



GLOBAL  
CCS  
INSTITUTE



# GLOBAL STATUS OF CCS: 2014

## A WATERSHED PERIOD FOR CCS

Staff presentation pack  
6 November 2014



# The Global CCS Institute

---



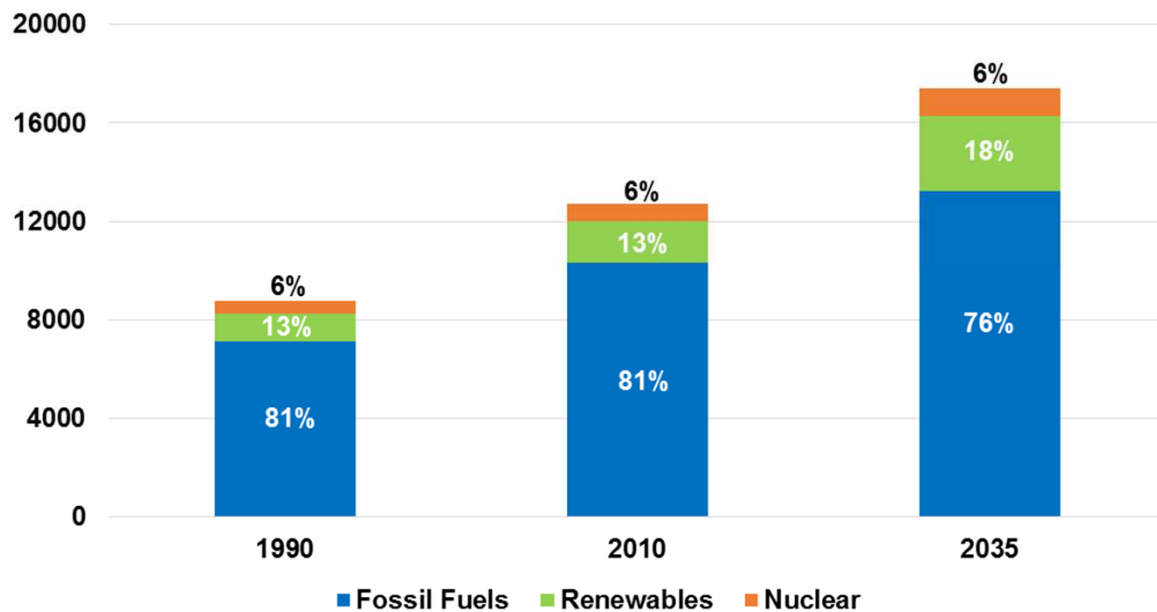
- We are an international membership organisation.
- Offices in Washington DC, Brussels, Beijing and Tokyo. Headquarters in Melbourne.
- Our diverse international membership consists of:
  - governments,
  - global corporations,
  - small companies,
  - research bodies, and
  - non-government organisations.
- Specialist expertise covers the CCS/CCUS chain.



# Fossil fuels must be part of the climate solution

Demand for fossil fuels remains robust and supply is abundant

Primary energy demand by fuel source:  
(million tonnes of oil equivalent)



