

Energy and the environment: what's the challenge?

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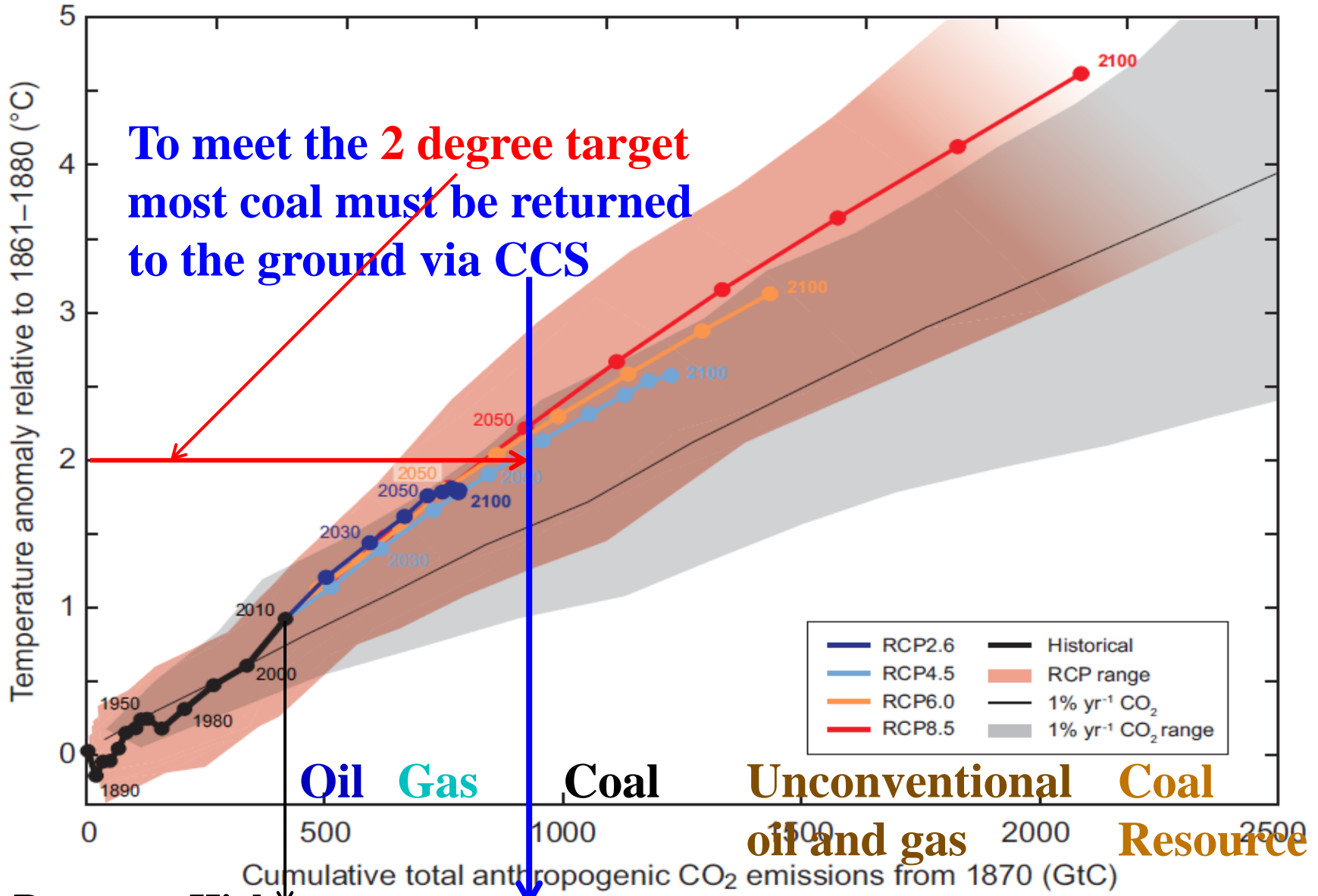
22nd September 2015



- What is the climate change challenge?
- What is the climate change challenge for energy?
 - => decarbonise power sector first
- How do we meet future world energy demand sustainably?
 - => RDD&D to drive down low-C costs
- The message on discount rates
 - => Public funds to investment in low-C; general taxation to fund climate change policies

Cumulative total anthropogenic CO₂ emissions from 1870 (GtCO₂)

