GLOBAL CCS INSTITUTE

CCS FLAGSHIP PROJECTS

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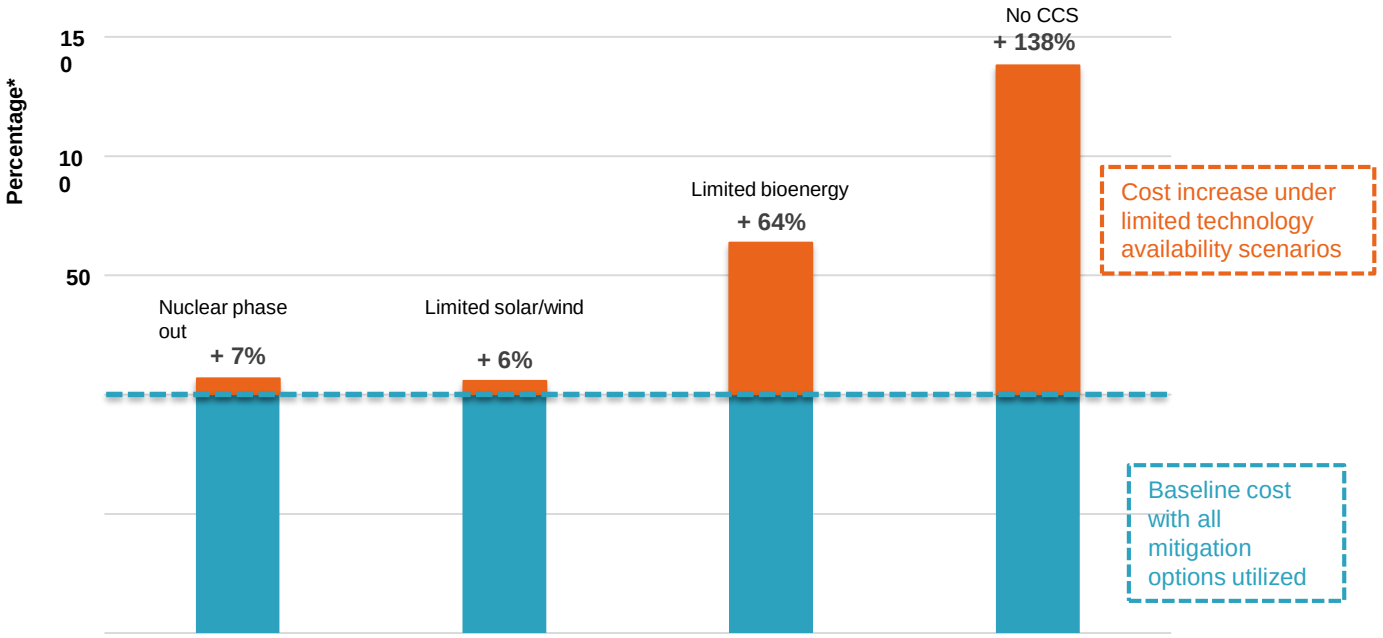
Cover image: Aerial view of Tomakomai CCS Demonstration carbon capture facilities located at Tomakomai City, Hokkaido, Japan. Image provided by JCCS.

- 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
  - NGOs.
- Specialist expertise covers the CCS/CCUS chain.