Fossil fuel proved reserves:  
*6 trillion barrels of oil equivalent*

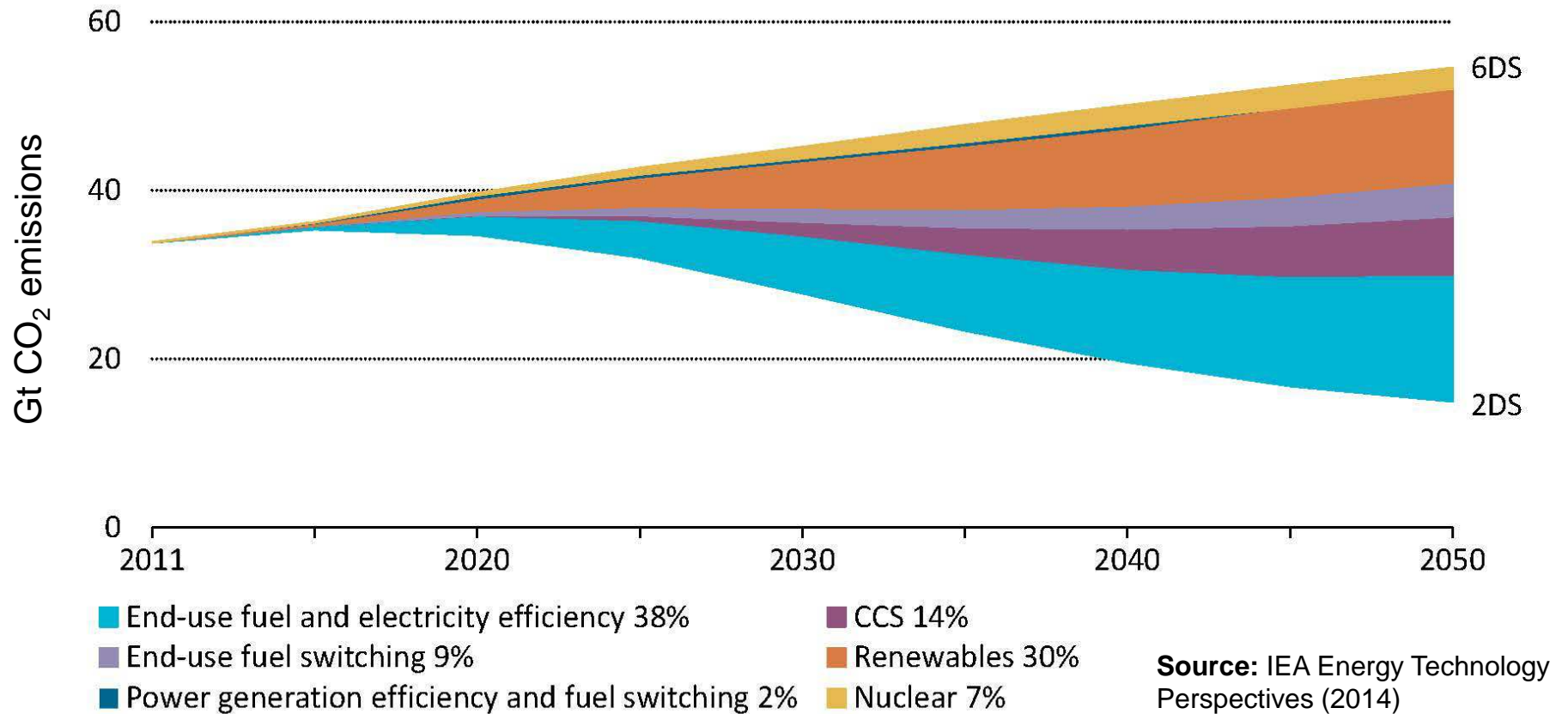
Reserves to production ratio:  
*~75 years*

Source: IEA World Energy Outlook, 2012  
IEA World Energy Outlook, 2013 (New policies scenario)

Source: BP Statistical Review of World Energy 2014



# CCS is a vital element of a low-carbon energy future



A transformation in how we generate and use energy is needed



## The case for CCS – independent voices

---

“Many models could not achieve atmospheric concentration levels of about 450ppm CO<sub>2</sub>eq by 2100 if additional mitigation is considerably delayed or under limited availability of key technologies, such as bioenergy, CCS and their combination (BECCS)”

**Summary report of the IPCC’s Fifth Assessment Report (AR5), Climate Change 2014: Mitigation of Climate Change, 2014.**

“A robust finding [of the study] is that the unavailability of carbon capture and storage and limited availability of bioenergy have the largest impact on feasibility and macroeconomic costs for stabilizing atmospheric concentrations at low levels...”

**The Energy Modelling Forum (EMF) 27 Study on *Global Technology and Climate Policy Strategies*, 2013**





“... We now need to shift to a higher gear in developing CCS into a true energy option, to be deployed in large scale. It is not enough to only see CCS in long-term energy scenarios as a solution that happens some time in a distant future. Instead, we must get to its true development right here and now.”

**Maria van der Hoeven, Executive Director, International Energy Agency. Foreword to the *Technology Roadmap: Carbon Capture and Storage*, 2013**



# Mitigation cost increases in scenarios with limited availability of technologies

Percentage increase in total discounted mitigation costs (2015-2100) relative to default technology assumptions – median estimate

2100 concentrations (ppm CO <sub>2</sub> eq)	no CCS	nuclear phase out	limited solar/wind	limited bioenergy
450	138% 	7% 	6% 	64% 

Symbol legend – fraction of models successful in producing scenarios (numbers indicate number of successful models)



Source: IPCC Fifth Assessment Synthesis Report, November 2014.



