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Energy and Climate Change: Challenges and Opportunities

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Outline

1. Where we are (and where we are currently headed)

2. Results of IEA analysis: five key actions to achieve a low-carbon energy sector

3. Technology risk, and risk management

4. Conclusions

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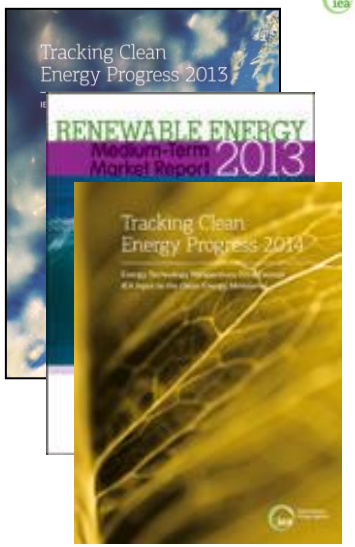
IEA sources for understanding where we are, and where we are headed

- **Energy and Energy CO_2 statistics**
  - Free online database
  - Smartphone apps
- **Energy Efficiency Indicators**
  - Two new manuals in 2014
- **Energy technology and R&D indicators**
- **Medium-term market reports**
- **World Energy Outlook and Energy Technology Perspectives scenario analysis**
- **Policy studies**



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Technology: Development is off track for levels consistent with 2°C

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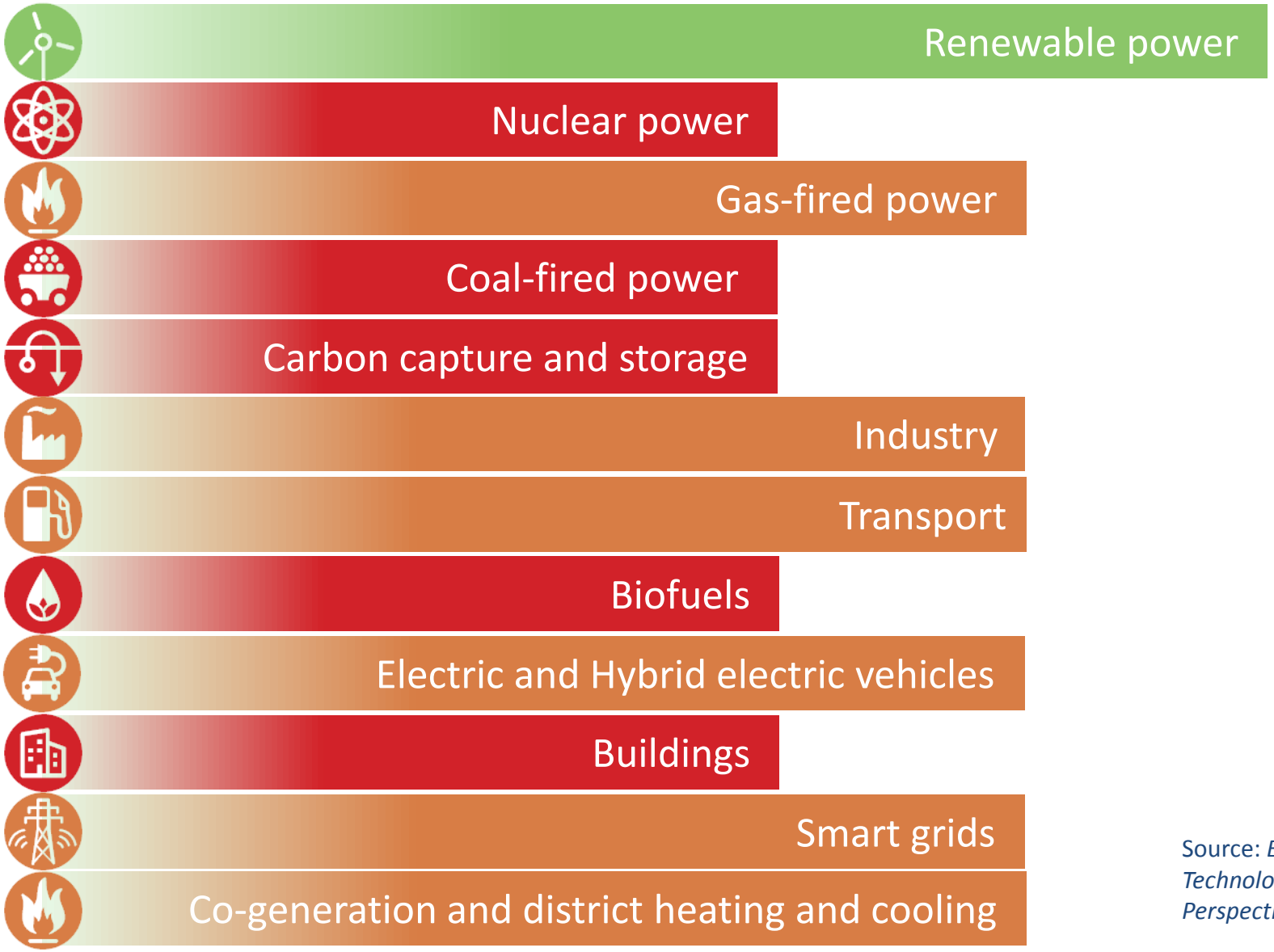
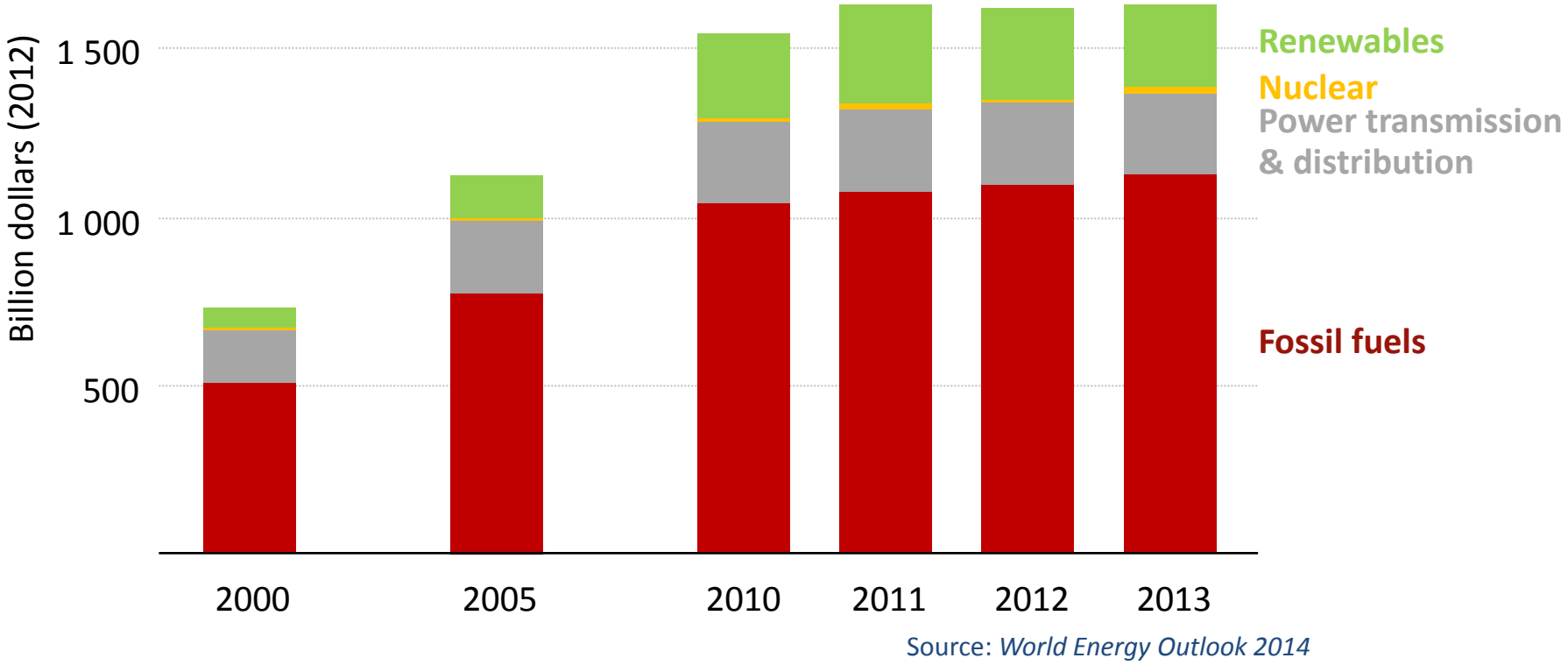


