExxonMobil Perspectives, December 15, 2015; and Brian Kahn, "**In Stunning Reversal, 'Big Oil' Asks for a Carbon Price**," Climate Central, June 1, 2015; For a broader survey of corporate opinion within the oil and gas sector, see Angus Warren, "**Results of Global Warming Survey 2014**," Warren Business Consulting, June 18, 2014.

6 For an overview of present policy interventions in the United States to address climate change, see Dallas Burtraw, "**The Regulatory Approach in U.S. Climate Policy**," in Towards a Workable and Effective Climate Regime, Scott Barrett, Carlo Carraro, and Jaime de Melo, eds. (CEPR Press, 2015), pp. 239-249; For an estimate of how much more expensive it is to address U.S. greenhouse gas emissions via conventional regulation, see William Pizer et. al., "**Modeling Economy-wide vs Sectoral Climate Policies Using Combined Aggregate-Sectoral Models**," Energy Journal 27:3, 2006; See also Sergey Paltsev et. al., "**Regulatory Control of Vehicle and Power Plant Emissions: How Effective and at What Cost?**" Climate Policy 15:4, 2015, pp. 438-457.

7 See, for instance, Jerry Taylor, "**The Conservative Case for a Carbon Tax**," Niskanen Center, March 23, 2015.

8 **Fifth Assessment of the Intergovernmental Panel on Climate Change**, Working Group III, 2014.

9 Noah Kaufman and Eleanor Krause, "**Putting a Price on Carbon: Ensuring Equity**," Issue Brief, World Resources Institute, April, 2016.

Wednesday, June 22, 2016

2:00pm – 5:00pm

Climate: BP America Strategy

- Stout and Nolan lead a discussion of BP America Climate Strategy Work Group Terms of Reference, Work Plan and interactions with BP Group.

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- Attachments: ToR, Work Plan and summary of recent external contacts.

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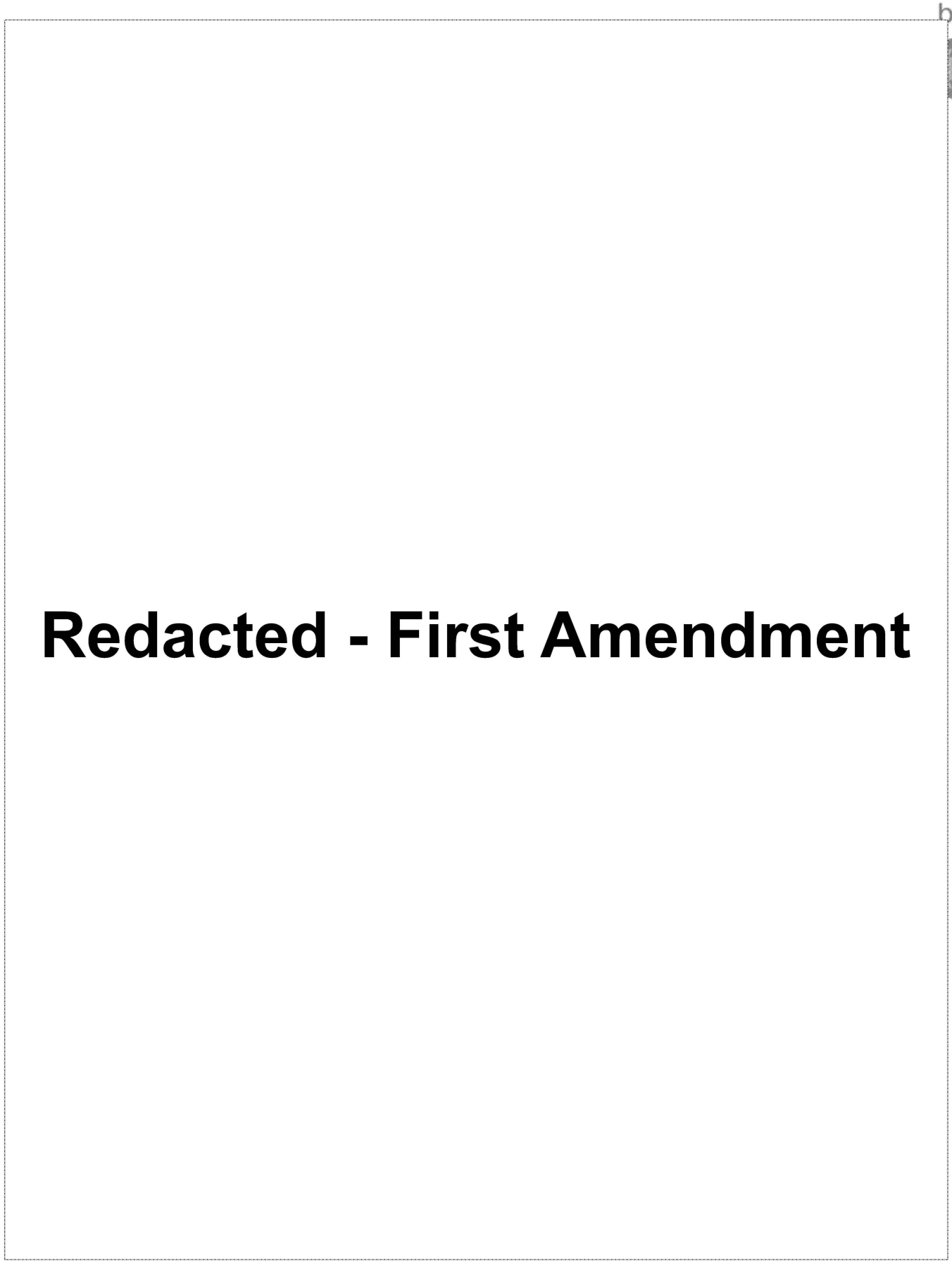
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