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.*

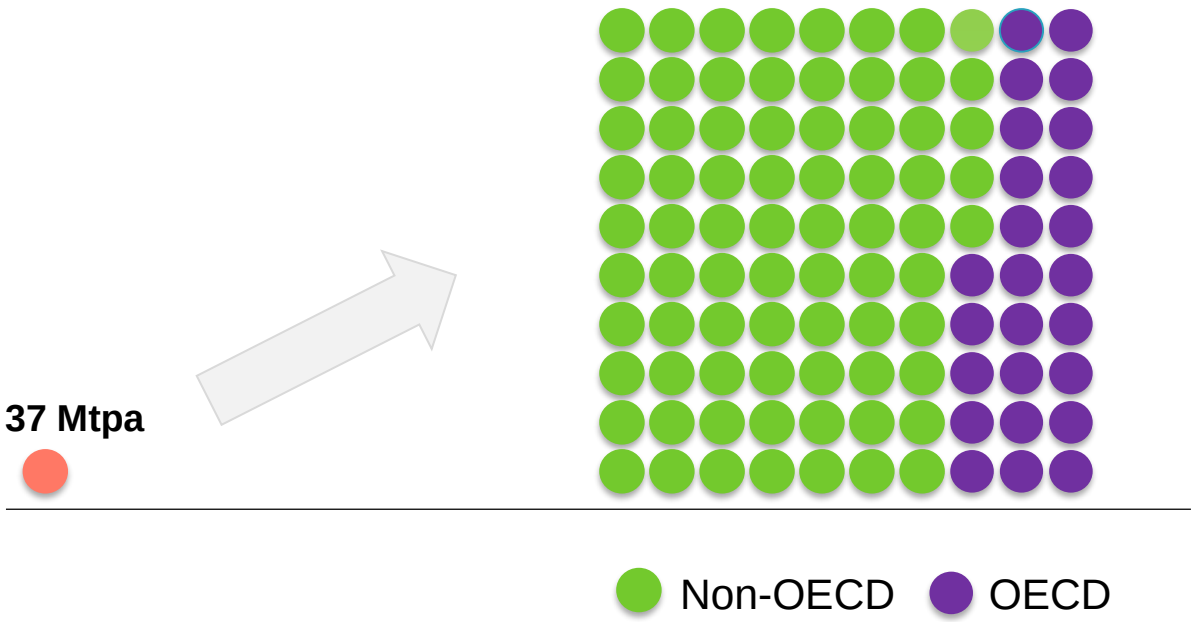
A significant task within one generation

Global Status of CCS September 2017

~3,700 Mtpa of CO_2 captured and stored by 2040 (IEA 2DS)**

37 large-scale CCS facilities - combined CO_2 capture capacity of approximately 65 Mtpa*:

- 21 facilities in operation or construction (**~37 Mtpa**)
- 5 facilities in advanced development (~11 Mtpa)
- 11 facilities in earlier stages of development (~17 Mtpa)