1000 2000 3000 4000 5000 6000 7000 8000



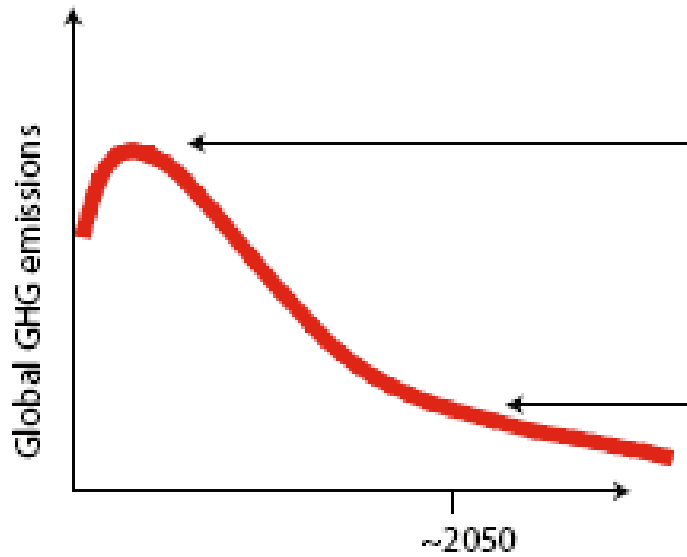
To meet the 2 degree target most coal must be returned to the ground via CCS

Oil Gas Coal Unconventional Coal
oil and gas Resource

Reserves: High
Low

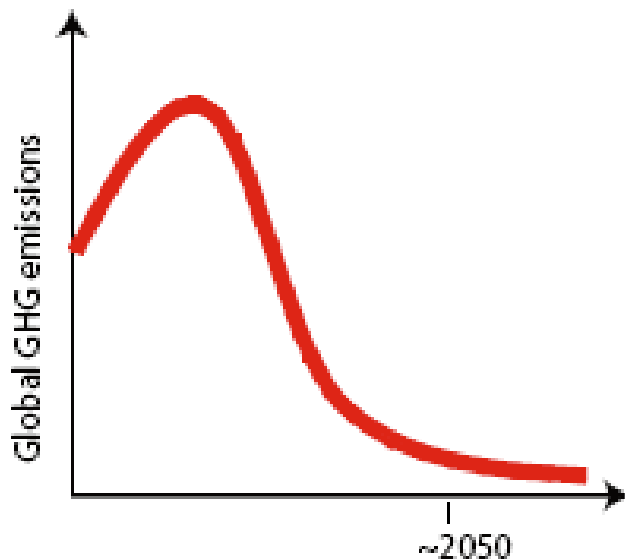


Total cumulative emissions determines global warming



Lower peak

Gradual reduction after peak



Higher / later peak

Faster reduction after peak

- Delaying peak requires a faster subsequent decline
- peak should be before 2020

