

# R&D &D priorities for session 2B

## CO2 storage and cross-cutting issues

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## Mission Innovation

Global initiative designed to accelerate the pace of innovation and make **clean energy** widely affordable.

Led by the public sector

**Gaps** in technology

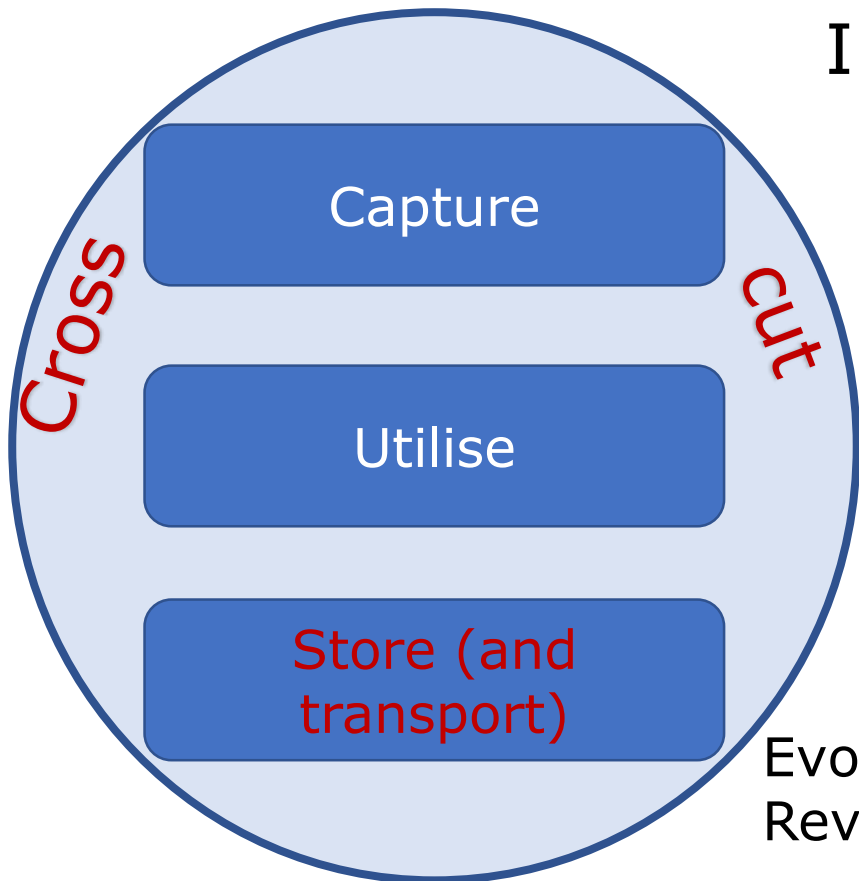
**Accelerate** innovation

Support **collaboration**

Identify promising **basic** research

CCUS tech needed for **energy-intensive industries**

# Four MI panels



Invention

Confirmation

Pilot

Scaling

Develop and deploy

Evolution - SHUFFLE ?

Revolution - STEP-CHANGE ?



## 18 Operating CCS projects (GCCSI)

● CO2-EOR   ▲ Saline   ✕ Published



Learning from industrial-scale storage

- Few & Slow ?
- How representative ?