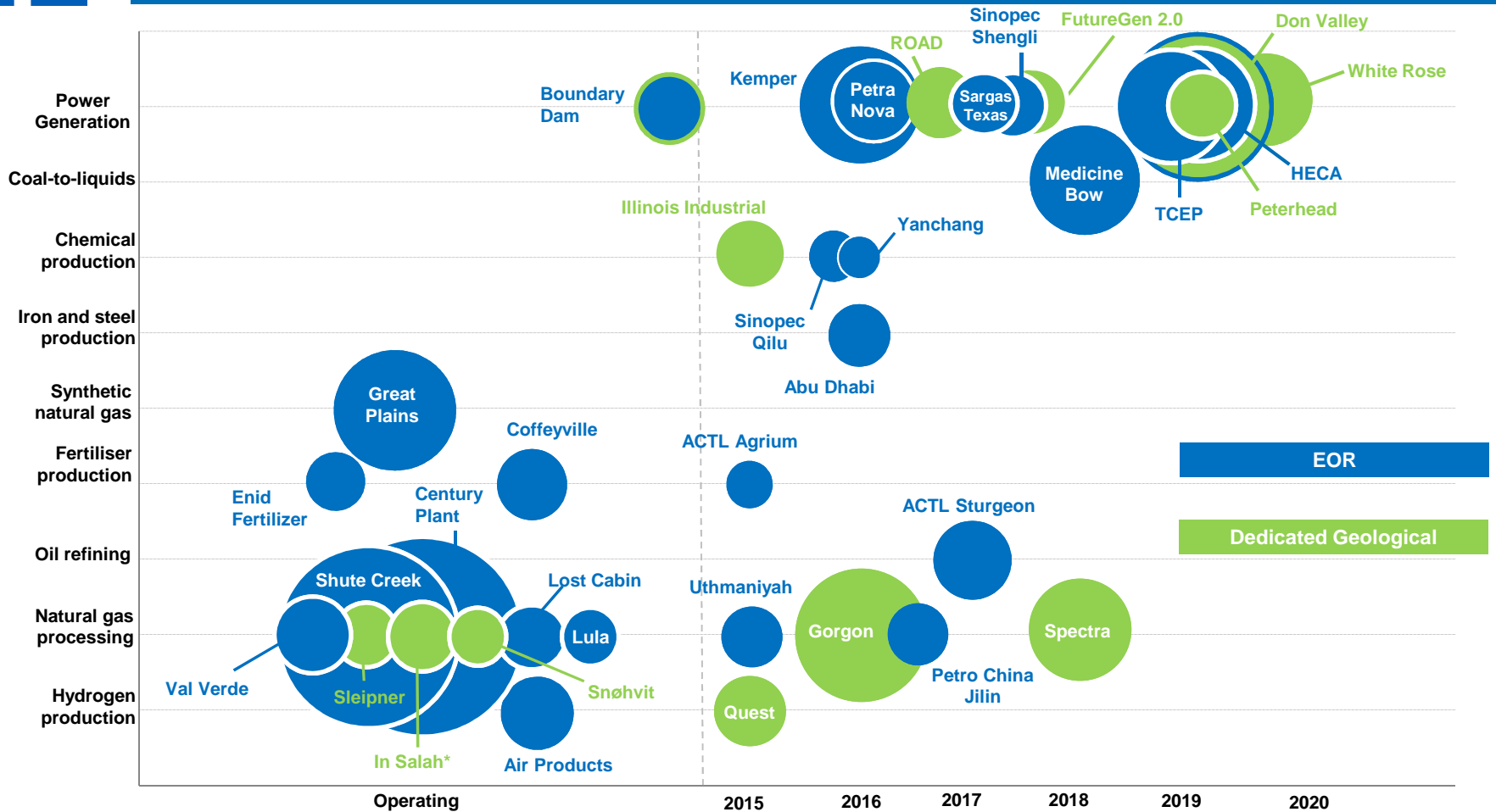
## Large-scale CCS projects by region or country

	Early planning	Advanced planning	Construction	Operation	Total
North America	5	6	6	9	26
China	8	4	-	-	12
Europe	2	4	-	2	8
Gulf Cooperation Council	-	-	2	-	2
Rest of World	4	-	1	2	7
Total	19	14	9	13	55

North America, China and UK (with 5) have the most projects



# Actual and expected operation dates for projects in operation, construction and advanced planning



○ = 1Mtpa of CO<sub>2</sub> (areas of circle are proportional to capacity)