**Mtpa = million tonnes per annum*

****Source**: *International Energy Agency (2017), Energy Technology Perspectives 2017, OECD/IEA, Paris*

Note: 2040 IEA 2DS data includes ~600 Mtpa "negative emissions" from BECCS

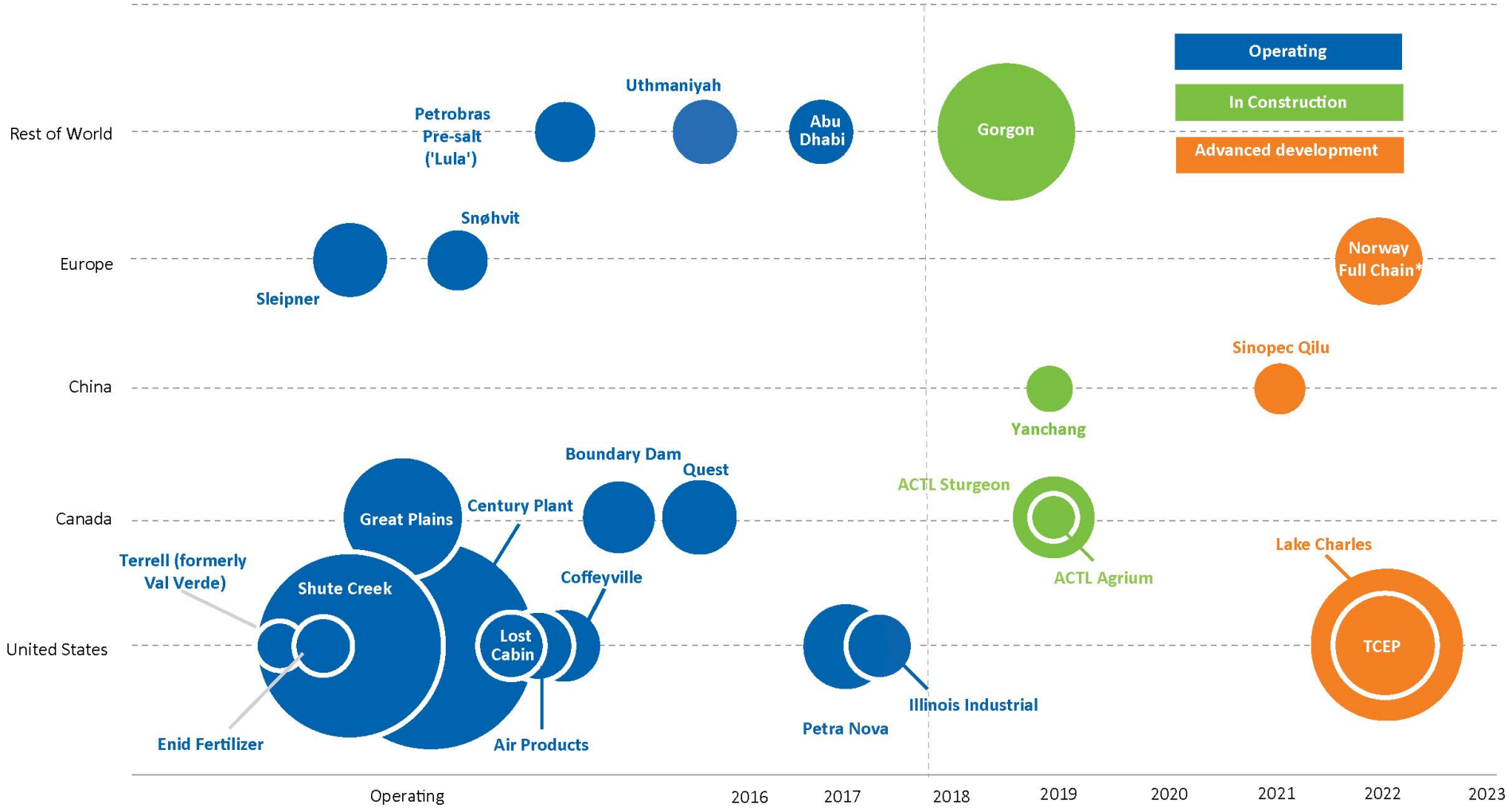
Large-scale CCS facilities by region or country –2017

	Early development	Advanced development	Construction	Operating	Total
North America	-	2	2	12	16
China	6	1	1	-	8
Europe	2	1	-	2	5
Gulf Cooperation Council	-	-	-	2	2
Rest of World*	3	1	1	1	6
Total	11	5	4	17	37

** Includes facilities in Australia, Brazil and South Korea.*

North America dominates – 14 (of 21) facilities in operation or construction, China has most facilities in development, facility pipeline needs replenishment