Source: *Energy Technology Perspectives, 2014*

Investment: Fossil fuels still dominate energy supply investment

Annual energy supply investment

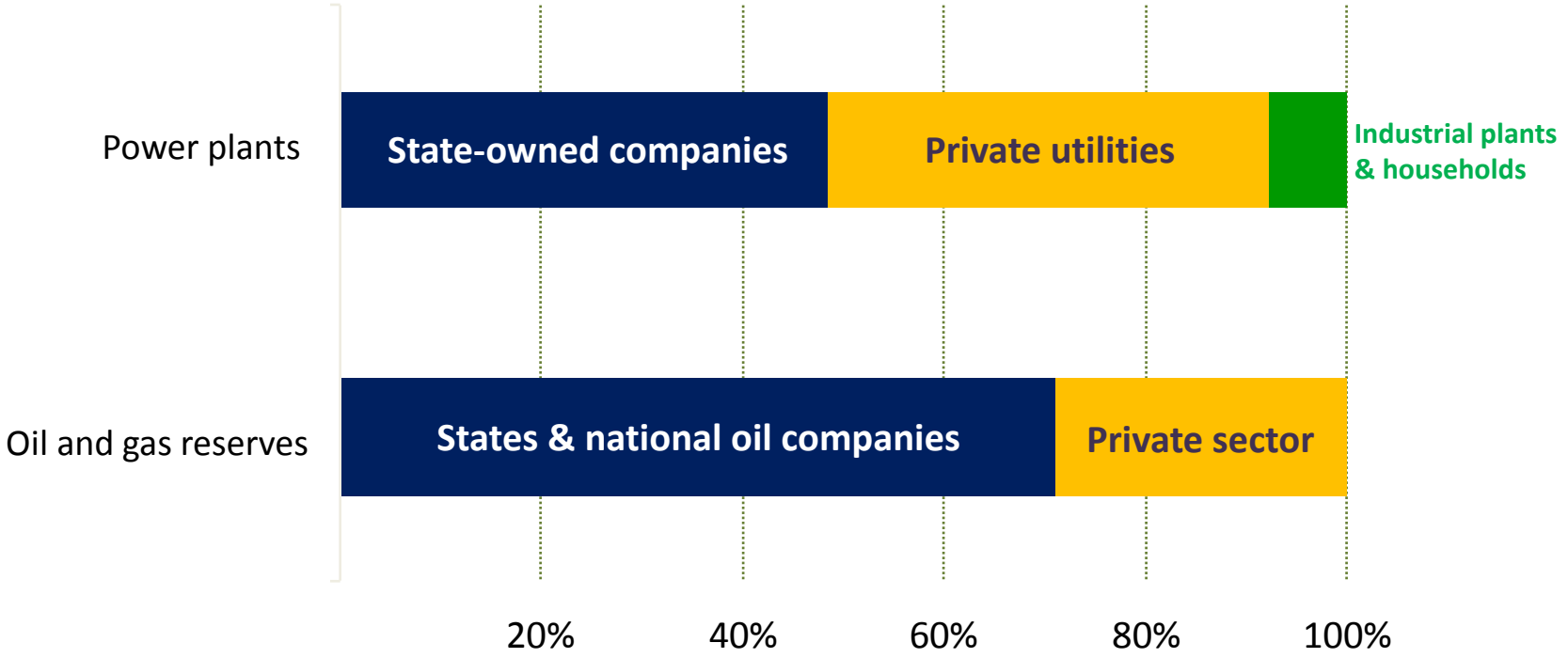


Source: *World Energy Outlook 2014*

Investment in renewables rose from $60 billion in 2000 to a high point approaching $300 billion in 2011, before falling back since

States hold many of the cards

Ownership of worldwide power generation capacity & oil and gas reserves



Source: *World Energy Investment Outlook, 2014*

Alongside investment by the private sector, the objectives, corporate culture & financing of state-owned companies are critical to future energy investment flows