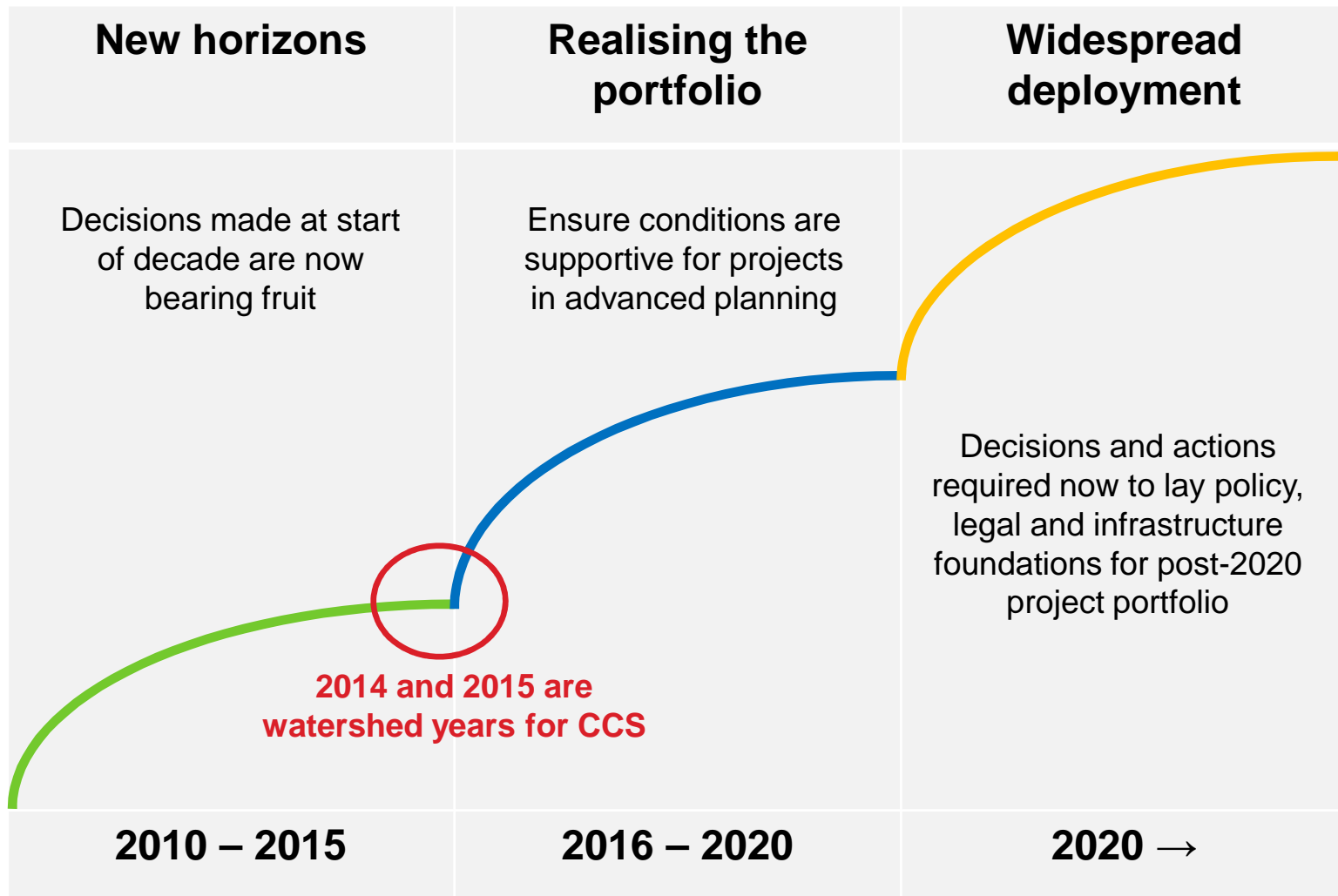
\* Injection currently suspended

**2014-2015 is a watershed period for CCS – it is a reality in the power sector and additional project approvals are anticipated**





# Pathway to CCS deployment





## Regional analysis – North America

---

- Has well over half the large-scale projects in operation or under construction.
- Home to all three of the world's large-scale CCS power projects in operation or under construction.
- CO<sub>2</sub>-EOR providing significant business case support.
- Policy actions and incentives to drive CCS deployment must complement regulatory action on emissions standards.
- US DOE supports an extensive R&D program into CCS technologies.
- Brazil and Mexico advancing CCS/CCUS programs.



