



GLOBAL
CCS
INSTITUTE



GLOBAL STATUS OF CCS

SECARB Annual Stakeholders' Briefing
March 10, 2016

Cover image: Overlooking the Quest Capture facility located at Shell - Scotford, near Fort Saskatchewan, Alberta. Image provided by Shell.



The Global CCS Institute

Our Vision for CCS:

CCS is an integral part of a low-carbon future

OUR MISSION
To accelerate the development, demonstration and deployment of CCS globally.

1

Fact-based, influential advice and advocacy

2

Authoritative knowledge sharing

- An international membership organisation
- Melbourne, Washington DC, Brussels, Beijing and Tokyo
- Diverse international membership:
 - governments
 - global corporations
 - small companies
 - research bodies
 - non-government organisations
- Specialist expertise covers the CCS/CCUS chain

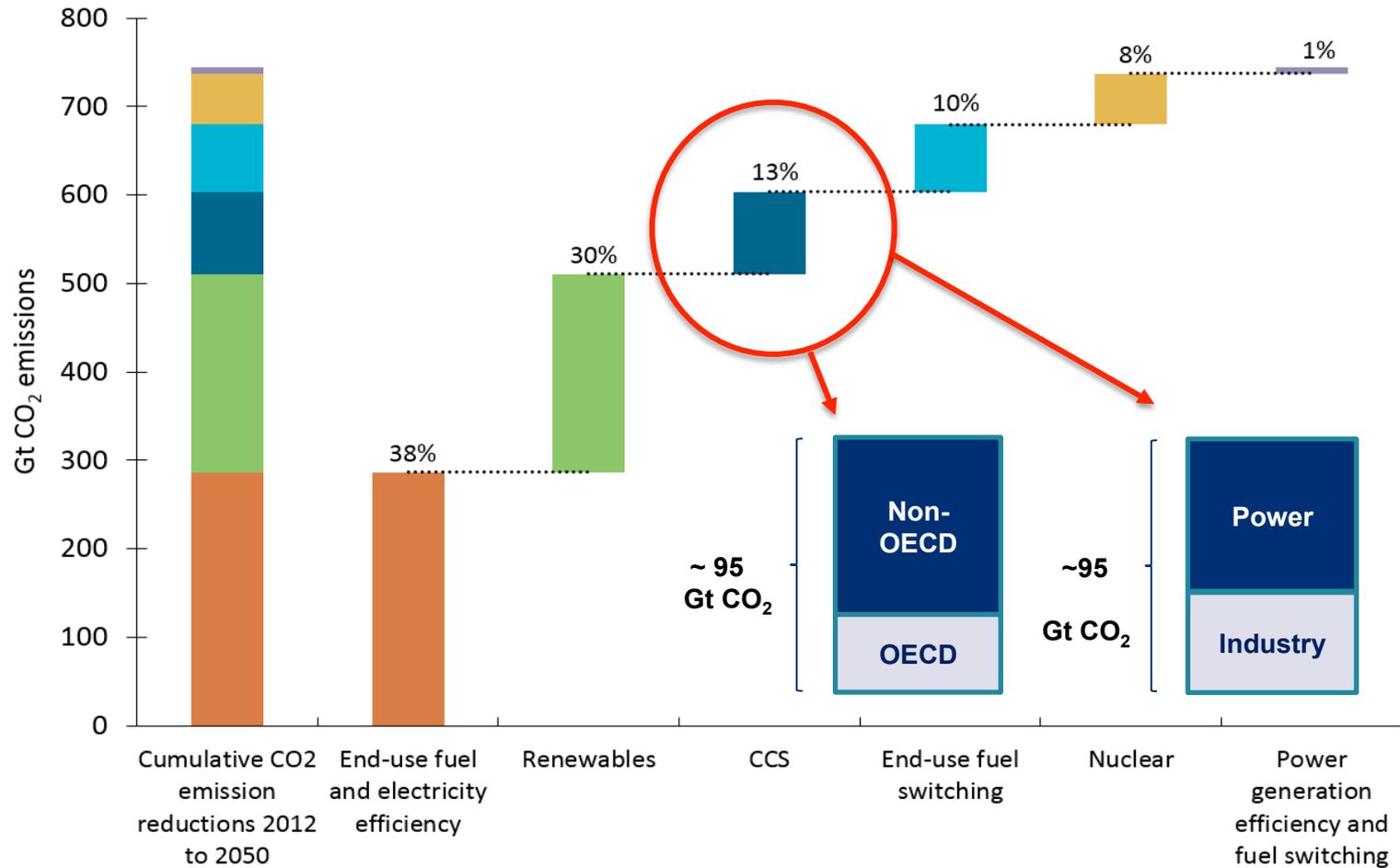


CCS in Context



CCS is critical in a portfolio of low-carbon technologies

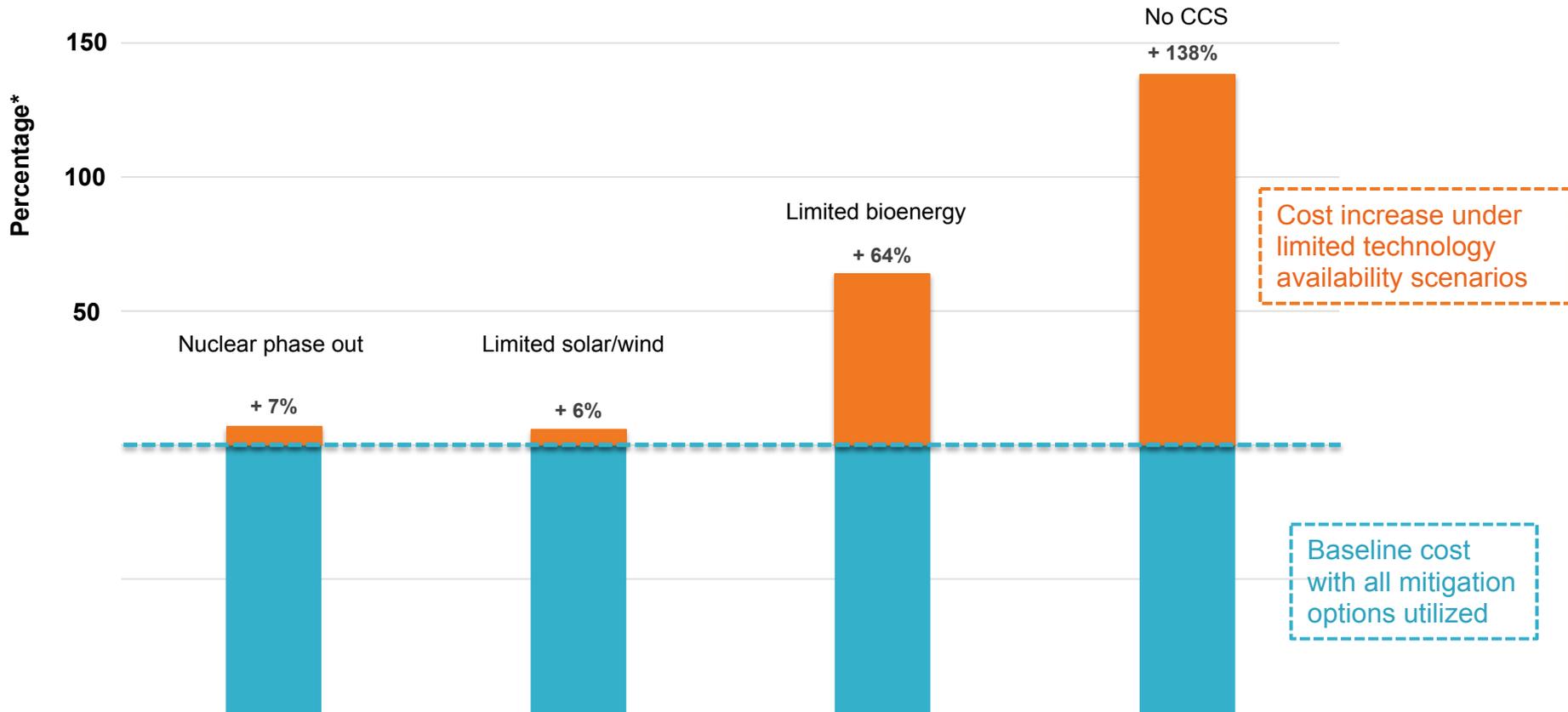
CCS contributes 13% of cumulative reductions required through 2050 in a 2DS world compared to 'business as usual'