Source: ENEP Emissions Gap Report 2010



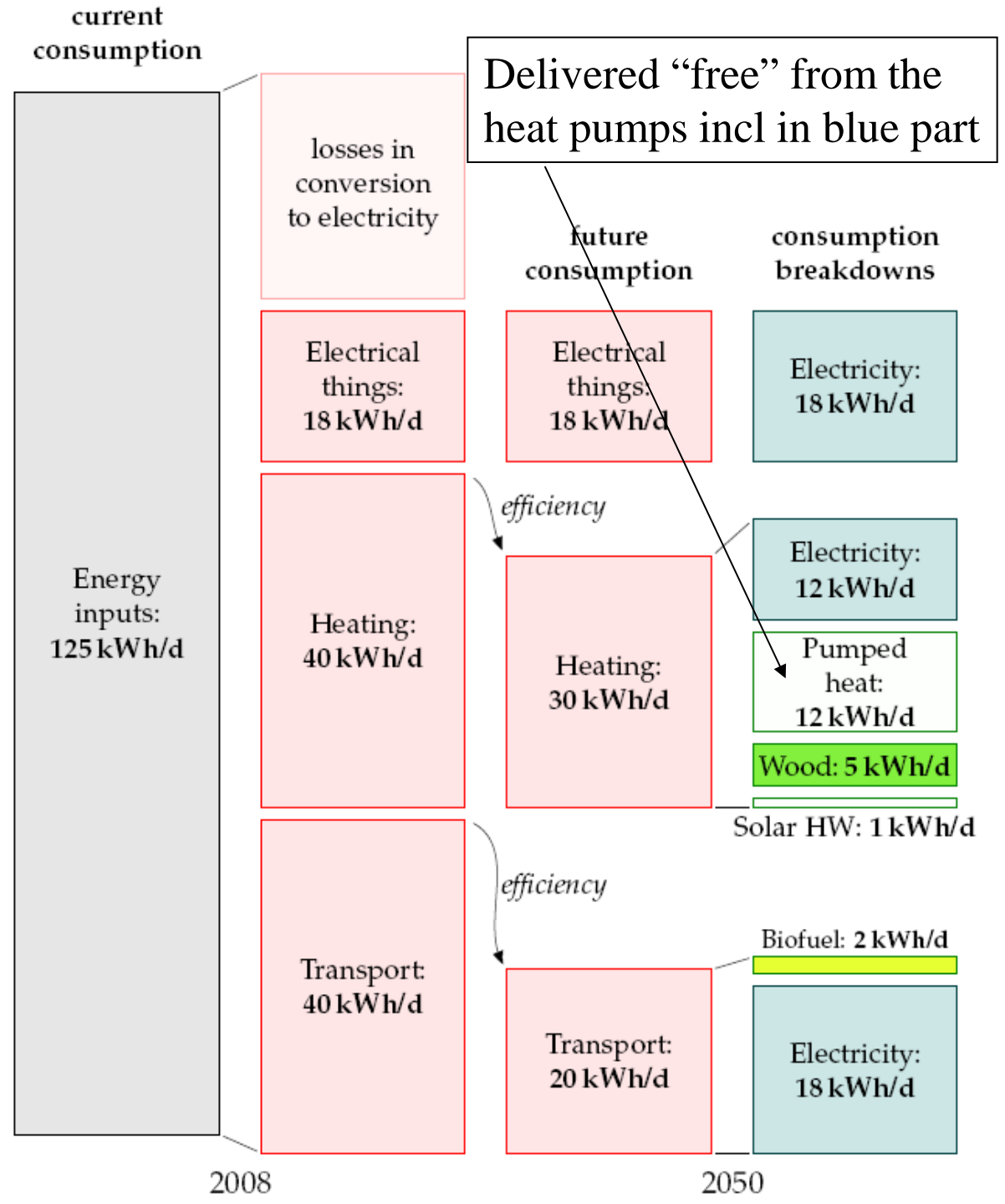
- **Power sector** key to decarbonising economy
 - Large, easiest, and capital **highly durable**
- Coal-fired electricity has more than **twice** the GHG emissions of gas *and* far higher air pollutants
 - **gas as transition fuel to the low carbon future**
 - But there is lots of coal => **CCS a long-run priority**
- Deployment has dramatically lowered cost of wind, PV
 - justifies **support for R&D and deployment**
- **Nuclear power** has attractions for mass deployment
 - if we can make it safe, proliferation-proof and **cheaper**
- Adequate carbon pricing could **lower fossil fuel prices**
 - ⇒ **need agreements and/or border tax** adjustments
 - ⇒ and hard to set the “right” carbon price

How to de-carbonise UK

MacKay's

<http://www.withouthotair.com/>

estimates indicate the large role of low-C electricity in any future low-C UK-sized Economy: figures per head per day



