



GLOBAL
CCS
INSTITUTE



GLOBAL STATUS OF CCS: 2014

A WATERSHED PERIOD FOR CCS

Staff presentation pack
6 November 2014



The Global CCS Institute



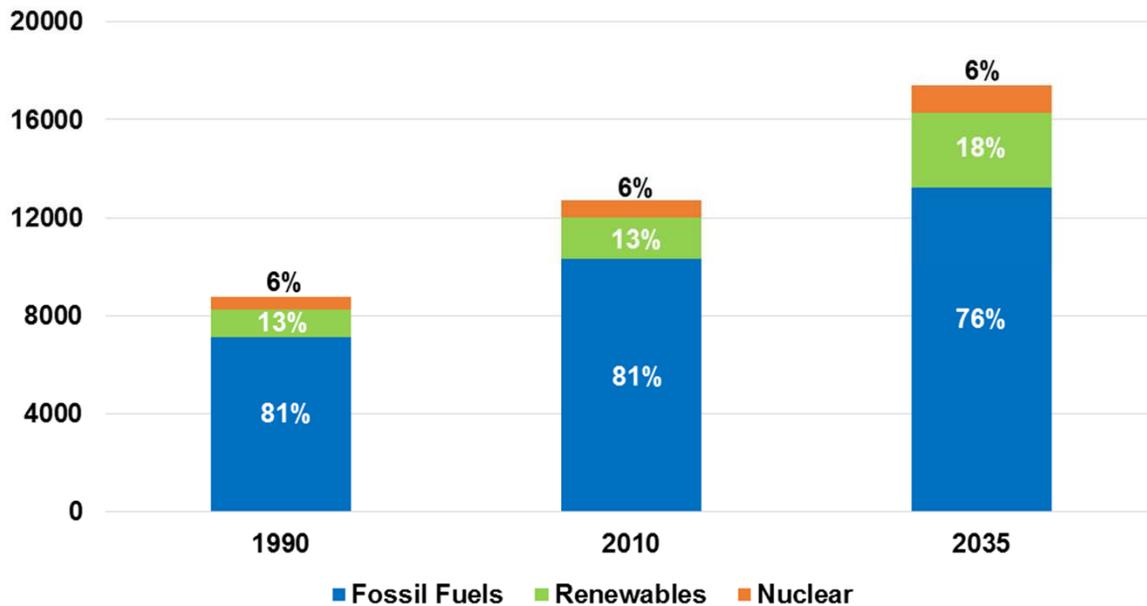
- We are an international membership organisation.
- Offices in Washington DC, Brussels, Beijing and Tokyo. Headquarters in Melbourne.
- Our diverse international membership consists of:
 - governments,
 - global corporations,
 - small companies,
 - research bodies, and
 - non-government organisations.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