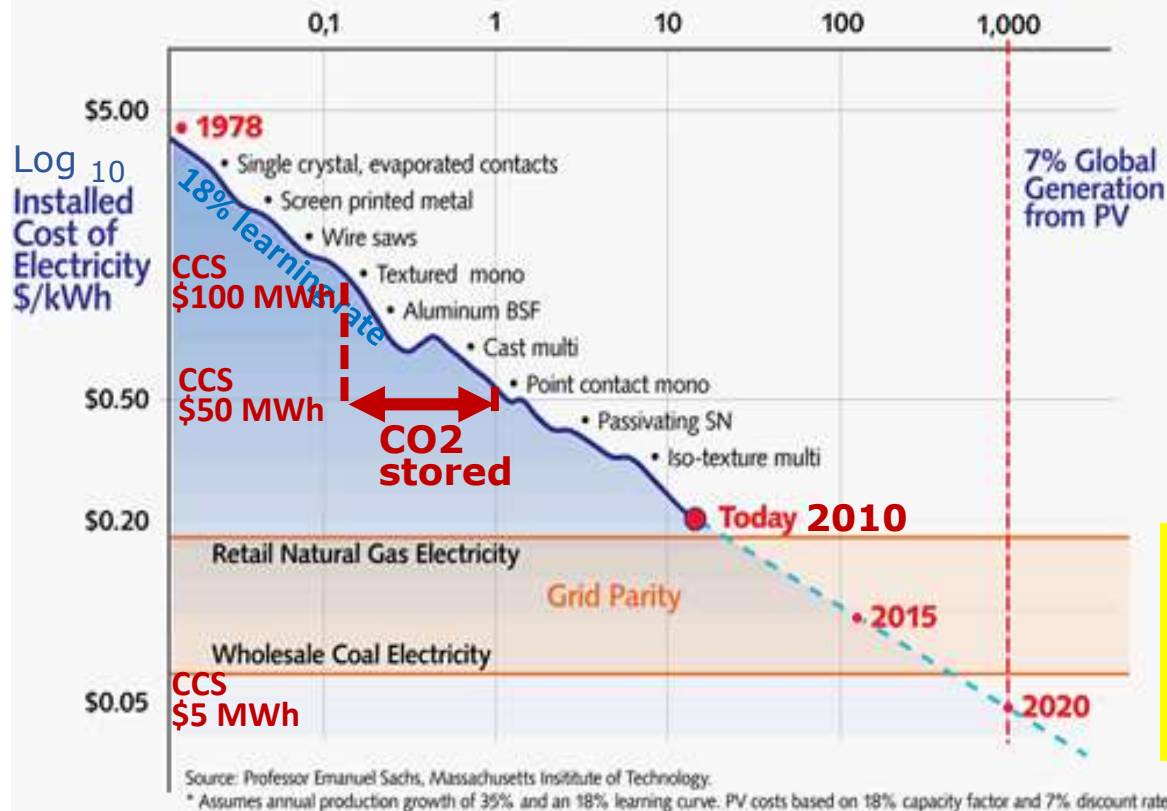
### NEED

- Many and rapid
- Shared DATA
- Cross-cut PEOPLE

Excludes pilots and closed operations

Name	Location	Operation date	Industry	Capture type	Capture capacity (Mtpa)	Primary storage type
Terrill Natural Gas Processing Plant (formerly Val Verde Natural Gas Plants)	United States	1972	Natural Gas Processing	Industrial Separation	0.4 - 0.5	Enhanced oil recovery
Enid Fertilizer	United States	1982	Fertiliser Production	Industrial Separation	0.7	Enhanced oil recovery
Shute Creek Gas Processing Plant	United States	1988	Natural Gas Processing	Industrial Separation	7.0	Enhanced oil recovery
Steiniger CO2 Storage	Norway	1996	Natural Gas Processing	Industrial Separation	1.0	Dedicated Geological Storage
Great Plains Synfuels Plant and Weyburn-Midale	Canada	2000	Synthetic Natural Gas	Industrial Separation	3.5	Enhanced oil recovery
Sleipvik CO2 Storage	Norway	2008	Natural Gas Processing	Industrial Separation	0.7	Dedicated Geological Storage
Century Plant	United States	2010	Natural Gas Processing	Industrial Separation	8.4	Enhanced oil recovery
Air Products Steam Methane Reformer	United States	2013	Hydrogen Production	Industrial Separation	1.0	Enhanced oil recovery
Coffeyville Gasification Plant	United States	2013	Fertiliser Production	Industrial Separation	1.5	Enhanced oil recovery
Lost Cabin Gas Plant	United States	2013	Natural Gas Processing	Industrial Separation	0.9	Enhanced oil recovery
Petrobras Santos Basin Pre-Salt Oil Field CCS	Brazil	2013	Natural Gas Processing	Industrial Separation	1.5	Enhanced oil recovery
Boundary Dam Carbon Capture and Storage	Canada	2014	Power Generation	Post-combustion capture	1.0	Enhanced oil recovery
Quest	Canada	2015	Hydrogen Production	Industrial Separation	1.0	Dedicated Geological Storage
Uthmaniyah CO2-EOR Demonstration	Saudi Arabia	2015	Natural Gas Processing	Industrial Separation	0.8	Enhanced oil recovery
Abu Dhabi CCS (Phase 1 being Emirates Steel Industries)	United Arab Emirates	2016	Iron and Steel Production	Industrial Separation	0.8	Enhanced oil recovery
Illinois Industrial Carbon Capture and Storage	United States	2017	Ethanol Production	Industrial Separation	1.0	Dedicated Geological Storage
Petra Nova Carbon Capture	United States	2017	Power Generation	Post-combustion capture	1.4	Enhanced oil recovery
CHPC Jilin Oil Field CO2 EOR	China	2018	Natural Gas Processing	Industrial Separation	0.8	Enhanced oil recovery