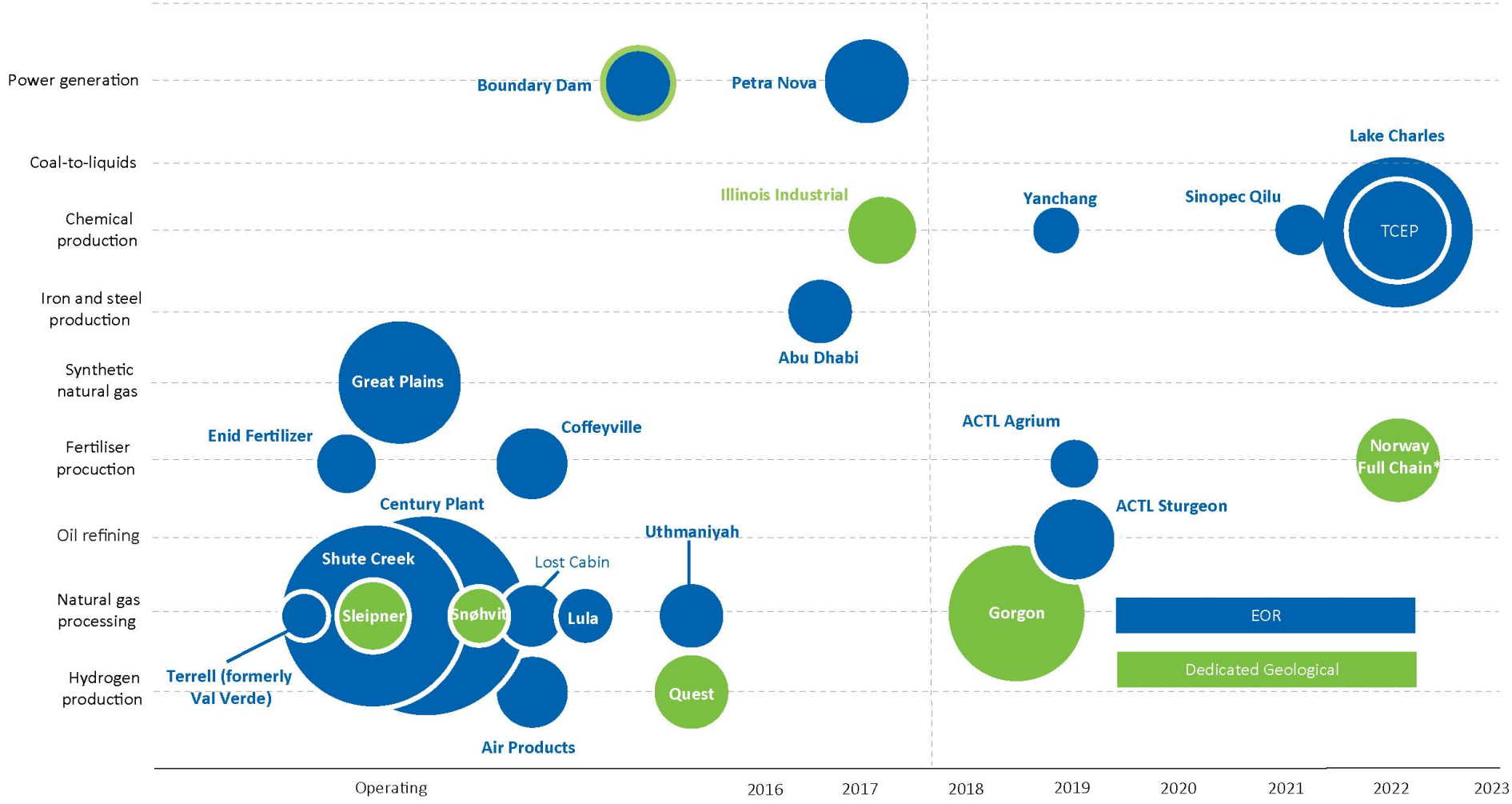
Actual and expected operation dates up to 2022 for large-scale CCS facilities by region and lifecycle stage



= 1Mtpa of CO_2 (area of circles proportional to capacity)

** Assessing CCS possibilities from ammonia production, from cement production and from waste-to-energy sources*

Actual and expected operation dates up to 2022 for large-scale CCS facilities by industry and storage type#



= 1Mtpa of CO_2 (area of circles proportional to capacity)