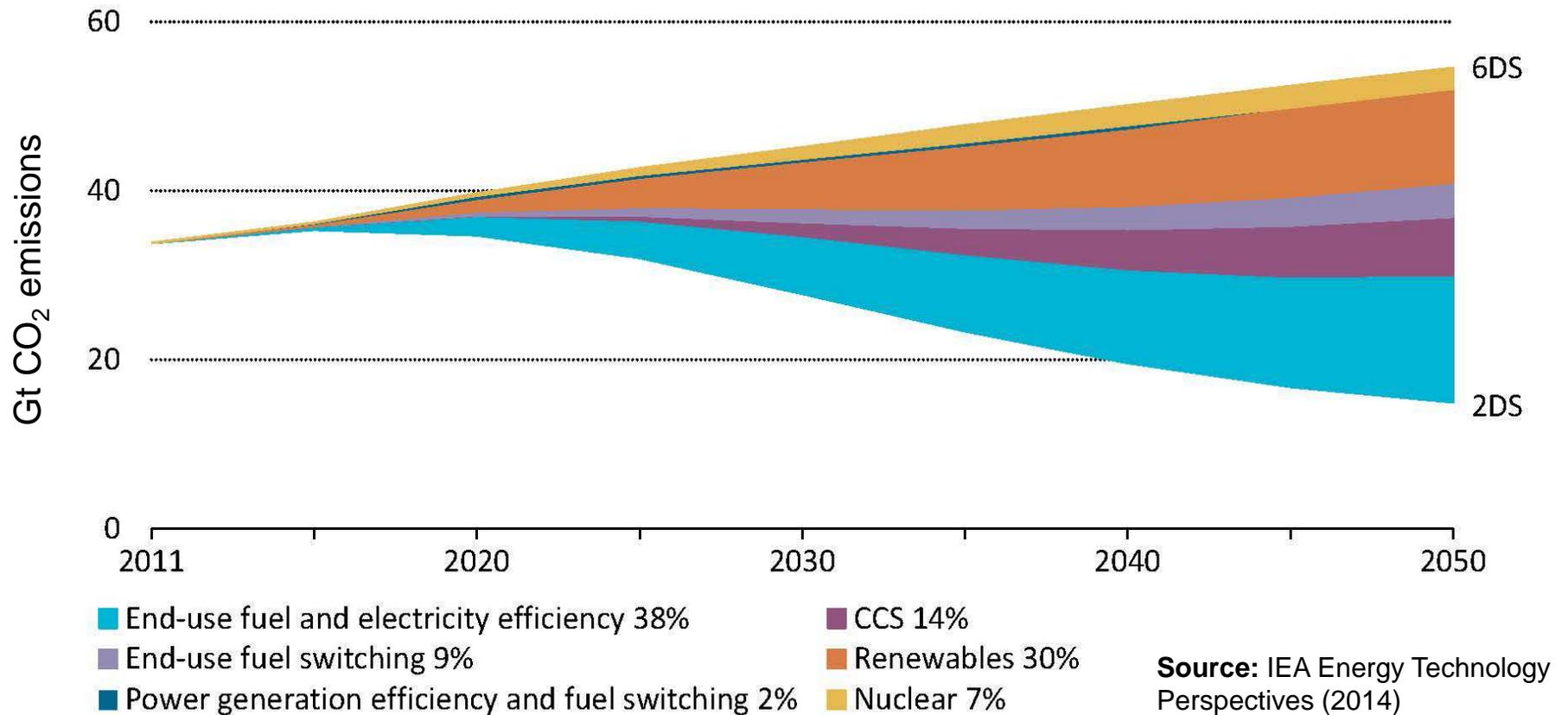
Reserves to production ratio:
~75 years

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 CO₂eq 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 ₂ 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.



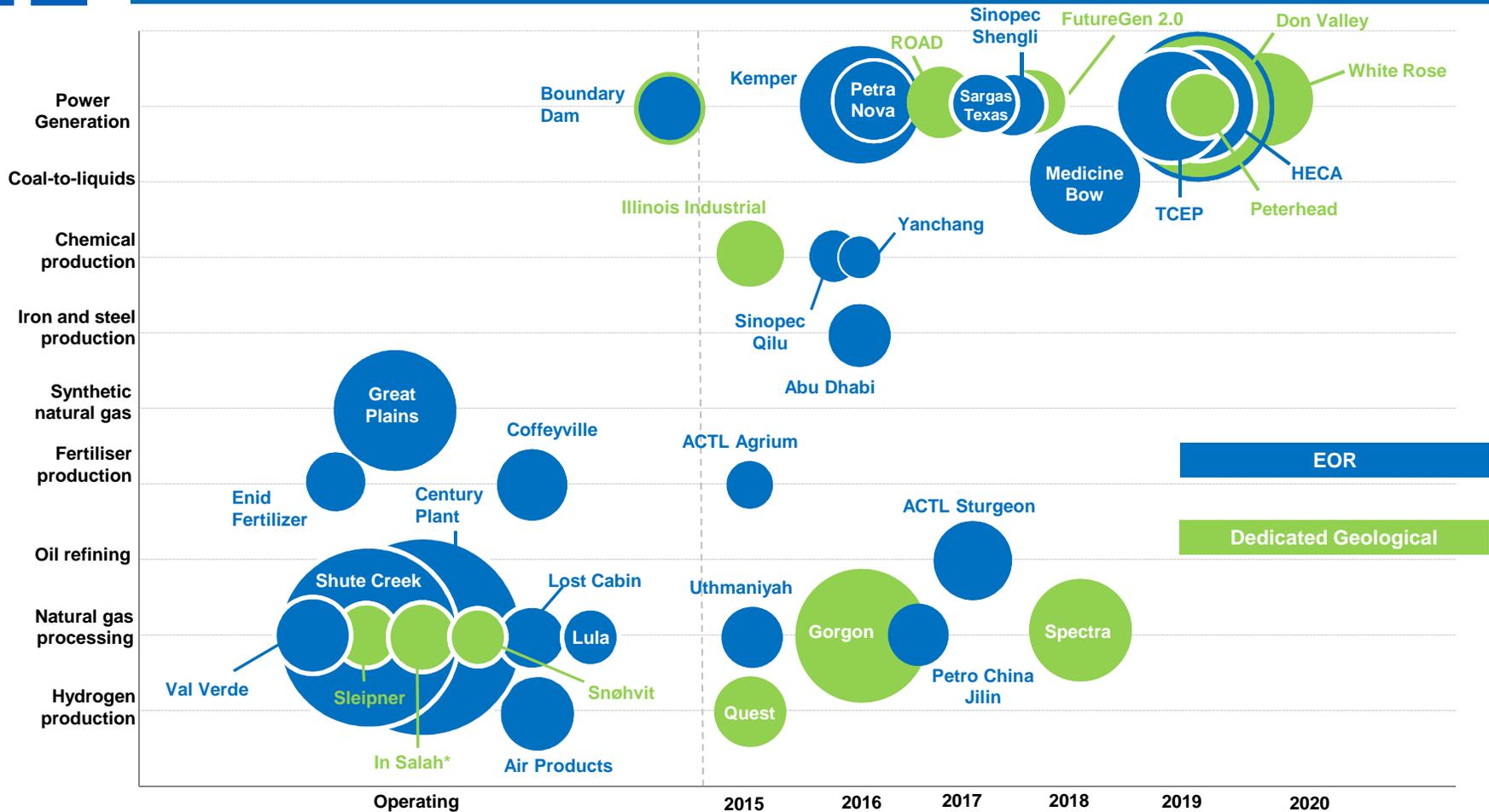
Large-scale CCS projects by region or country