## Regional analysis – Asia Pacific

---

- China follows the US as the most active country in CCS/CCUS.
- The world's largest dedicated geological storage project – the Gorgon Carbon Dioxide Injection Project in Australia – is planned to be operational in 2016.
- Japan and Korea have CCS activities at pilot and demonstration scale:
  - Japan – the Tomakomai and Osaki CoolGen projects are in construction
  - Korea – KEPCO is testing advanced capture technologies
- A key focus is increasing knowledge of storage potential in the region.
- Legal and regulatory advances are required in some jurisdictions to provide greater certainty to project proponents.



## Regional analysis – Europe

---

- CCS ambition at start of the decade has not been realised.
- Recognition of CCS in the October 2014 European Council conclusions is a positive sign of support.
- CCS projects in the UK are progressing and policy makers are developing mechanisms to support CCS in the power and industrial sectors.
- European projects in planning are important contributors to a global portfolio – all are in the power sector and plan to use offshore geological storage.
- The Dutch ROAD project is critical for CCS in mainland Europe.



## Regional analysis – Gulf Cooperation Council (GCC)

---

- GCC countries are at an early stage of CCS/CCUS deployment.
- Saudi Arabia and the United Arab Emirates (UAE) have significant projects.
- The UAE hosts the world's first CCS/CCUS project in the iron and steel sector.
- The focus of CCS/CCUS activity in the region is two-fold:
  - validate large-scale projects under local conditions
  - support for R&D activities
- Confidence from these programs is a key driver for longer-term deployment.



## CO<sub>2</sub> capture – focus on cost

---

- First generation projects will deliver important lessons.
- Continued R&D activities – on materials, processes and equipment – will help drive down costs.
- Collaboration crucial to achieve cost and performance goals.
- Next-generation technologies ready for the 2020-2025 timeframe.



## CO<sub>2</sub> storage – focus on timing

---

- EOR providing support to current wave of CCS projects.
- Global deployment will require significant geological storage.
- 2°C scenario requires over 2Gt annual storage by 2030, over 7Gt by 2050.
- Greenfields sites can take up to 10 years to assess to FID standard.
- Currently, industry has no incentive to undertake storage exploration.



## Policy and regulatory support is vital

---

- Achieving climate goals without CCS would incur substantial additional costs - or not be possible.
- Current large-scale CCS project activity is supported by public funding programs established towards the end of the last decade.
- Looking forward, a strong policy, legal and regulatory environment will incentivise and provide predictability for investors in CCS projects.
- Action is needed now if we are to deliver projects in the next decade
- The new international climate agreement under development will be an important foundation stone.
- Regional and national policy settings should be technology neutral to ensure that CCS is not disadvantaged relative to other technological solutions.