Source: IEA, *Energy Technology Perspectives* (2015).



Mitigation costs more than double in scenarios with limited availability of CCS



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

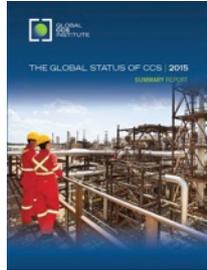
Source: IPCC Fifth Assessment Synthesis Report, Summary for Policymakers, November 2014.



Global Projects Status



A significant task within one generation



**Global Status
of CCS: 2015**

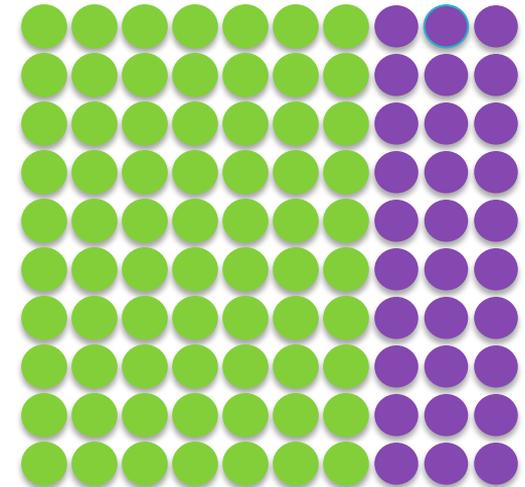
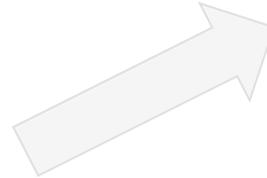


**4,000 Mtpa of CO₂
captured by CCS by 2040
(IEA 450 Scenario)****

44 large-scale CCS projects -
combined capture capacity of
79 Mtpa*:

- 22 projects in operation or construction (**40 Mtpa**)
- 10 projects in advanced planning, five nearing FID (14 Mtpa)
- 12 projects in earlier stages of planning (25 Mtpa)