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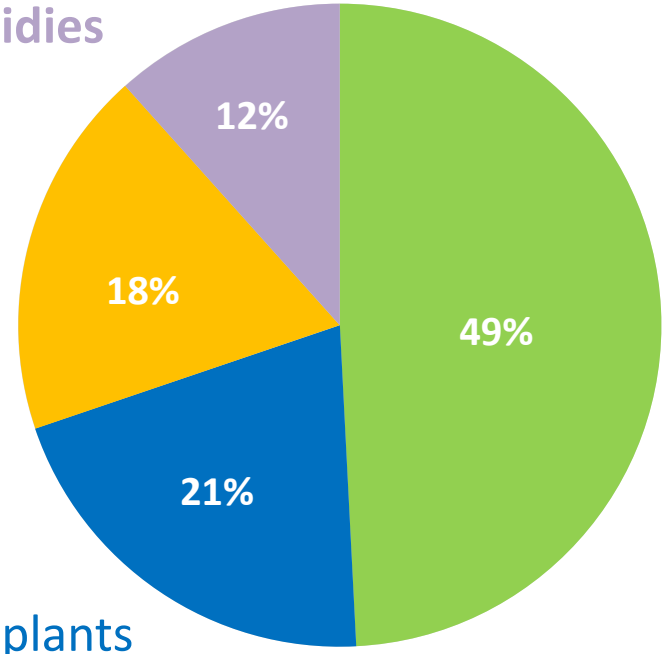
1. Cost-effective short-term action

Emissions savings in the 4-for-2 °C Scenario, 2020



Partial removal of **fossil-fuel subsidies**

Implement selected **energy efficiency** policies

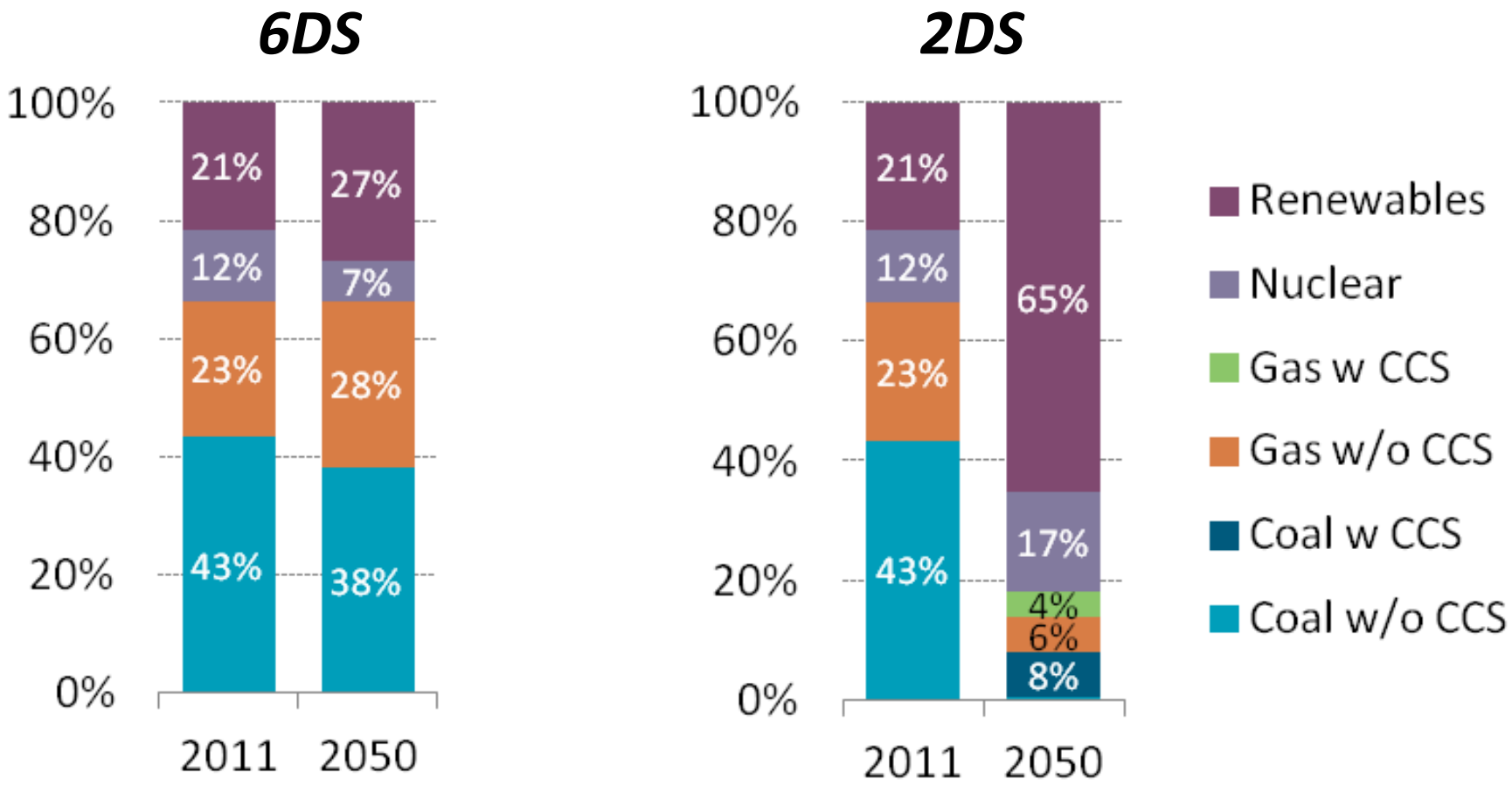
Reduce **methane releases** from upstream oil and gas

Limit use of **inefficient coal** power plants

Source: *World Energy Outlook Special Report: Redrawing the Energy-Climate Map*, 2013

Four measures can stop the growth in emissions by 2020 at no net economic cost, reducing emissions by 3.1 Gt, 80% of the savings required for a 2 °C path