Rapid decarbonisation of electricity is possible

- with nuclear power

CO2 emissions per kWh 1971-2000

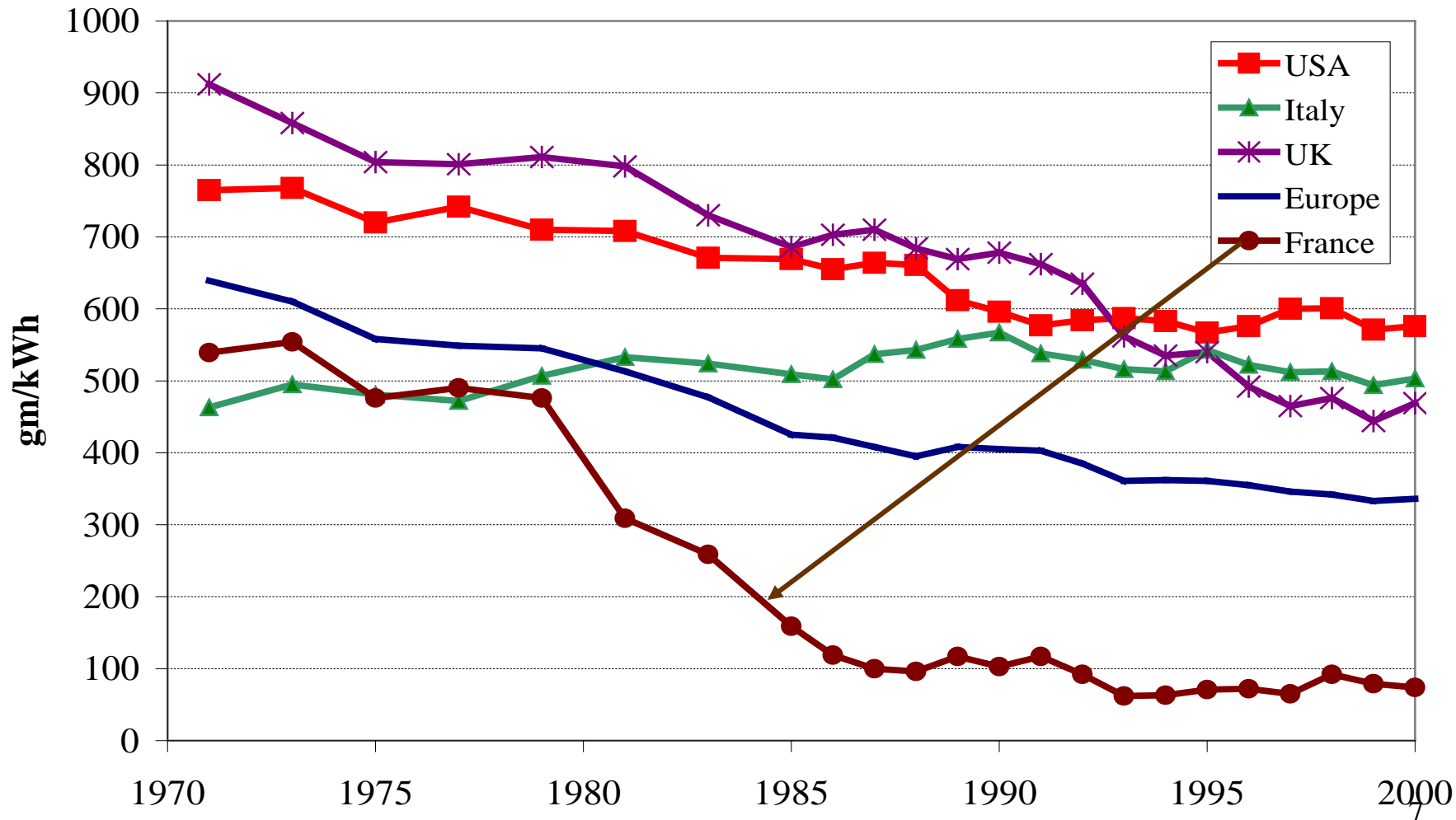
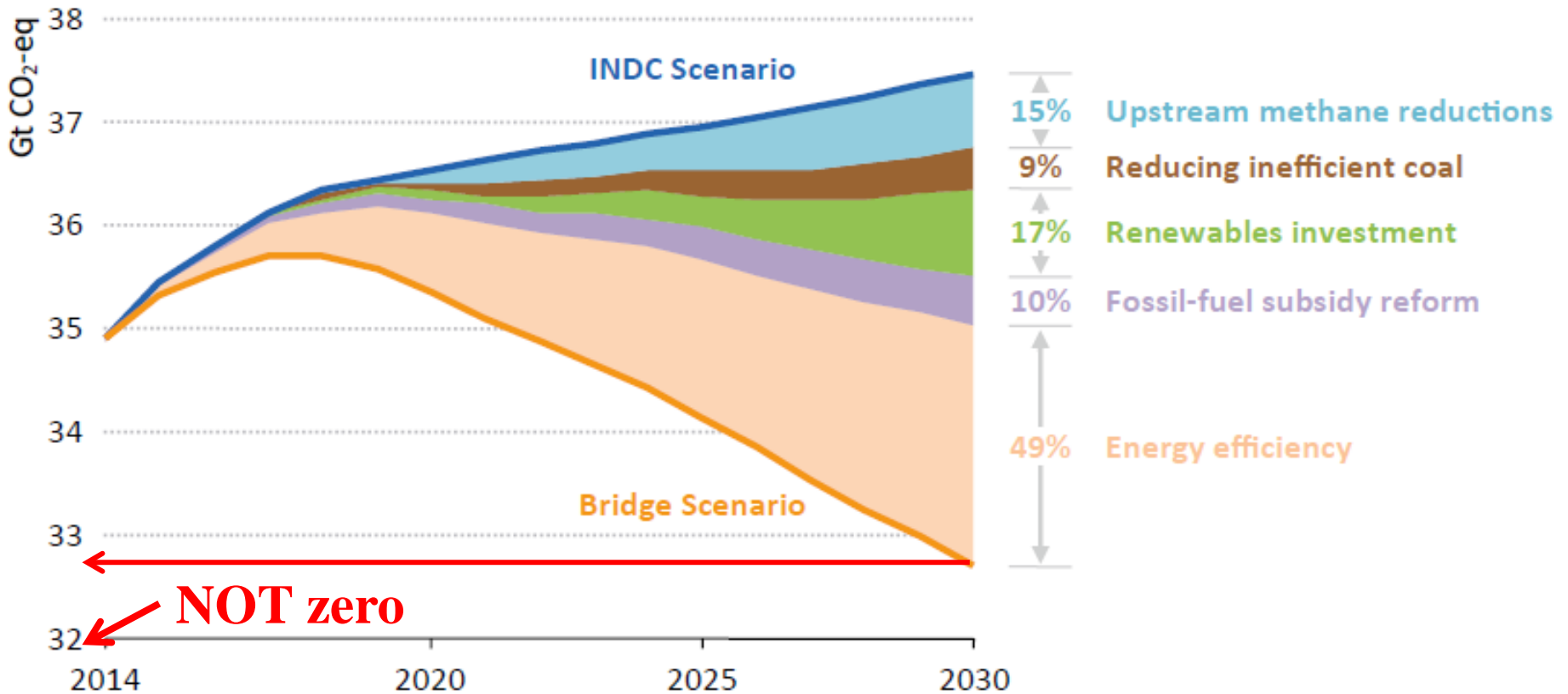
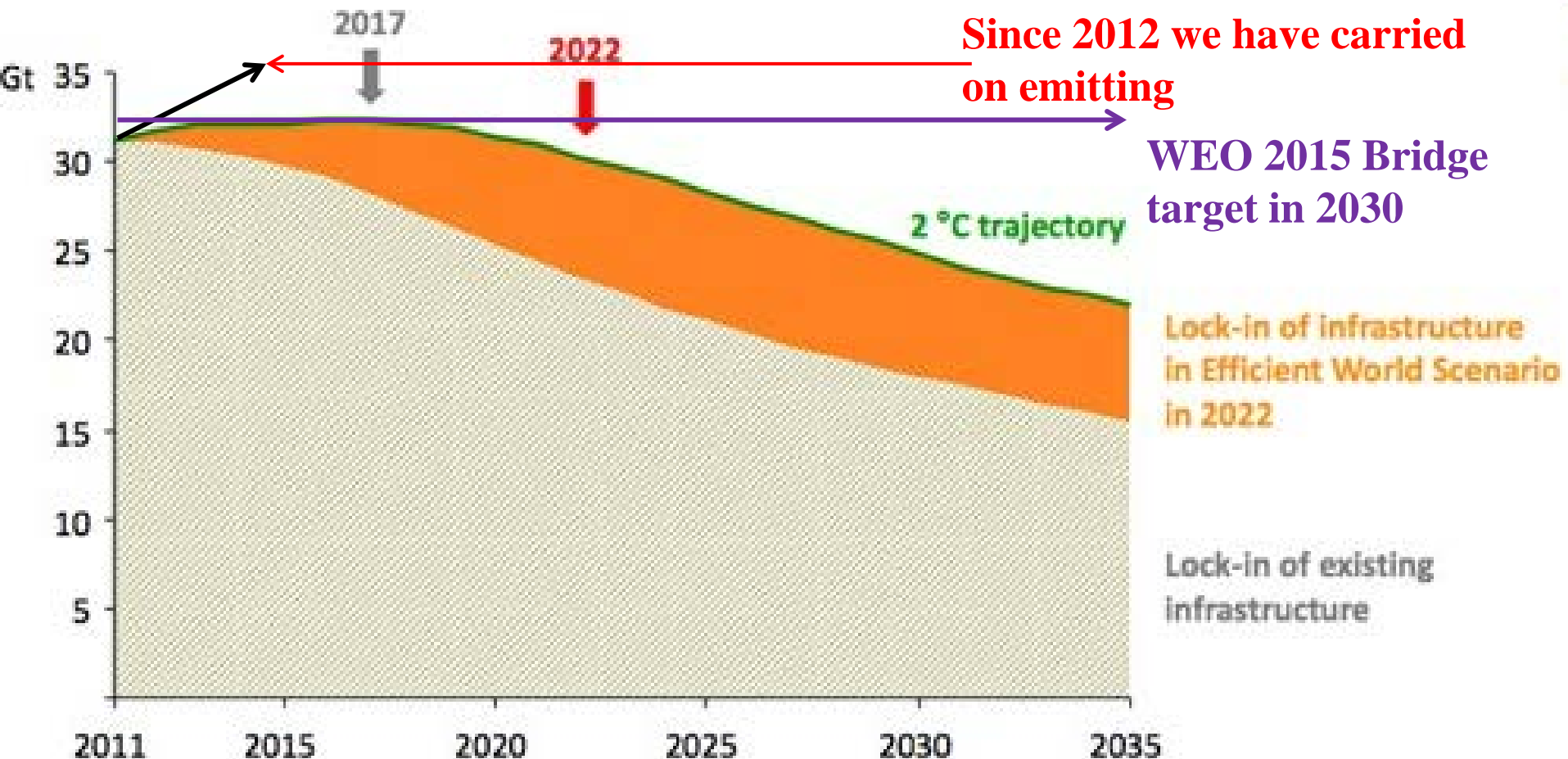