Facilities in the Operating, In construction and Advanced development stages

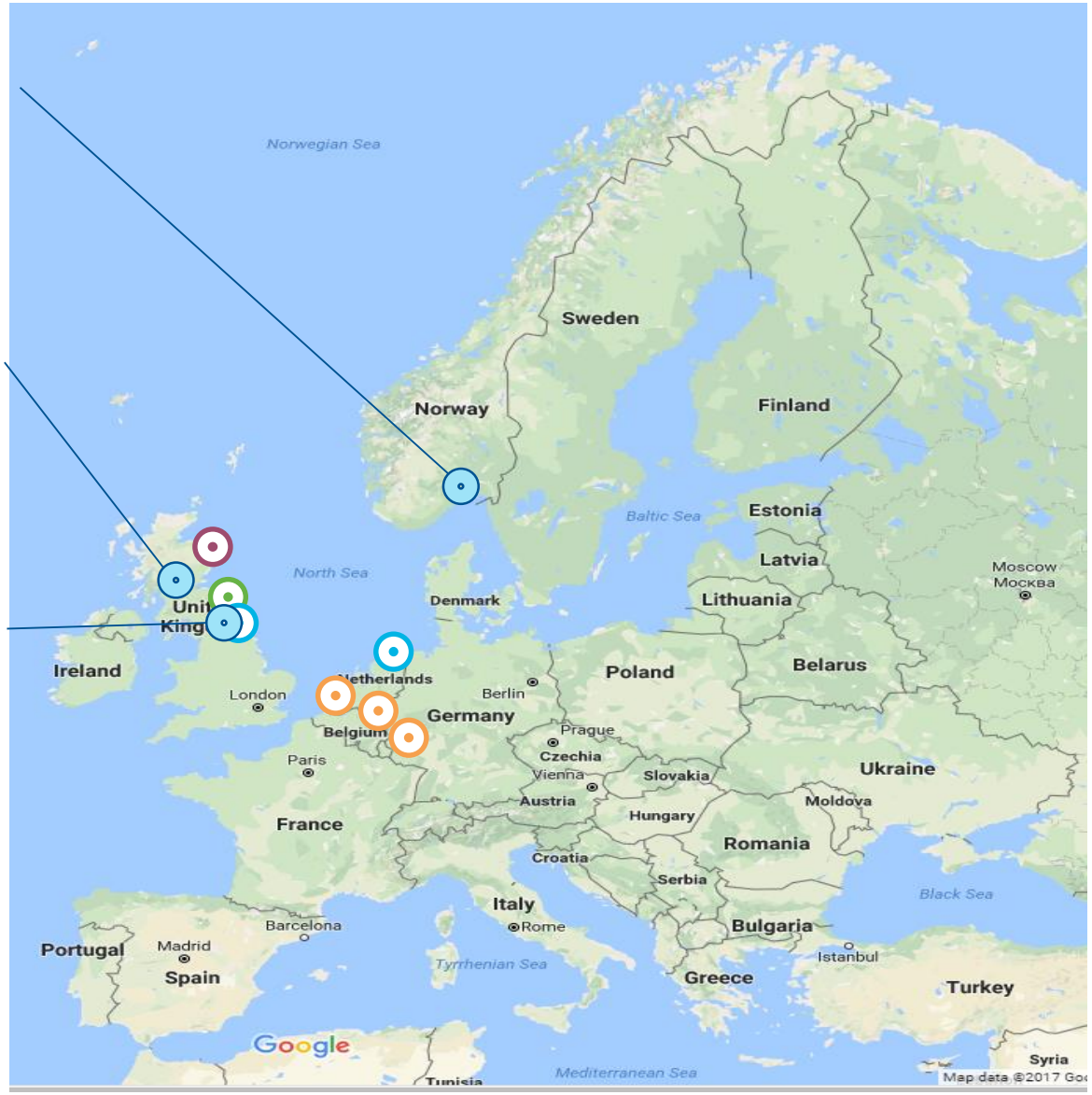
** Assessing CCS possibilities from ammonia production, from cement production and from waste-to-energy sources*

Planned CCS large-scale facilities in Europe

Full chain CCS, NO
Various industrial sources
(1.3 Mtpa)

Caledonia Clean Energy, UK
Power sector
(3.0 Mtpa)

Teesside Collective, UK
Various industrial sources
(0.8 Mtpa)



CO2 Cross Border Transport Connections project, NL, NO, UK
CO_2 shipping infrastructure to NCS
(PCI)