2. Decarbonising the electricity sector

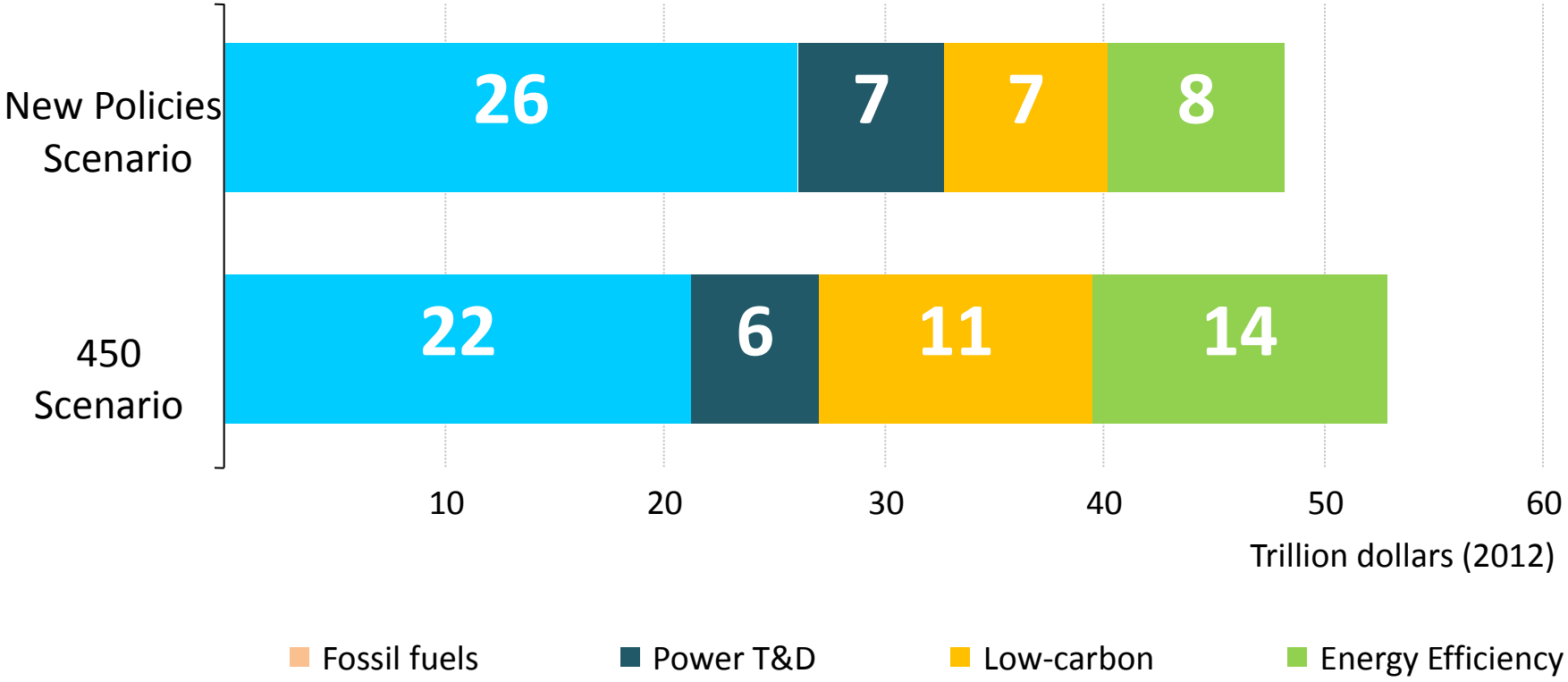


Source: *Energy Technology Perspectives, 2014*

In the 2DS, 94% of electricity is generated from low-carbon sources (renewables, nuclear, CCS) in 2050

3a. Reshape investment patterns

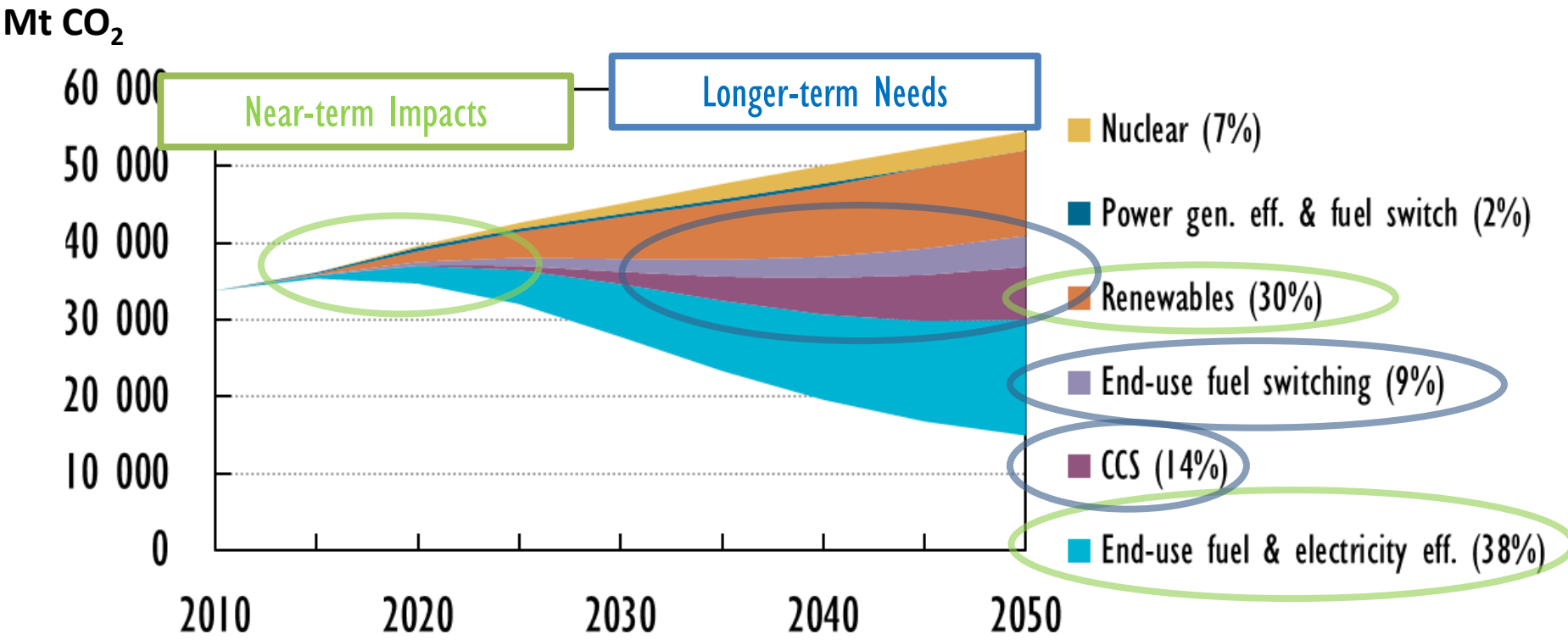
Investment in the New Policies and 450 Scenarios, 2014-2035