	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



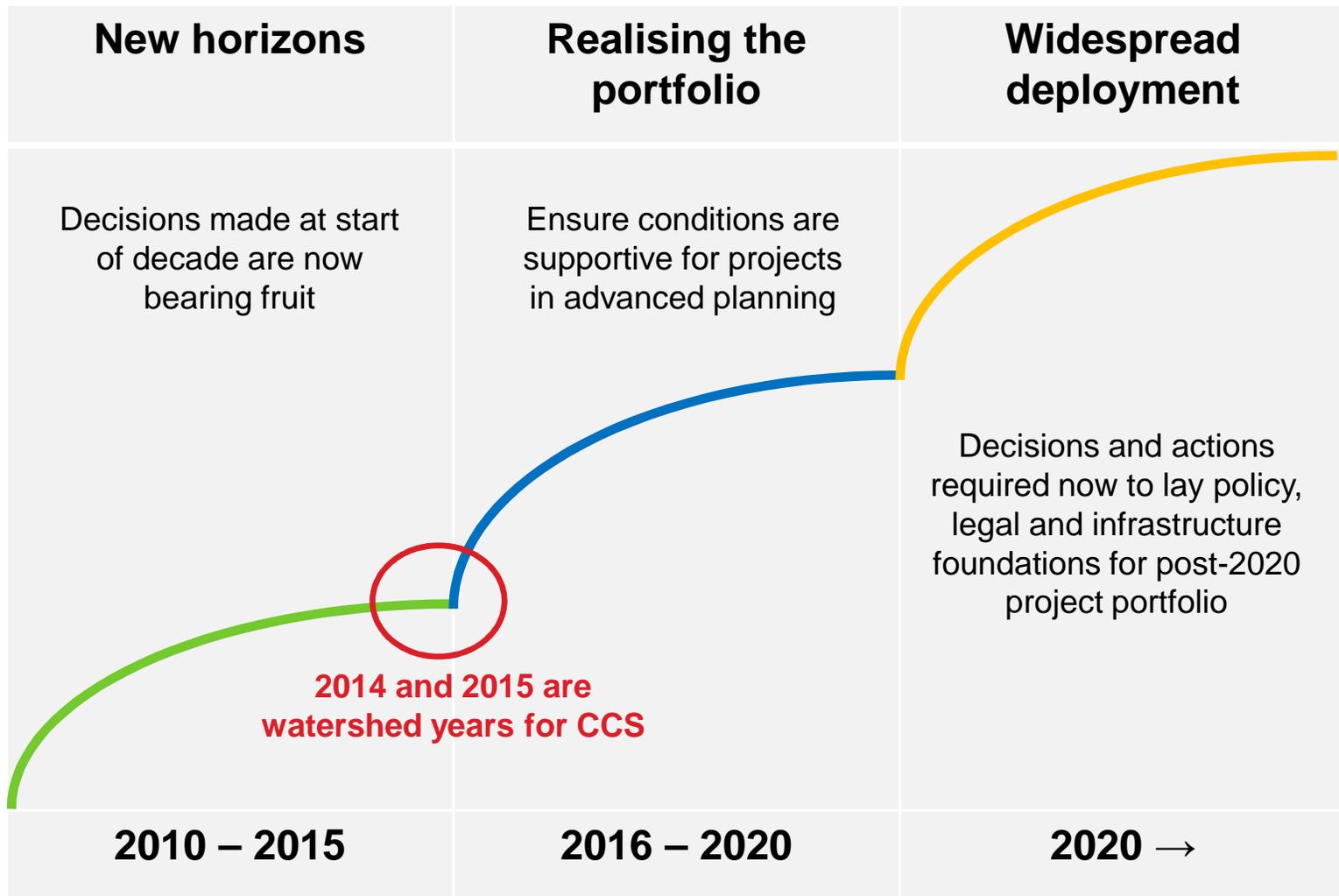
○ = 1Mtpa of CO₂ (areas of circle are proportional to capacity)

* 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.
- CO₂-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.