Teesside CO_2 Hub, BE, GER, NL, UK
CO_2 pipelines & shipping infrastructure
(PCI)

CO_2 SAPLING, NL, NO, UK
CO_2 pipelines & shipping infrastructure
(PCI)

Rotterdam Nucleus, NL, UK
CO_2 pipelines infrastructure
(PCI)

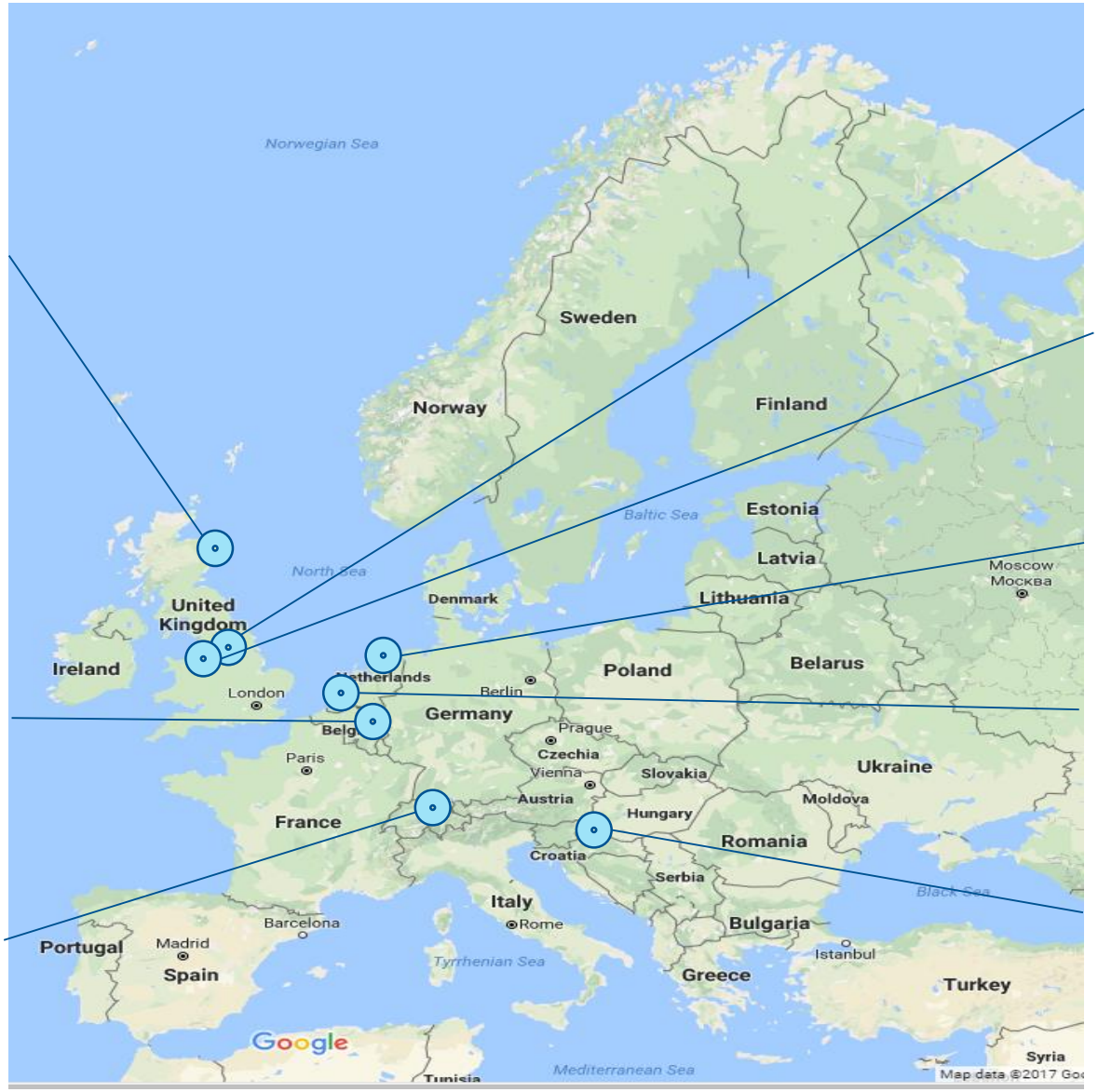
Planned capture projects in Europe (2)