Source: *World Energy Investment Outlook 2014*

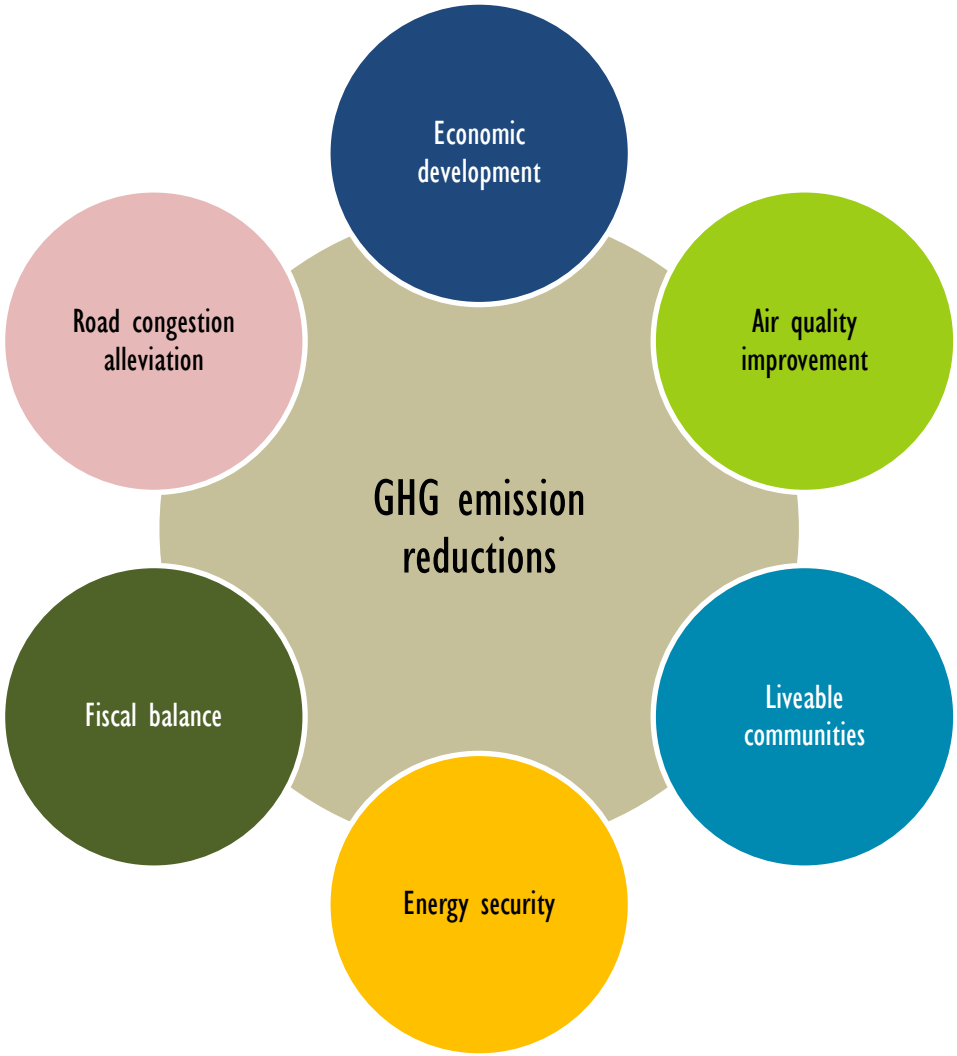
Efficiency spending is $6 trillion higher & the composition of supply investment changes: CCS is widely deployed, $300 billion of fossil fuel investment is left stranded

3b. Accelerate innovation



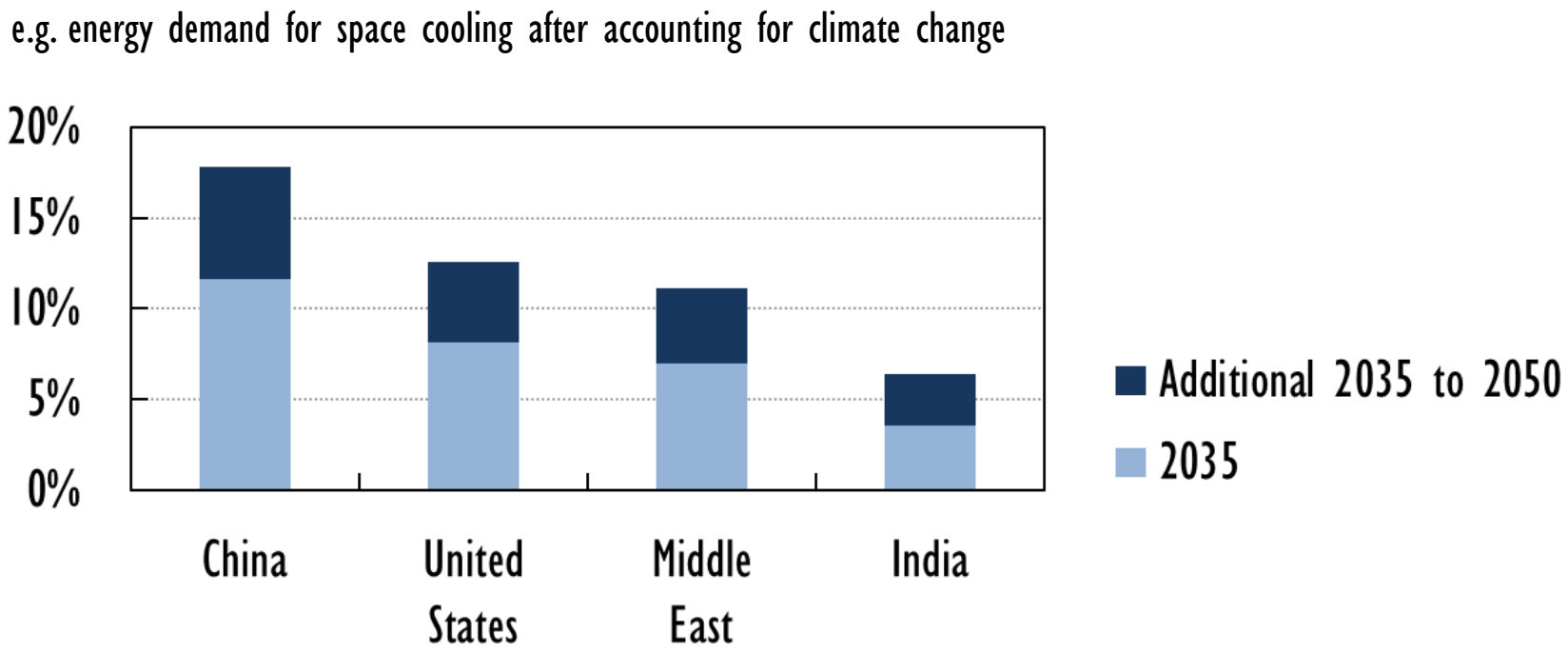
Source: *Energy Technology Perspectives*, 2014

4. Harness non-climate drivers of actions that reduce emissions



5. Strengthen energy sector resilience

The energy sector needs to become more resilient to both extreme events, and long-term gradual changes



Source: *World Energy Outlook Special Report: Redrawing the Energy-Climate Map*, 2013

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Managing technology risk

Risk:

Technology delay increases costs, reduces feasibility of low-carbon scenarios

Risk Mitigation:

- International collaboration to share best-practice policy frameworks for RD&D support and evaluation
- Portfolio approach to RD&D
- Track and report global level of investment in technology development
- Strong focus on energy efficiency
- Broad-based policies for implementation