Photo Voltaic 2010 Cumulative production GigaWp



CCS requires a SERIES of innovations to be incorporated.

Slowed by 5yr storage development and size

Ten projects to move from Electric \$100 MWh

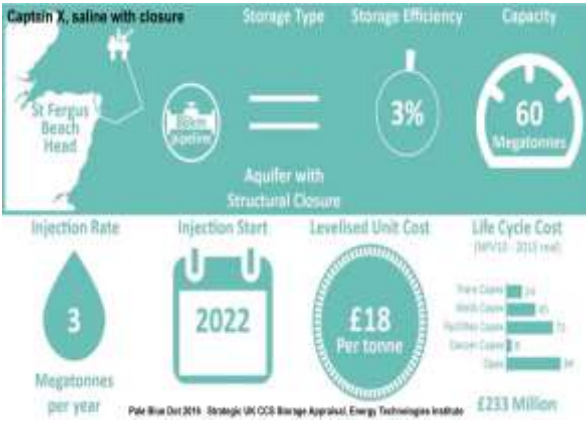
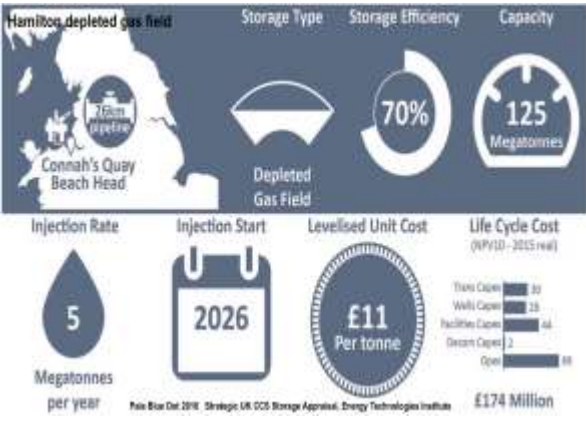
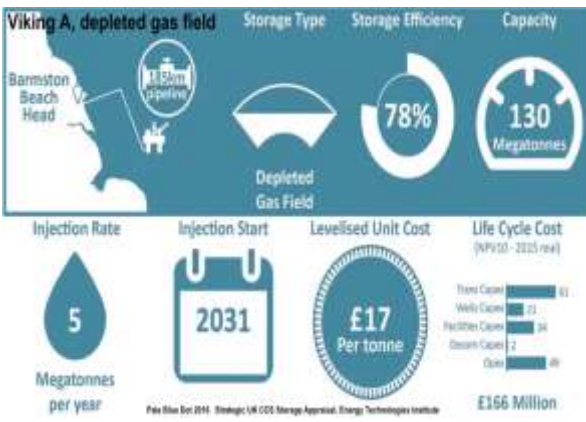
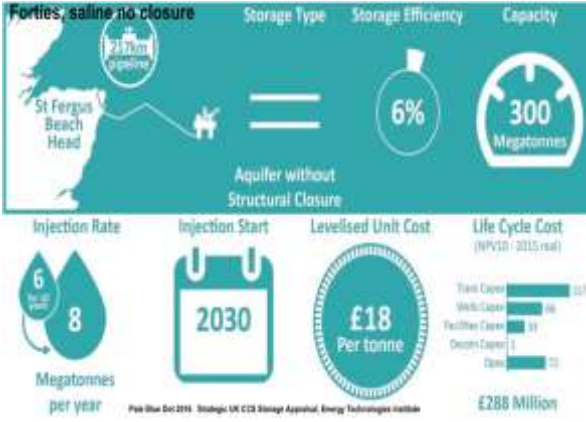
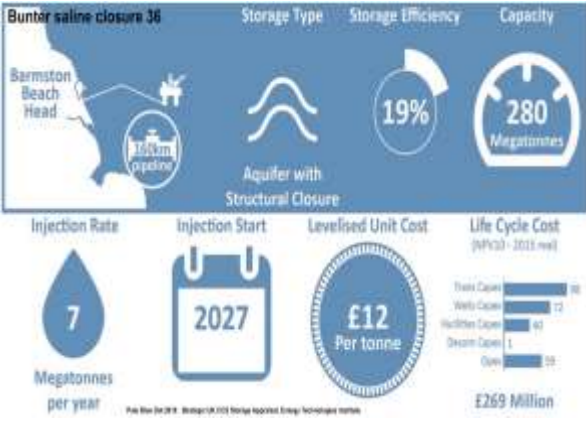
to