40 Mtpa



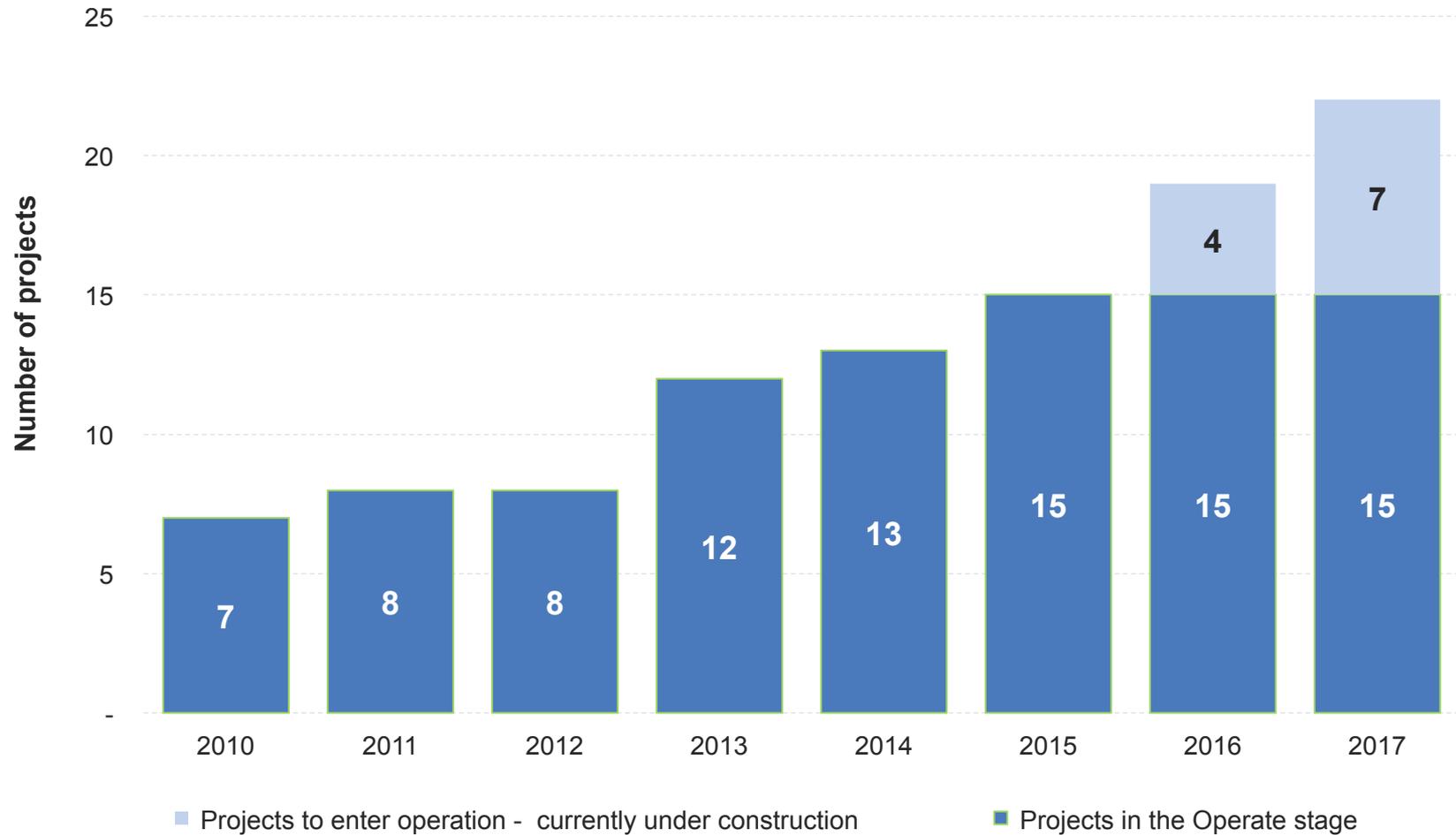
● Non-OECD ● OECD

*Mtpa = million tonnes per annum

**Source: IEA, Energy Technology Perspectives (2015).



Much to look forward to over the next 18 months





Large-scale CCS projects by region or country

	Early planning	Advanced planning	Construction	Operation	Total
North America	1	2	5	10	18
China	5	4	-	-	9
Europe	2	3	-	2	7
Gulf Cooperation Council	-	-	1	1	2
Rest of World*	4	-	1	2	7
Total	12	9	7	15	43

* Includes projects in Algeria, Australia, Brazil and Korea.

North America dominates projects in operation and under construction, China has the most projects in planning