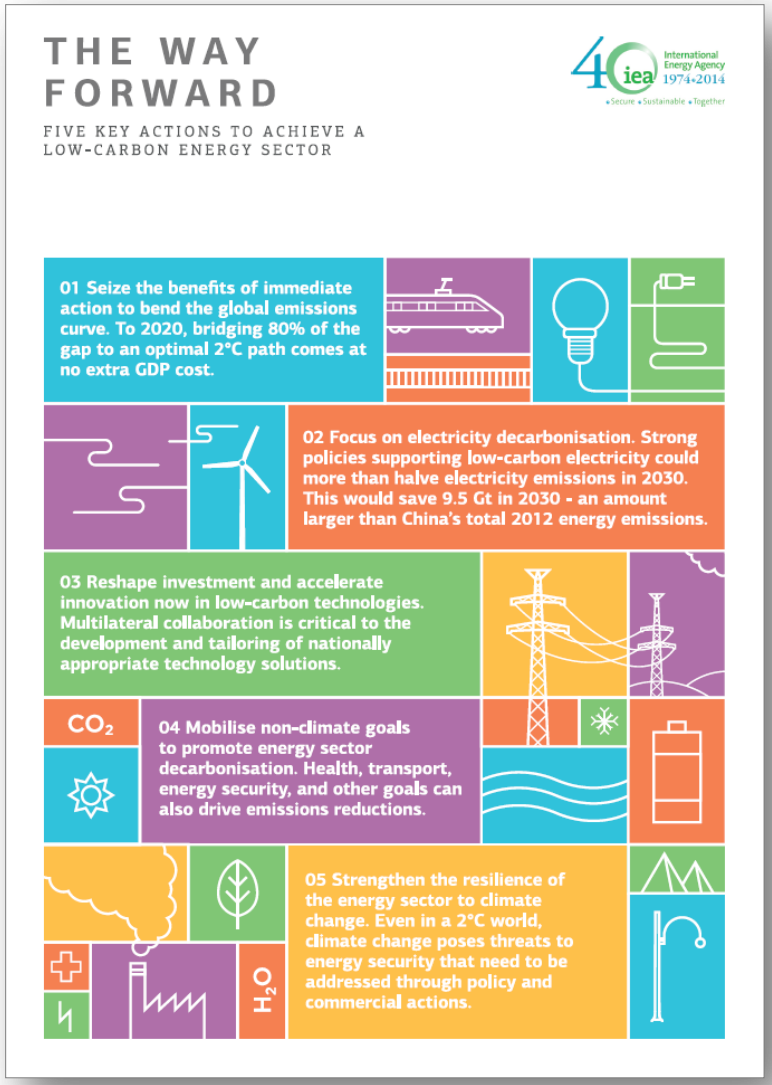
Conclusions

1. Current policies and investment patterns are not consistent with 2C

2. Moving to a 2C pathway is technically possible and affordable, but requires sustained effort. Key actions:

- Act to reduce emissions pre-2020
- Focus on power sector decarbonisation
- Shift investment patterns
- Accelerate clean energy technology development
- Harness non-climate objectives
- Build resilience

3. Actions needed to mitigate risk of technology delay



Thank you

Download at:

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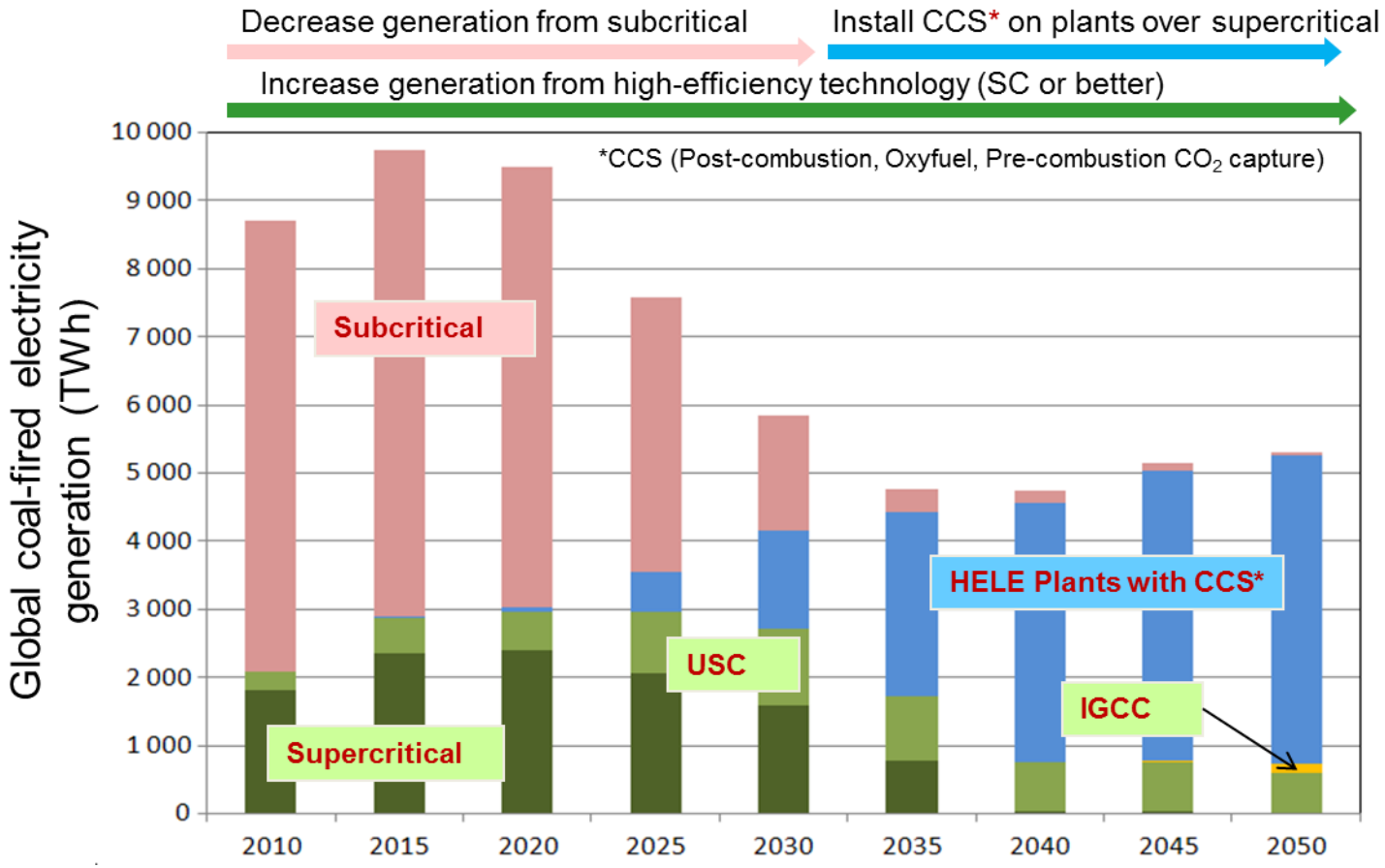
Spare slides