Electric \$50 MWh

And then \$0.5/ MWh

Photo-Voltaic solar: many Products, but CCS: few Projects  
SLOW replication rate  
DIVERSE Capture, Transport, Storage  
LACKS Market pull, FiT, Mandate, Procurement

# UK industry calculations storage costs: No new tech, cost is transport, recycled pipes



**Transport 895 Gt Store  
Cost GBP 11 - 18 t CO2  
Start inject 2022 - 2031**

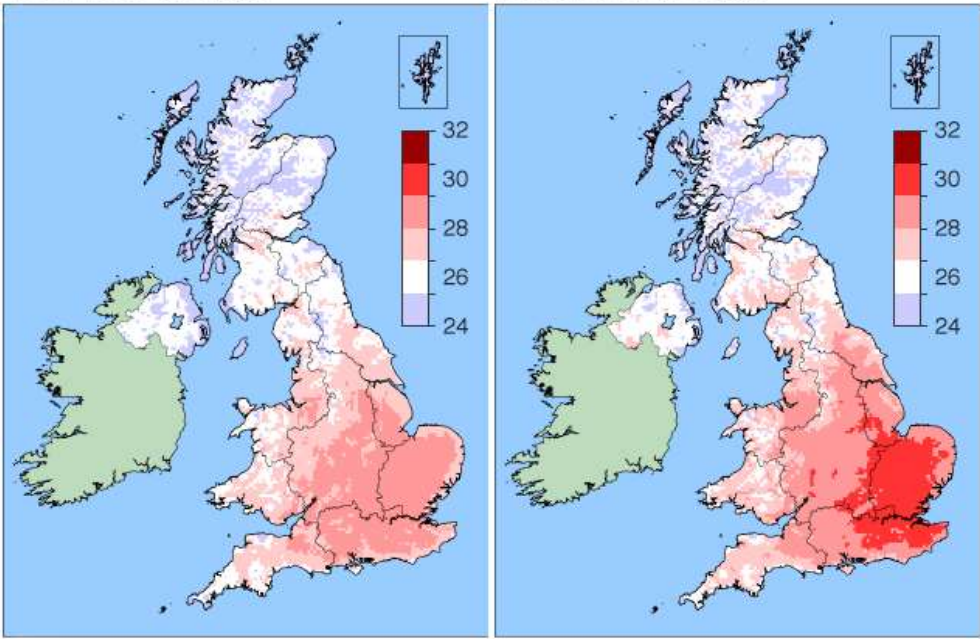
***Ability* far ahead of policy and market**

# Climate change is already here : requires step change from innovation to deployment

## Highest maximum temperature

**26°C**  
1961-1990 average

**26.8°C**  
2008-2017 average



Source: Met Office