15 large-scale projects are operational



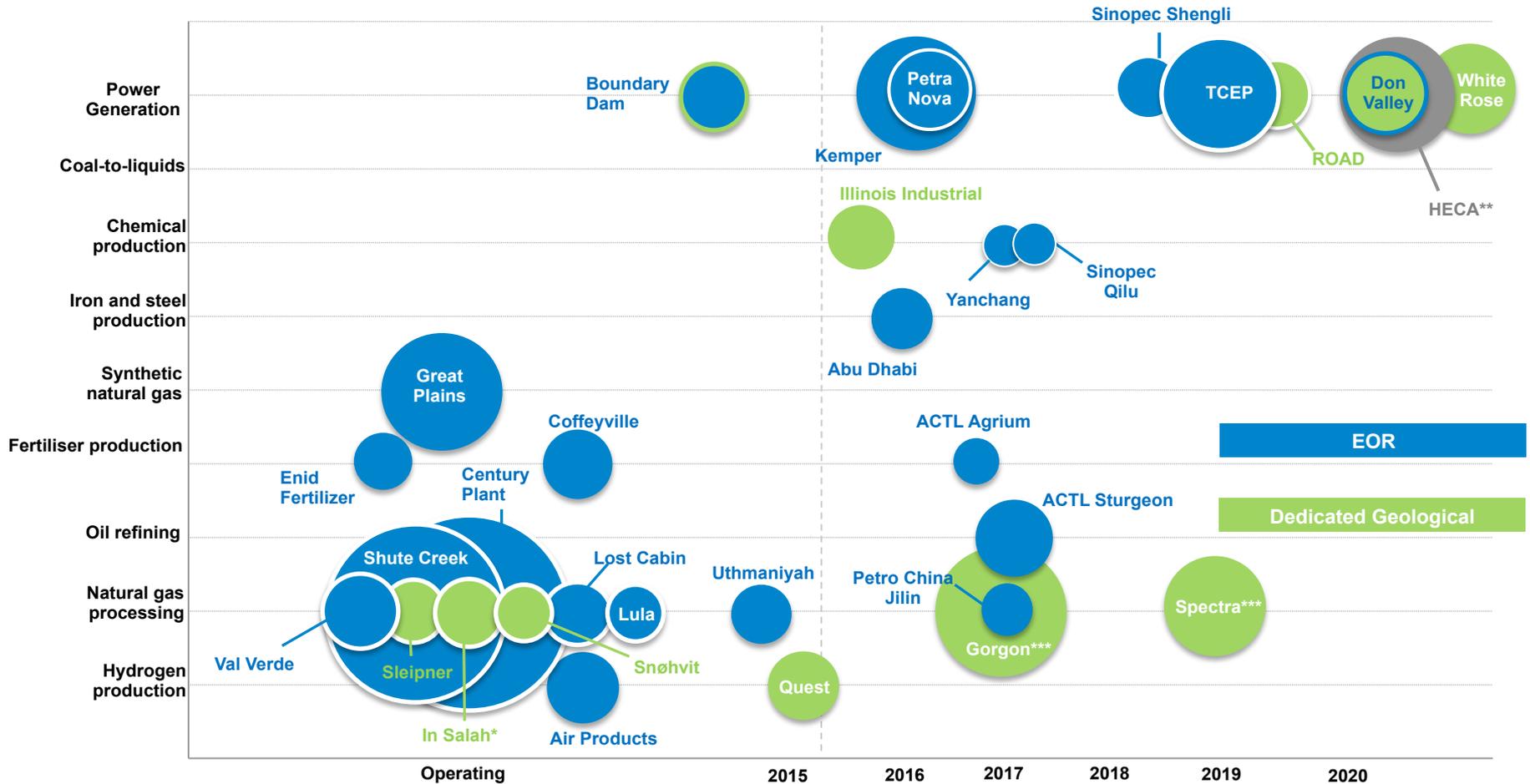


Large-scale projects expected operational by 2017





Global projects – operation, construction & advanced planning



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

* Injection currently suspended ** Storage options under evaluation
 *** Institute estimate