Coal: avoiding carbon lock-in
Improve efficiency, then deploy CCS

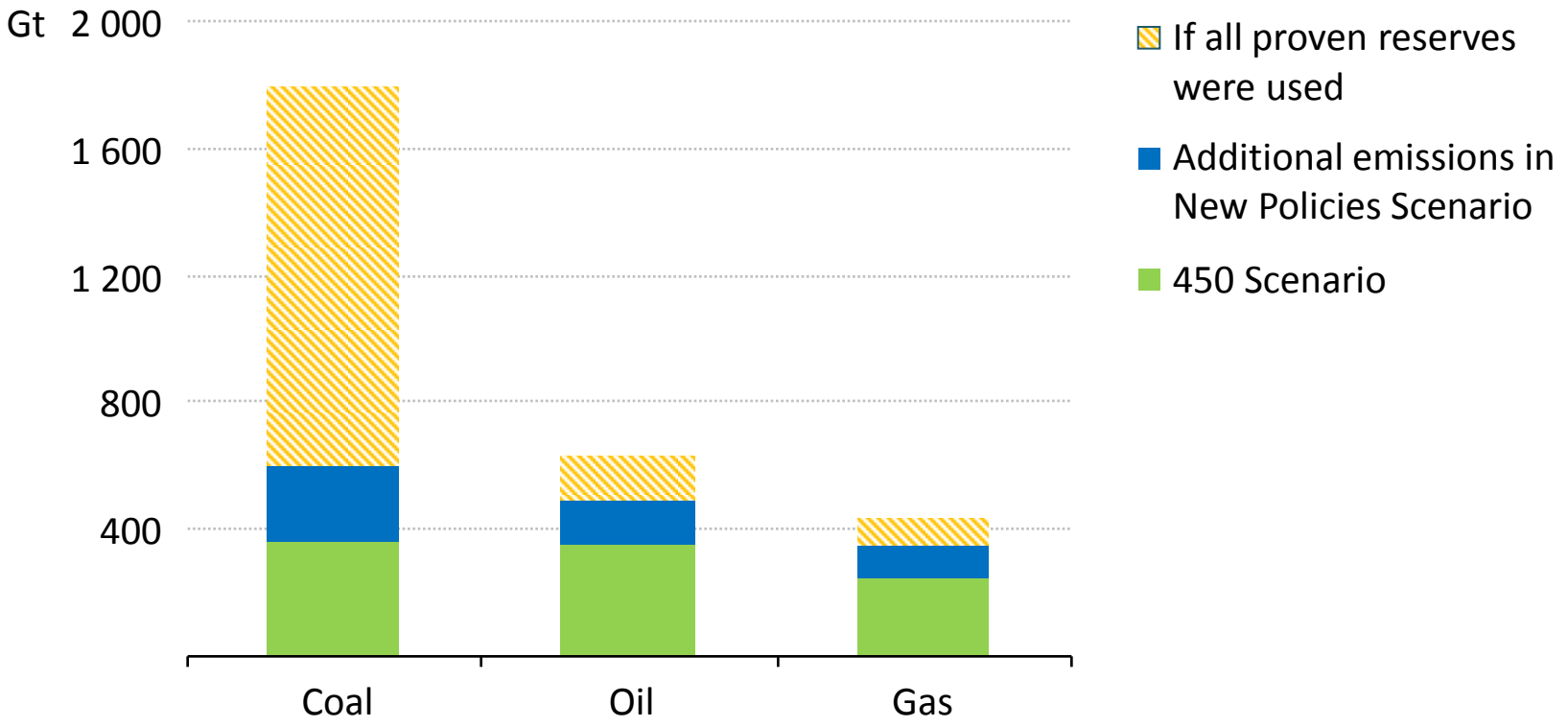


* CCS fitted to SC (or better) units.

To meet the 2DS, generation from subcritical plants would need to cease before end of their technical lifetimes.

Some fossil-fuel reserves remain underground

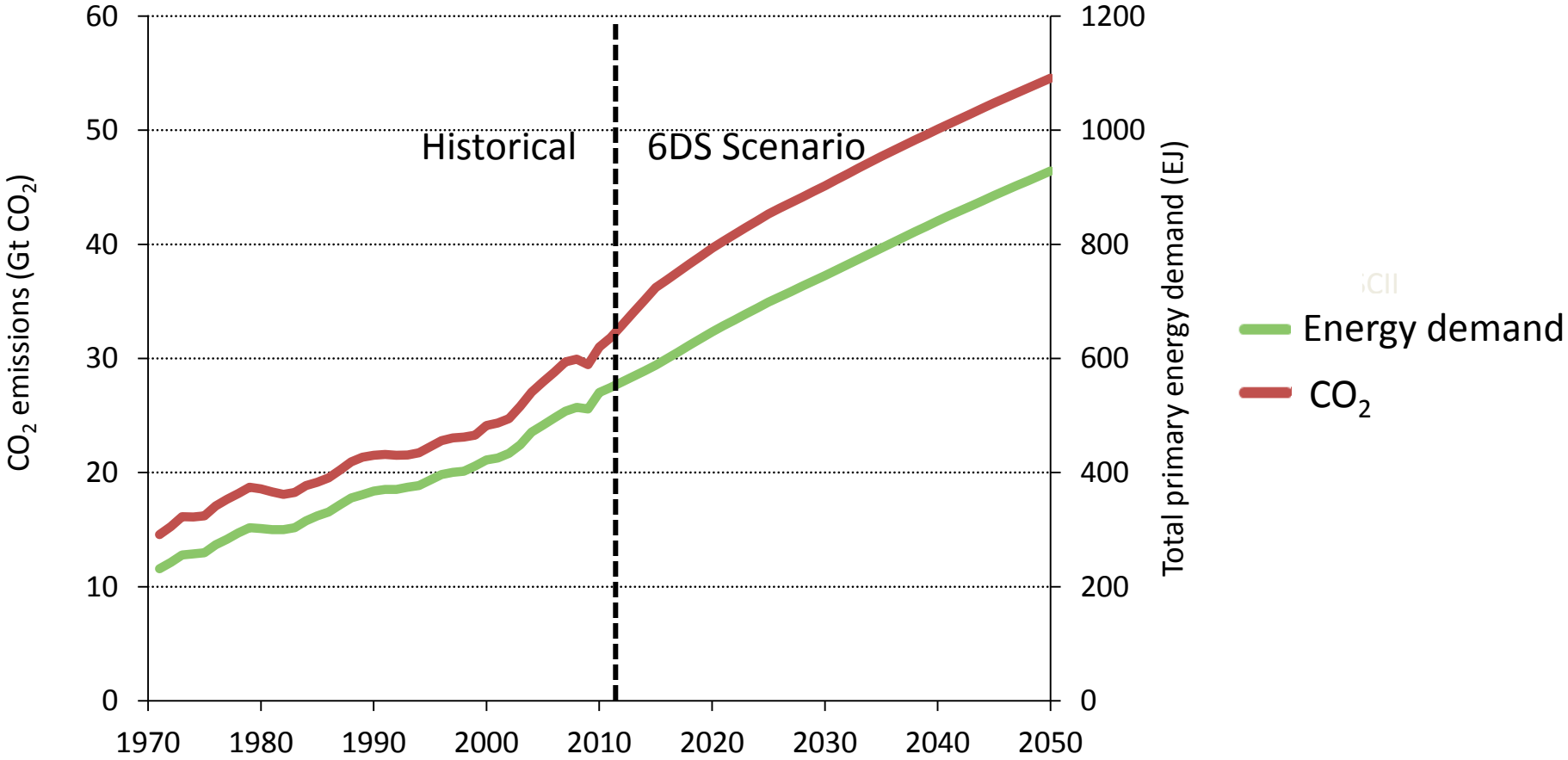
Potential CO_2 emissions from proven fossil-fuel reserves to 2050



