ABOUT THE INSTITUTE

• **Member-owned International Think-Tank:** 105 members including governments, multi-national energy companies, technology providers, research organisations and NGOs

• **Mission:** Accelerate the deployment of CCS globally

• **Global Operation:** with offices in Melbourne (HQ), Washington DC, Houston, London, Brussels, Tokyo, Beijing and Abu Dhabi
CONTEXT

IT'S ONLY ABOUT CLIMATE CHANGE

• Paris Agreement
  ➢ 2.0°C and aim for 1.5°C (current trajectory >3.0°C); **AND**
  ➢ Net Zero Emissions (NZE) in second half of this century

• The Math
  ➢ Classic stock problem
  ➢ 2°C pathway generally = 85% emission \(\downarrow\) by mid-century
  ➢ 1.5°C = 100% emission \(\downarrow\) by mid-century
  ➢ NZE absolutely required for both: 5-10Gt+ pa CDR by mid century
ILLUSTRATIVE PATHWAYS IN THE IPCC SPECIAL REPORT ON 1.5
THE UNCOMFORTABLE REALITY

- Existing capital stocks will overwhelm a $1.5^\circ$C or $2^\circ$C carbon budget.

- IEA Analysis (2018): Existing global energy capital stocks (assuming normal capital life) consume 95% of the CO$_2$ budget under the IEA SDS ($2^\circ$C)
  - $1.5^\circ$C budget was not possible without 100 – 1,000 Gt of CO$_2$ removal by 2100.
  - But new emissive energy facilities continue to be built.....
  - Coal fired power plants in Asia have average age of 14 years.

- Achieving climate goals requires (among other things):
  - (a) premature retirement of existing facilities at an enormous scale, or
  - (b) many gigatonnes of annual abatement using CCS, or (most likely)
  - (c) both.
CCS: VITAL TO NET-ZERO

A GAME CHANGING TECHNOLOGY

- Zero emission electricity is a big part but not the whole answer
- Hard to decarbonise sectors need CCS – steel, chemicals, cement, fertiliser, plastics etc
- New opportunities and fuels, especially H₂
- NZE commitment rapidly increasing – CDR via BECCS / DAC
- CCS consequently rapidly coming to the fore

- So where is CCS at?
GLOBAL CCS FACILITIES UPDATE

- **66 commercial CCS facilities:**
  - 26 operating
  - 4 under construction
  - 34 in planning
  - 2 facilities with operations suspended.

- **17 new commercial facilities in 2020**

- **Almost 40 Mtpa of CO₂ captured** from 26 operating commercial facilities.

- **Total capture capacity of around 115 Mtpa of CO₂** from all 66 facilities.
UPWARD MOMENTUM CONTINUES: COMMERCIAL CCS FACILITIES PIPELINE

The capacity of facilities where operation is currently suspended is not included in the 2020 data.
EMISSIONS REDUCTIONS IN CEMENT, IRON & STEEL AND CHEMICALS SECTORS BETWEEN 2017 AND 2060 - CCS
GLOBAL SHARES OF HYDROGEN PRODUCTION FROM DIFFERENT SOURCES AND PROCESSES

- METHANE (PURE H₂) - 43.8%
- METHANE OR COAL (SYNGAS) - 39.6%
- COAL (PURE H₂) - 13.4%
- CHLOR-ALKALI BI-PRODUCT (PURE H₂) - 1.9%

- METHANE (PURE H₂) WITH CCS - 0.6%
- METHANE OR COAL (SYNGAS) WITH CCS - 0.4%
- RENEWABLE ELECTROLYSIS (PURE H₂) - 0.3%
- COAL/COKE (PURE H₂) WITH CCS - 0.1%
Zero emission electricity required to produce this quantity of hydrogen using electrolysers:

>26,000 TWh, which is approximately equal to the total electricity generated by all sources combined in 2018.*

* assumes 50 kWh per kg of hydrogen produced 2018 electricity generation from IEA WEO 2019
CLean Hydrogen Production Costs - 4 Recent Reports

Only CSIRO included an estimate of cost of electrolysis using otherwise curtailed renewable electricity – no high or low is shown. (assumes utilization is 10% hence high cost)

Source: CSIRO 2018, National Hydrogen Roadmap, Pathways to an economically sustainable hydrogen industry in Australia
IRENA 2019, Hydrogen, A renewable energy perspective.
Hydrogen Council 2020, Path to hydrogen competitiveness; A cost perspective.
CCS: VITAL TO NET-ZERO

SIGNIFICANT CCS POLICY VITAL TO ACHIEVE GLOBAL CLIMATE TARGETS

• To achieve net-zero emissions, CCS capacity must increase more than a hundredfold by 2050.

• Stronger policy to incentivise rapid CCS investment is overdue.

• Policy priorities include:
  • Creating conditions for investment
  • Facilitating development of CO₂ infrastructure
  • Clarifying key legal and regulatory issues

2,000+ LARGE-SCALE FACILITIES REQUIRED BY 2050
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