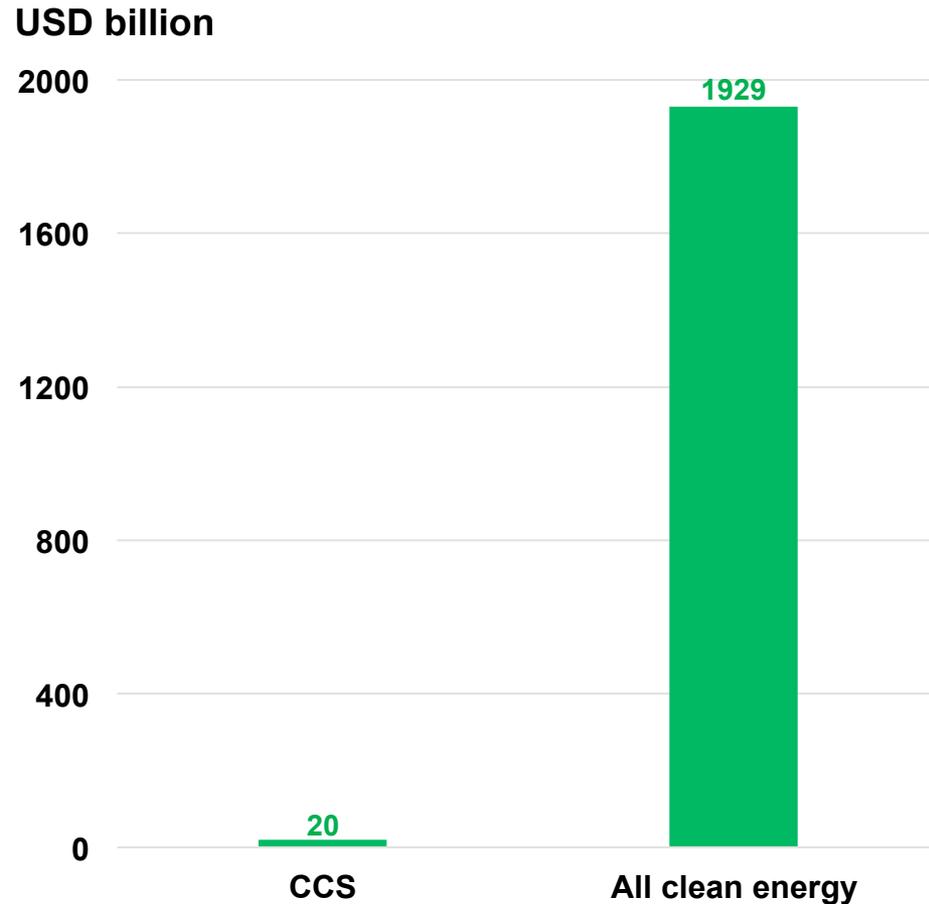


Policy & Regulatory



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?



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.