Acorn, UK
Natural gas processing
(Full chain CCS)

CEMCAP, Europe
Cement production
(CO_2 capture)

LEILAC, BE
Cement production
(CO_2 capture)

Climeworks, CH
Direct air capture



H21 Leeds City Gate project , UK
Hydrogen

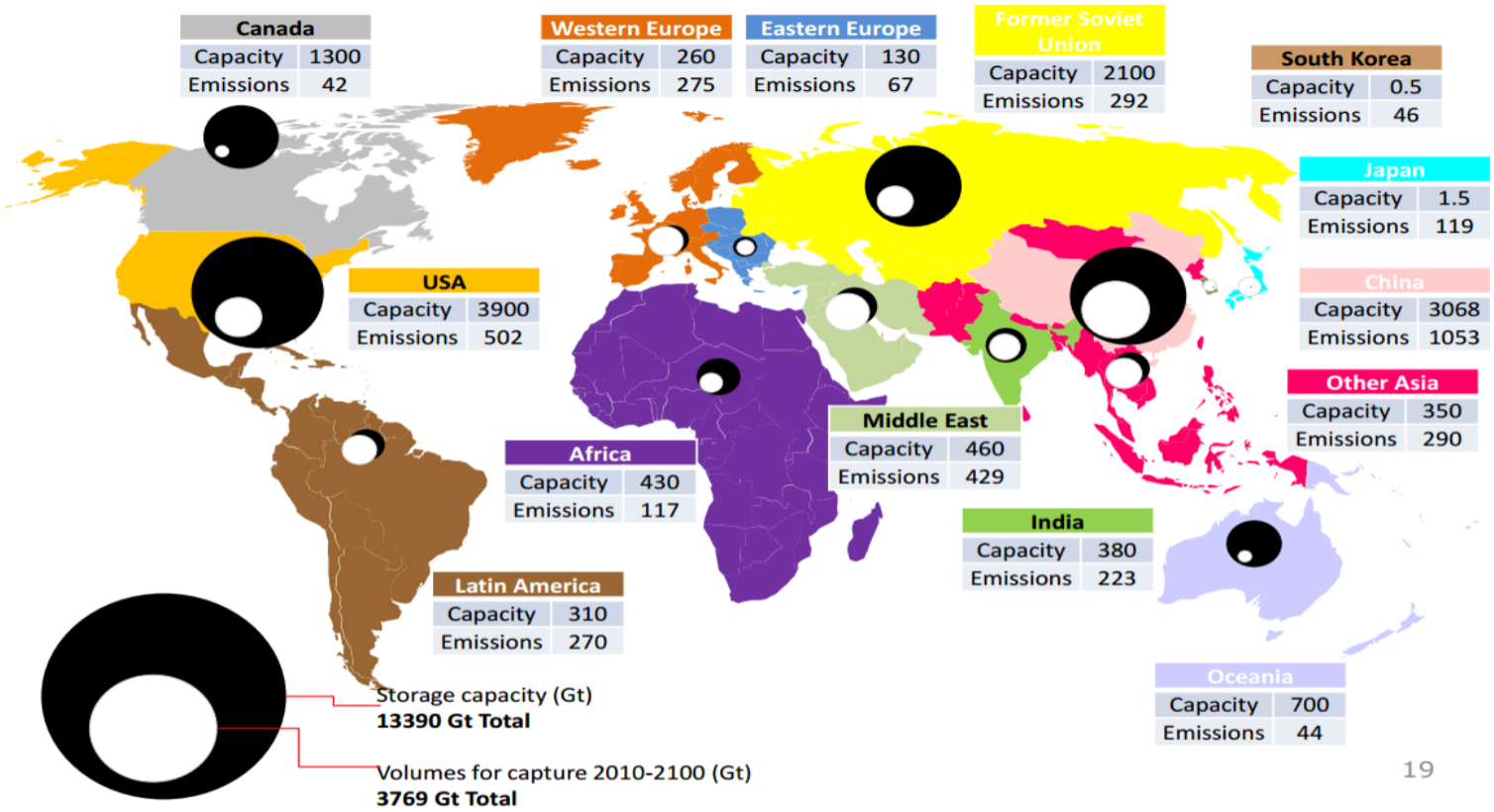
Cadent Liverpool-Manchester Hydrogen Cluster project, UK
Hydrogen (0.73 Mtpa)