Figure 3.2 ▷ Global energy-related GHG emissions reduction by policy measure in the Bridge Scenario relative to the INDC Scenario

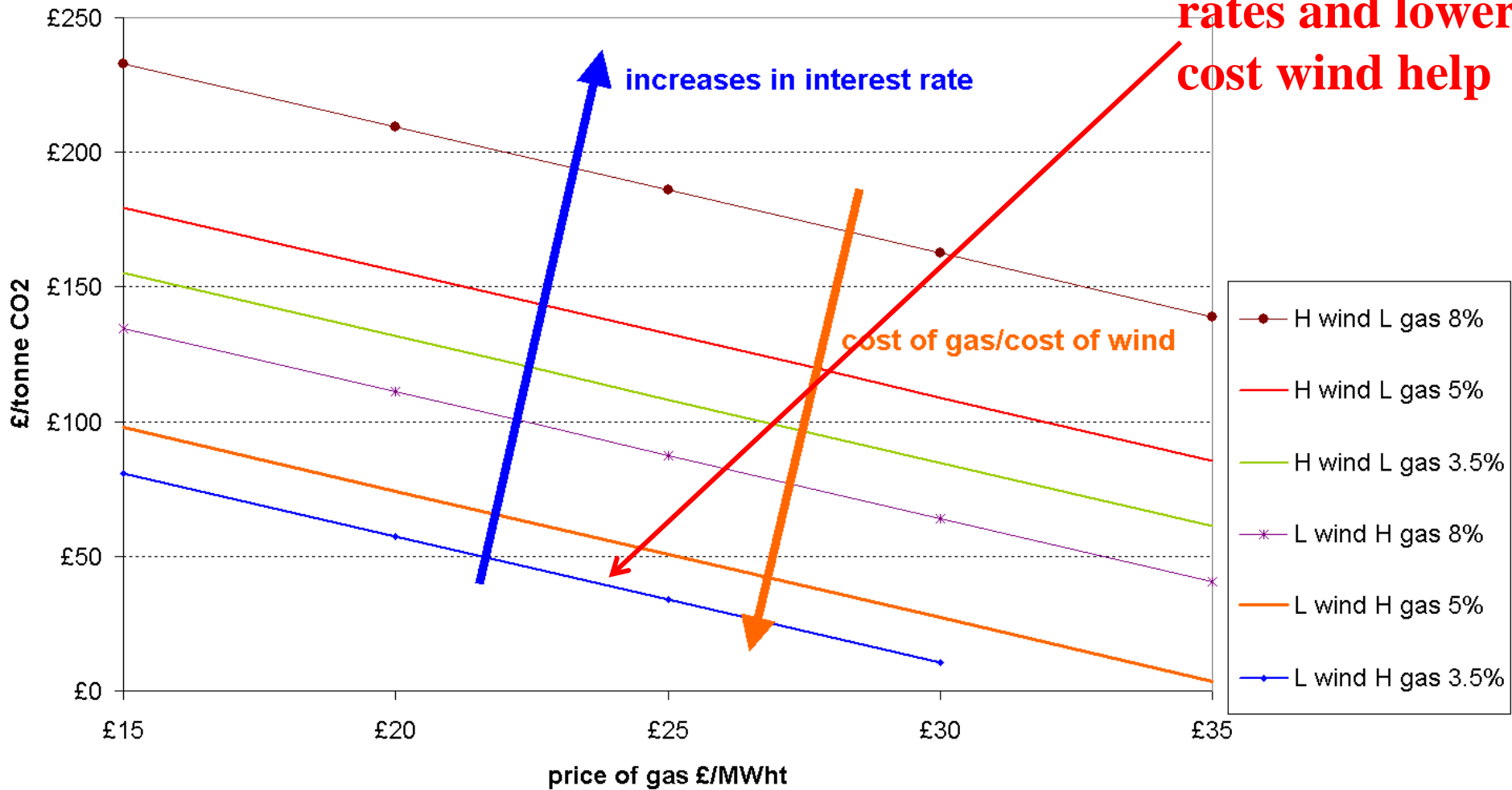


By 2012 we had already locked in to high carbon emissions from past fuel choices



Hard to set the “right” carbon price

Breakeven CO2 price vs gas price





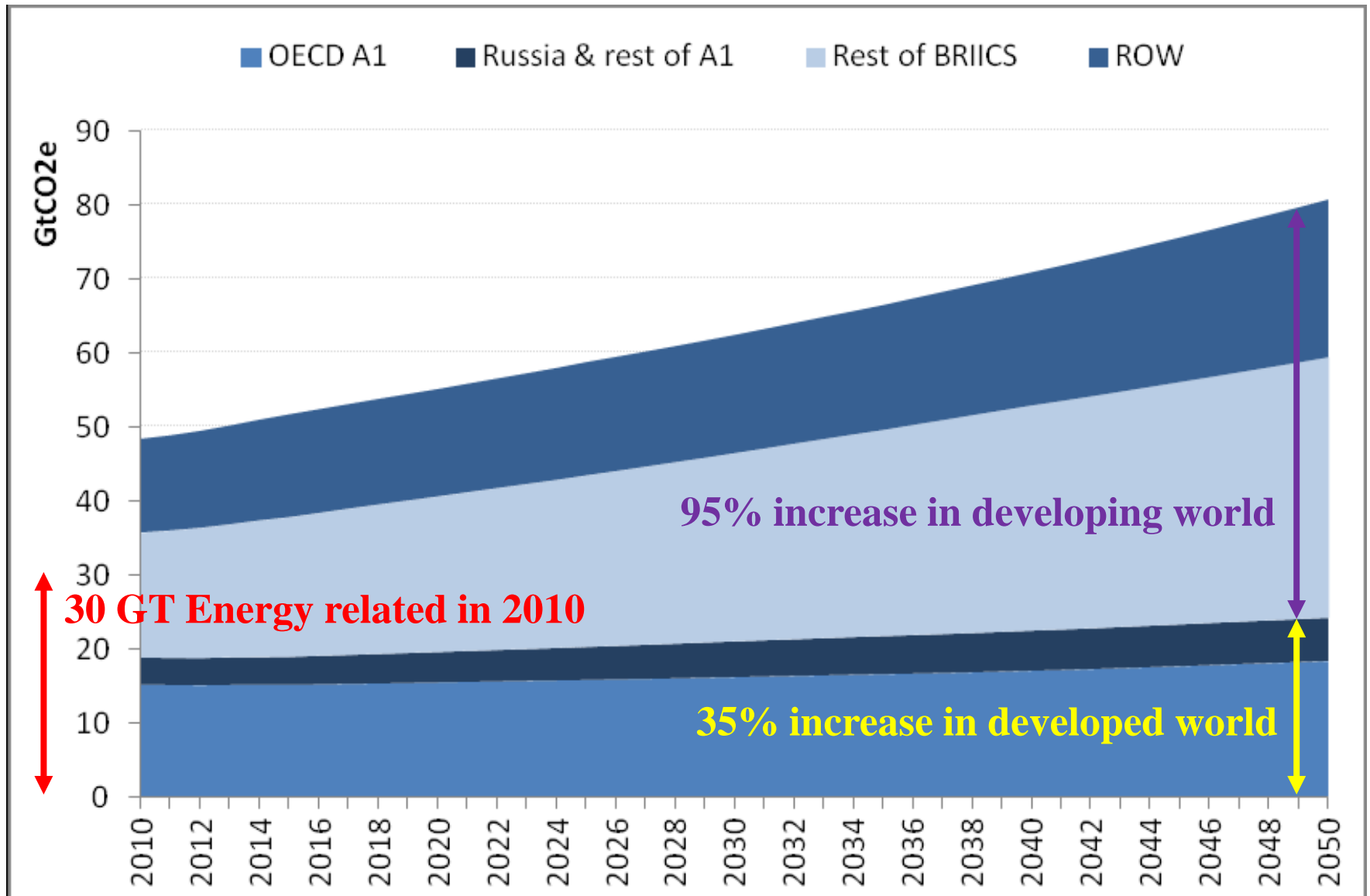
- £1 million in 100 years discounting at **10% = £72**
 - at 5% worth £7,600, **at 1.7% worth £185,000**
- Unlikely but extreme future climate change events imply **low discount rates** – Stern assumed 1.7%
- High discount rates lower prices of exhaustible resources
 - oil, gas and coal favoured
- Low discount rates favour low-carbon investments
- **The cost of public sector borrowing is low**
 - => private finance for low carbon too costly**
 - => public finance sensible**



- **Public sector financed** massive past power investment
- France decarbonised its electricity sector in 10 years by a mass drive to nuclear power
- NASA spent \$\$\$ to get to the moon. Saving this planet deserves more **massive R&D**
 - = Public good => should be **funded from general taxes**
- Public sector borrowing rates have never been lower

Public investment to decarbonise energy => public assets balancing public debt *AND* climate benefits