CCS Legal and Regulatory Indicator results

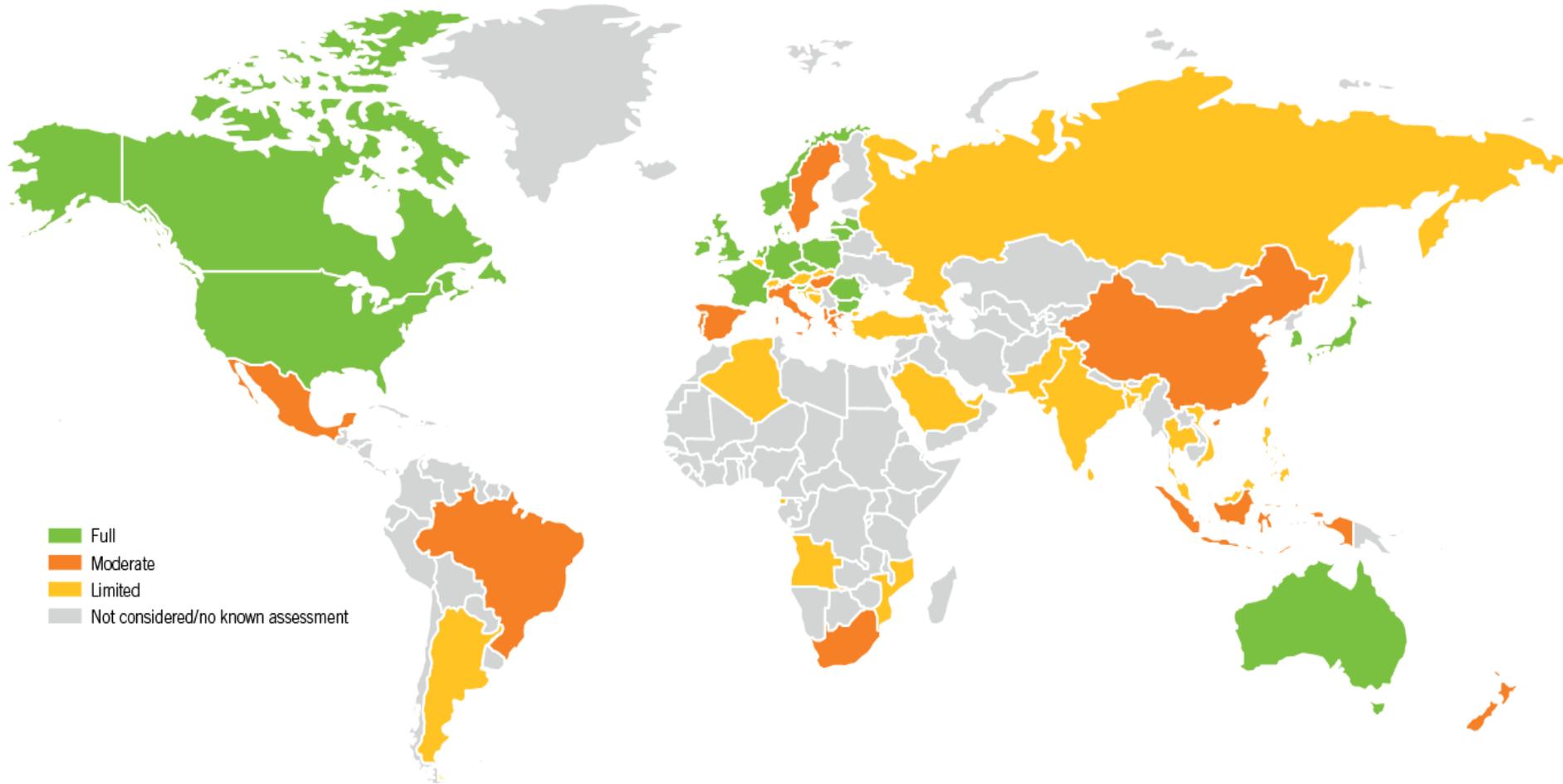
COUNTRY		TOTAL SCORE (out of a possible 87)
BAND A: CCS-specific laws or existing laws that are applicable across most parts of the CCS project cycle (5 countries)		Average score: 65
	Australia	67.0
	Canada	65.5
	United Kingdom	65.0
	United States	64.0
	Denmark	62.0
BAND B: CCS-specific laws or existing laws that are applicable across parts of the CCS project cycle (27 countries)		Average score: 47
BAND C: Very few CCS-specific or existing laws that are applicable across parts of the CCS project cycle (21 countries scored)		Average score: 26



CCS by Region



Geographical coverage of storage resource assessments





Regional headlines – Asia Pacific

- **China:** follows the US as the most active country in CCS/CCUS
- **Australia:** World's largest dedicated geological storage project – Gorgon Carbon Dioxide Injection Project – operational in the next 18 months
- **Japan and Korea:** CCS activities at pilot and demonstration scale
 - Japan – the Tomakomai and Osaki CoolGen projects are in construction
 - Korea – KEPCO is testing advanced capture technologies
- **Key focus:** increasing knowledge of storage potential in the region
- **Legal and regulatory advances:** required in some jurisdictions to provide greater certainty to project proponents



Regional headlines – Europe

- CCS ambition at start of the decade has not been realized
- Recognition of CCS in the October 2014 European Council conclusions is a positive sign of support
- **Netherlands:** The Dutch ROAD project is critical for CCS in Europe
- **UK:** In November 2015 the UK Government announced that the £1 billion capital budget for the Carbon Capture and Storage Competition is no longer available
 - Peterhead CCS Project subsequently cancelled
 - Future of the White Rose CCS Project unclear