Magnum project, NL
Hydrogen (4.0 Mtpa)

Green Hydrogen project, NL
Hydrogen

CLEAG Geothermal, HR
Power sector
(1.5 Mtpa)

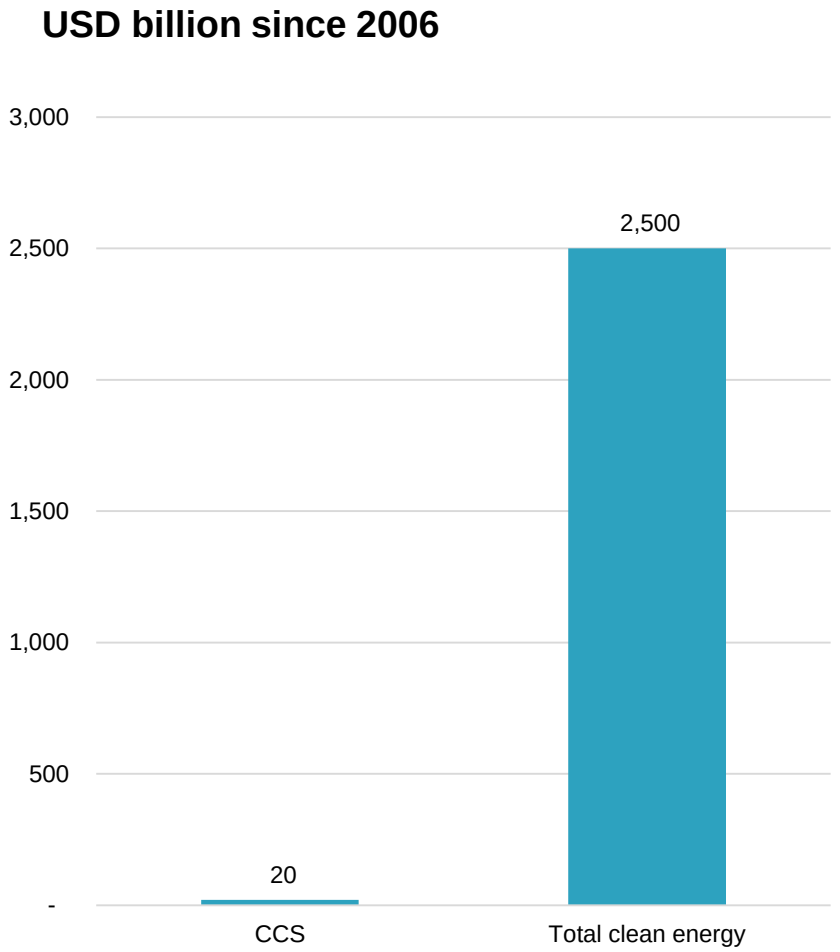
Plenty of storage capacity on a global scale



Source: http://www.manaarco.com/presentations/Fleming%20Gulf%20Manaar%20EOR%20Abu%20Dhabi%20March%202013.pdf

Strong policy drives investment – CCS must be afforded 'policy parity'

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



Data source: **IEA 2015 "Tracking Clean Energy Progress". Bloomberg New Energy Finance "Clean Energy Investment By the Numbers – End of Year 2015" fact pack.**

Call to action

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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