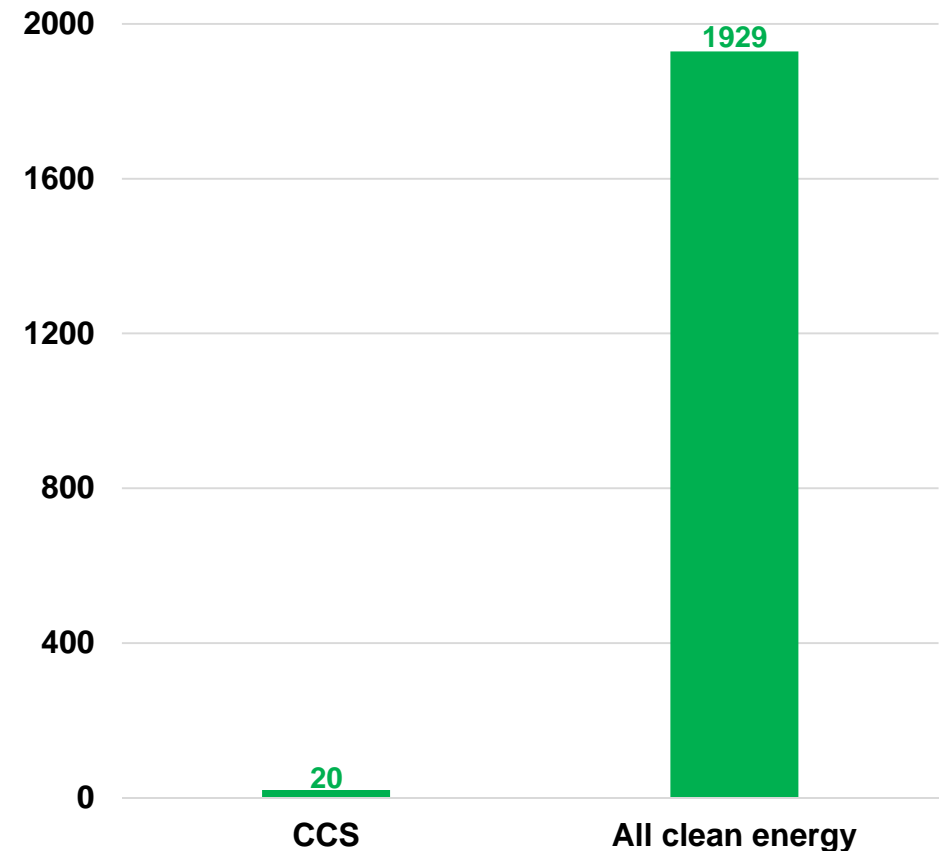


## Strong policy drives investment

- Scale of renewables investment is instructive
- CCS has not enjoyed commensurate policy support
- EOR has provided impetus in North America
- Policy parity is essential
- How do we get CCS onto a similar curve?

### Clean energy investment between 2004-2013

USD billion



Data source: Bloomberg New Energy Finance as shown in IEA presentation “*Carbon Capture and Storage: Perspectives from the International Energy Agency*”, presented at National CCS week in Australia, September 2014.



## Recommendations for decision makers

---

- Near-term policy support critical to move advanced projects into construction.
- Strong, sustainable emission reduction policies that give investors confidence to invest in CCS are needed for longer-term deployment. These policies must be technology neutral.
- Programs that encourage the exploration of significant storage resources are needed to give storage certainty and support timely deployment.
- Substantial emissions reductions are required in non-OECD countries - focused effort is required to increase project activity in these economies.
- CCS is the only technology that can achieve large reductions in CO<sub>2</sub> emissions from industries such as iron and steel and cement. Urgent attention must be given to policies that incentivise deployment of CCS in such industries.



## **Our call to action for 2015**

---

**It is time to move the agenda forward:**

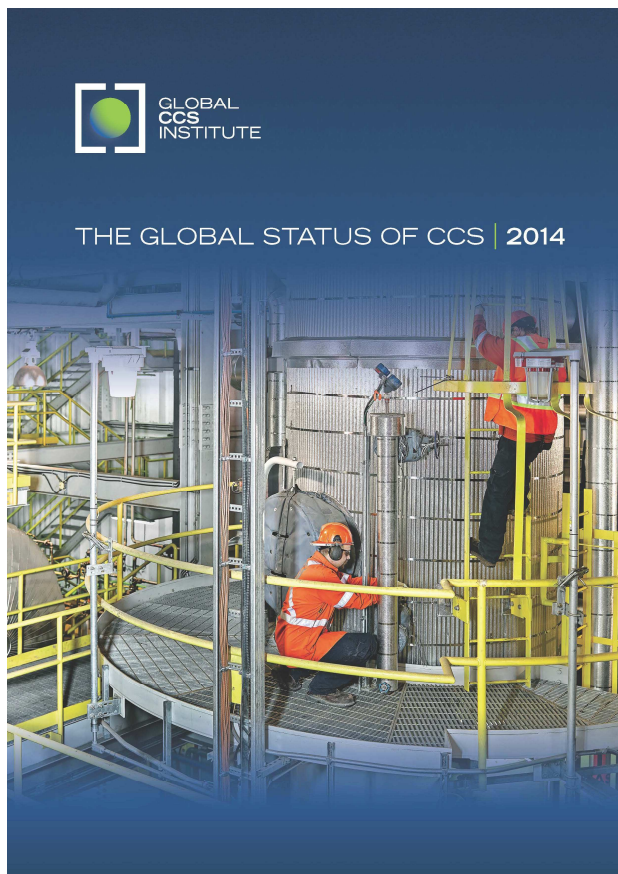
- CCS in the power sector is now a reality
- We now have 50% more projects than at the start of the decade
- Next generation CCS needs decisions now
- We must all take today's messages and promote CCS
- Challenge is not technology – it is policy and support
- CCS community must build on recent successes

**OUR CALL TO ACTION IS TO  
ACCELERATE CCS AROUND THE WORLD**



# The Global Status of CCS: 2014

## The *Global Status of CCS: 2014* – Key Institute publication



This year's report:

- Provides a comprehensive overview of global and regional developments in large-scale CCS projects, in CCS technologies and in the policy, legal and regulatory environment.
- Introduces and links to project descriptions for around 40 lesser scale 'notable' CCS projects.
- Makes recommendations for decision makers.
- The full report is available online, including supporting resources and data

GLOBAL**CCS**INSTITUTE.COM