Regional headlines – Gulf Cooperation Council (GCC)

- Early stages of CCS/CCUS deployment
- **Saudi Arabia:** home to the region's first operational large-scale CCS project
- **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



Regional headlines – 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 provides significant business case support
- Policy actions and incentives must complement regulatory action on emissions standards
- **US:** DOE supports an extensive R&D program into CCS technologies
- **Canada:** harvesting learnings from \$3 billion + CCS investments
- **Brazil and Mexico:** advancing CCS/CCUS programs



The Road Ahead



The future of CCS – action is required

- CCS is indispensable in a least-cost approach to global decarbonization
- Opportunities for cost reductions are being identified
- The task is enormous – the urgency of CCS deployment is only increasing
- Deployment is not a technology challenge
- Supporting CCS in industrial applications and non-OECD countries is very important
- Policies that spur investment are the missing pieces to the puzzle
- In North America, incentives for CO₂ capture and EOR-storage are key



The future of CCS – action is required

- Industry and government must move advanced projects across the finish line
- Policy parity must be provided
- This includes:
 - Providing predictable and enduring policy arrangements
 - Implementing effective and cost-efficient CCS law and regulation
 - Incentivising early storage site identification and characterisation
 - Increasing R&D efforts to reduce costs and increase efficiency
 - Encouraging efficient development of hub and cluster arrangements

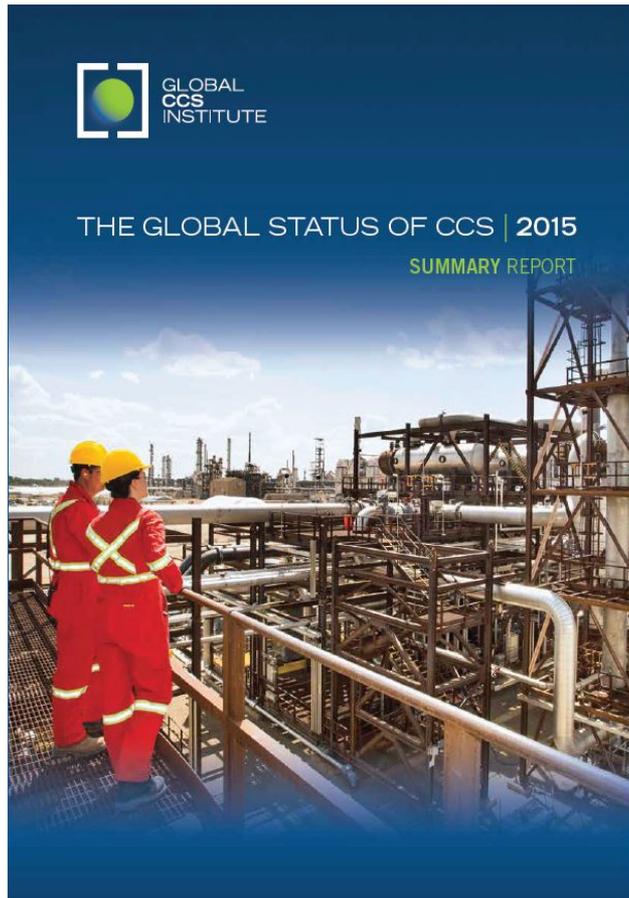


The future of CCS – action is required

1. We cannot hope to tackle the scale of the climate challenge without CCS
2. It is time to implement effective policies which focus on this outcome
3. Strong leadership is needed by decision-makers in government and industry to realise the full potential of CCS
4. Collaboration among CCS proponents is essential



The Global Status of CCS: 2015



The Institute's key publication

Summary Report, Key Findings and other advocacy materials can be found at:

<http://status.globalccsinstitute.com/>

Full report is available online in the Institute's Members' Portal.

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