Source: *World Energy Investment Outlook 2014*

On today's trends, half of the proven fossil-fuel reserves would be left undeveloped to 2050 – stronger climate action would increase the share

Emissions: Energy demand and CO_2 emissions are steadily rising

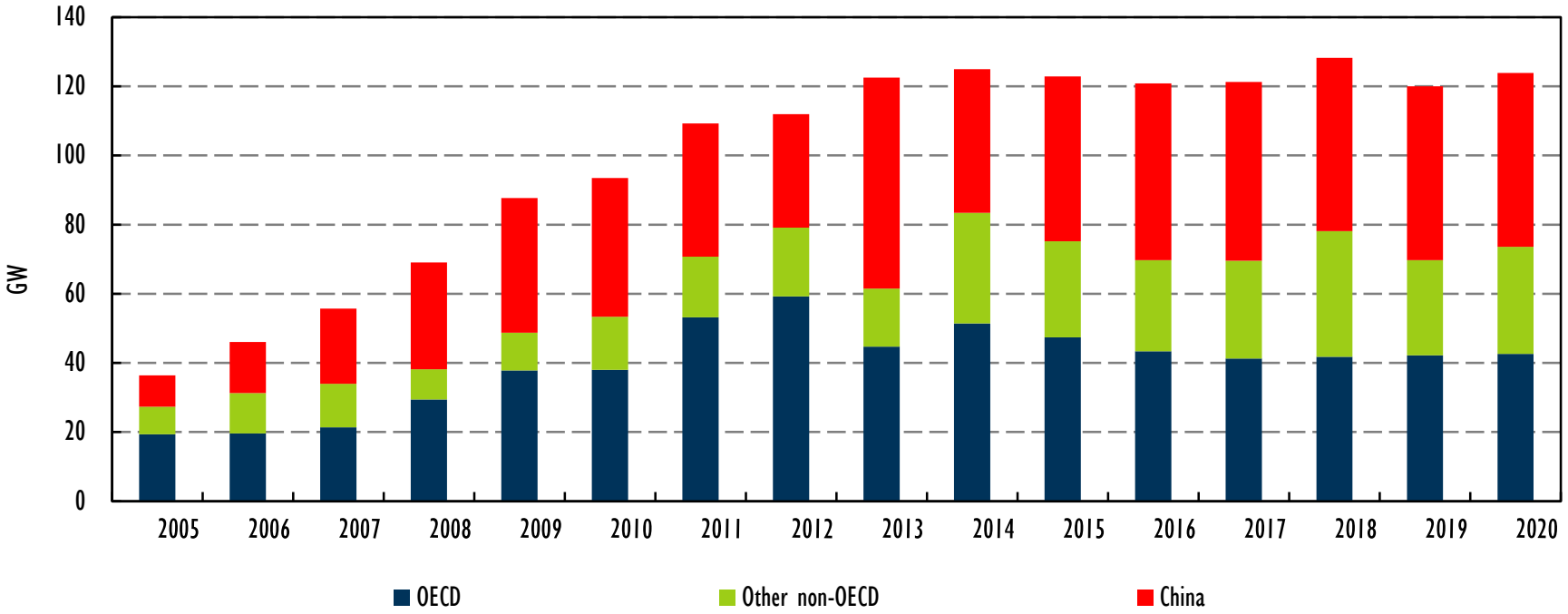


Source: *Energy Technology Perspectives, 2014*

… and with current policies will continue to do so

Increasing risks are expected to slow renewable growth

Renewable power annual net capacity additions, historical and projected



Source: Medium-Term Renewable Energy Market Report, *2014*

- **Policy and market risks threaten to slow deployment momentum for renewables**

"Un-locking" high emission assets

Unlocking action	Policy Options		
	Direct regulations	**Supply/demand balances**	**Price**
Retirement of coal plant	- ownership decision - lifetime limits - phase-out	- fleet-wide emissions performance standard - Renewables regulation - demand reductions	- fuel tax changes - carbon pricing - preferential renewables tariffs
Change dispatch of existing power plant fleet	- "clean-first" dispatch - priority dispatch of renewables	- fleet-wide emissions performance standard	- fuel tax changes carbon pricing - removal of fossil fuel subsidies
Efficiency retrofit of coal plant	- targets for plant retrofit rates	- fleet-wide emissions performance standard	- carbon pricing - removal of fossil fuel subsidies
Retrofit of coal plant for CCS	- regulated lifetime limits - CCS mandates	- CCS trading schemes - fleet-wide emissions performance standard	- carbon pricing - preferential tariffs for CCS generation

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5 key actions to achieve a low-carbon energy sector

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1. Seize the benefits of immediate action to bend the global emissions curve
2. Focus on electricity decarbonisation
3. Reshape investment and accelerate innovation now in low-carbon technologies
4. Mobilise non-climate goals to promote energy sector decarbonisation
5. Strengthen the resilience of the energy sector to climate change