OECD *Baseline* GHG emissions by region





- The first priority is to **decarbonise electricity**
 - To avoid long-term lock-in
 - **existing technology can do this at modest cost**
- Setting **a carbon price** may not be enough
 - decarbonising will **lower the price of fossil fuels**
- Developing countries need cheaper low-C options
 - ⇒ **RDD&D by rich countries critical to drive down costs**
 - ⇒ Need to avoid exporting C-intensive production
- Fund climate change policies from **general taxation**
 - not levy charges on fuel used by poor
 - **public funding** for low-cost finance of investment

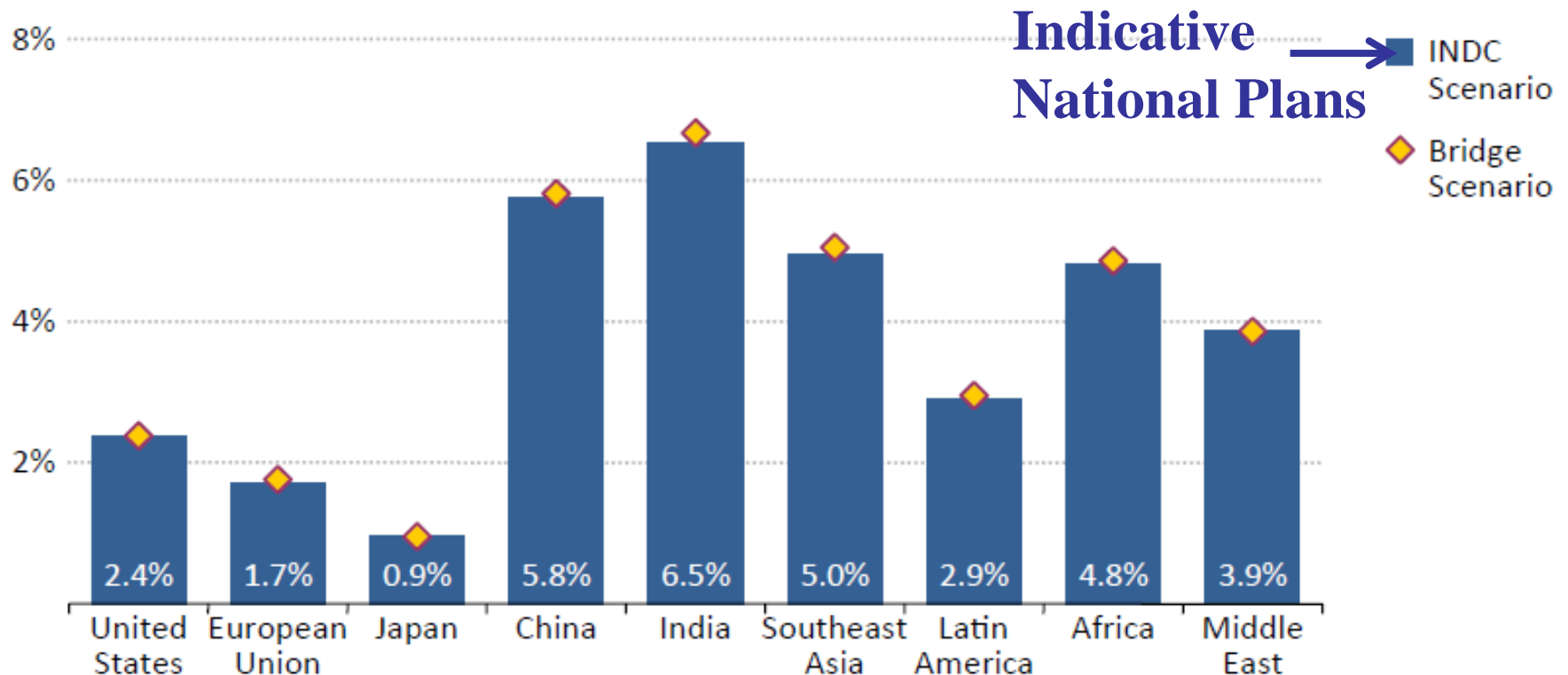
CCS	Carbon Capture and Storage
GHG	Greenhouse gases
GT	Gigatonnes (billion tonnes)
INDC	Indicative national
R&D	Research & Development
RDD&D	Research, Development Demonstration and Deployment
WEO	World Energy Outlook

Reference

IEA (2015) *Energy and Climate Change*; World Energy Outlook Special Report

Growth not sacrificed by decarbonisation

Figure 3.17 ▶ Average annual GDP growth by scenario by selected region, 2013-2030



Source: OECD ENV-Linkages model. Growth rates are calculated on a PPP-basis.

IEA WEO 2015

Bridge scenario improves access modestly

Figure 3.21 ▶ Global population with and without access to electricity and clean cooking in the Bridge Scenario