CO₂ 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.



CO₂ 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.

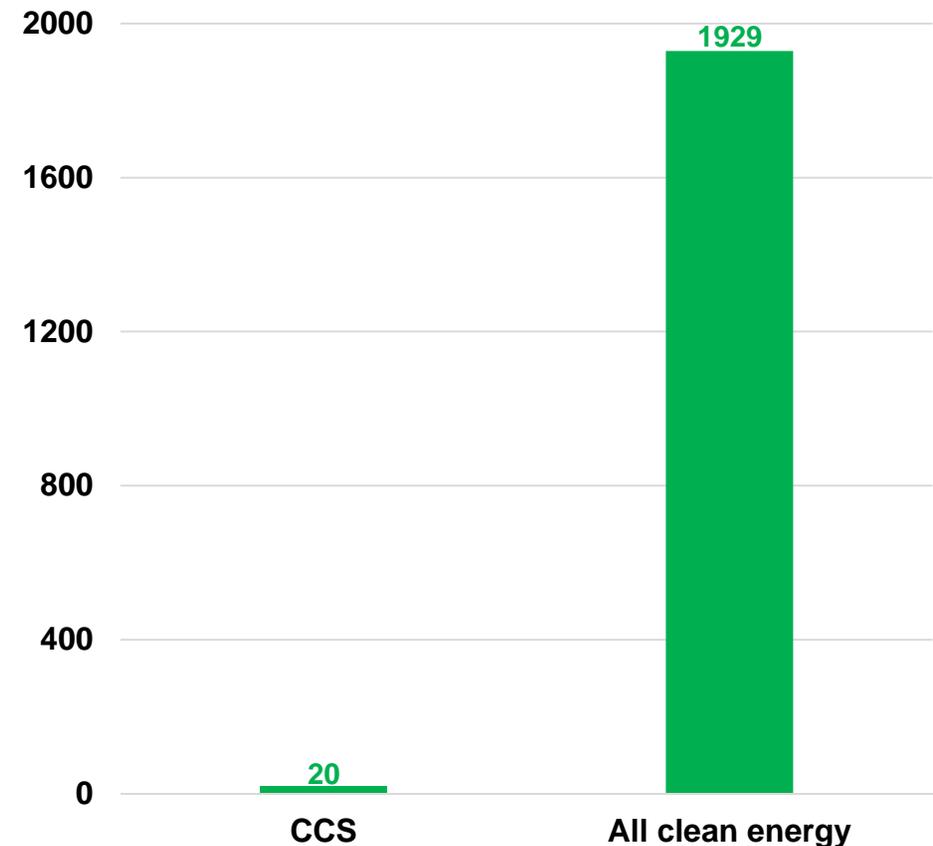


Strong policy drives investment

- 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 CO₂ 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:

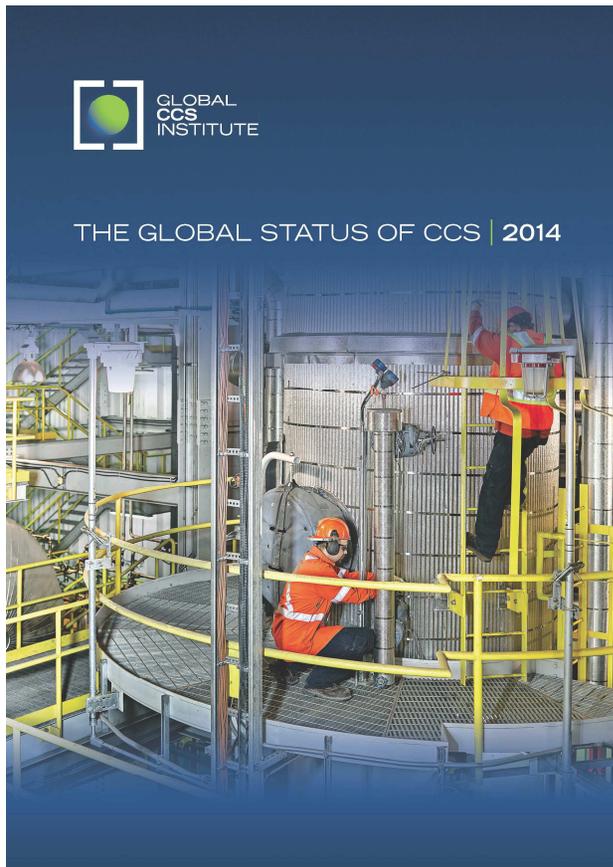
- CCS in the power sector is now a reality
- We now have 50% more projects than at the start of the decade
- Next generation CCS needs decisions now
- We must all take today's messages and promote CCS
- Challenge is not technology – it is policy and support
- CCS community must build on recent successes

**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

