International Energy Agency

Carbon Capture and Storage:
Still many questions
- but answers emerging

UNFCCC COP 20

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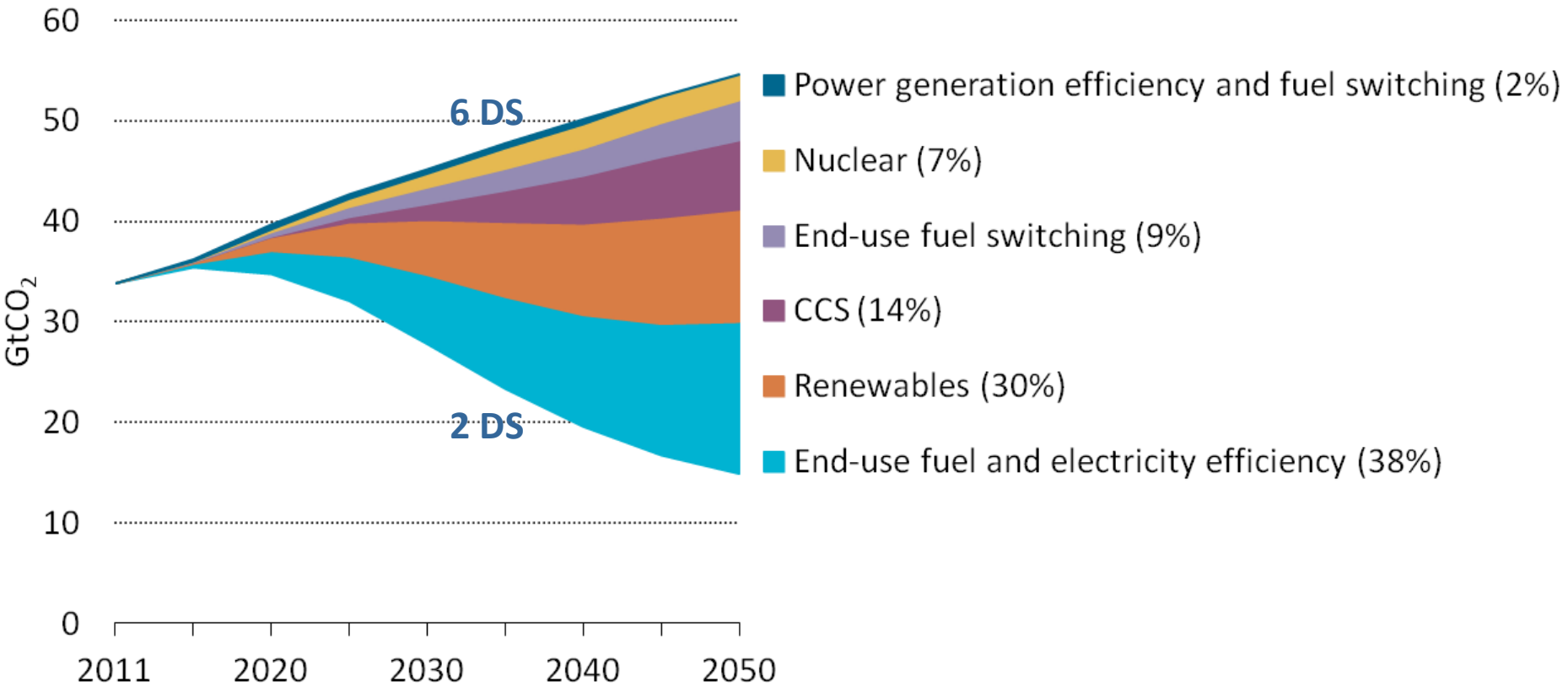
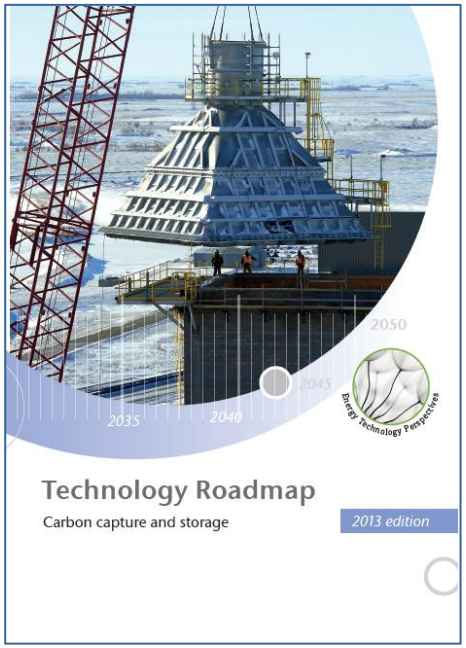
Carbon capture and storage

CCS is one piece of the puzzle



Carbon capture and storage (CCS) contributes 14% of total emissions reductions through 2050 relative to the IEA 6DS scenario

2013 CCS Roadmap: Key findings



- The individual component technologies are generally well understood. **The largest challenge is the integration** of component technologies into large-scale demonstration projects.
- Incentive frameworks are urgently needed to deliver upwards of **30 operating CCS projects by 2020**.
- CCS is not only about electricity generation: 45% of captured CO_2 comes from **industrial applications** between 2015 and 2050.
- The largest deployment of CCS will need to occur in **non-OECD countries, 70% by 2050**. China alone accounts for 1/3 of the global total of captured CO_2 between 2015 and 2050.
- The urgency of CCS deployment is only increasing. **This decade is critical** in developing favourable conditions for long-term CCS deployment.

First commercial power plant with capture: Boundary Dam 3 launched on 2 October 2014

Boundary Dam 3 (Source: SaskPower)

(Source: SaskPower)

Size: 110 MW **Fuel**: lignite **Capture rate**: 90% of CO_2,
Capture per annum: 1 million tonnes

Four other notable projects under construction or nearing start-up

KEMPER (US)
3Mt pa

Source:
Power / IGCC

Storage:
CO_2-EOR


Kemper (Source: IEA)


Gorgon (Source: Chevron)

GORGON (AUS)
3,4Mt pa

Source:
Gas / LNG

Storage:
Saline aquifer

PARISH (US)
1,4Mt pa

Source:
Power / PCC

Storage:
CO_2-EOR

Parish (Source: NRG)

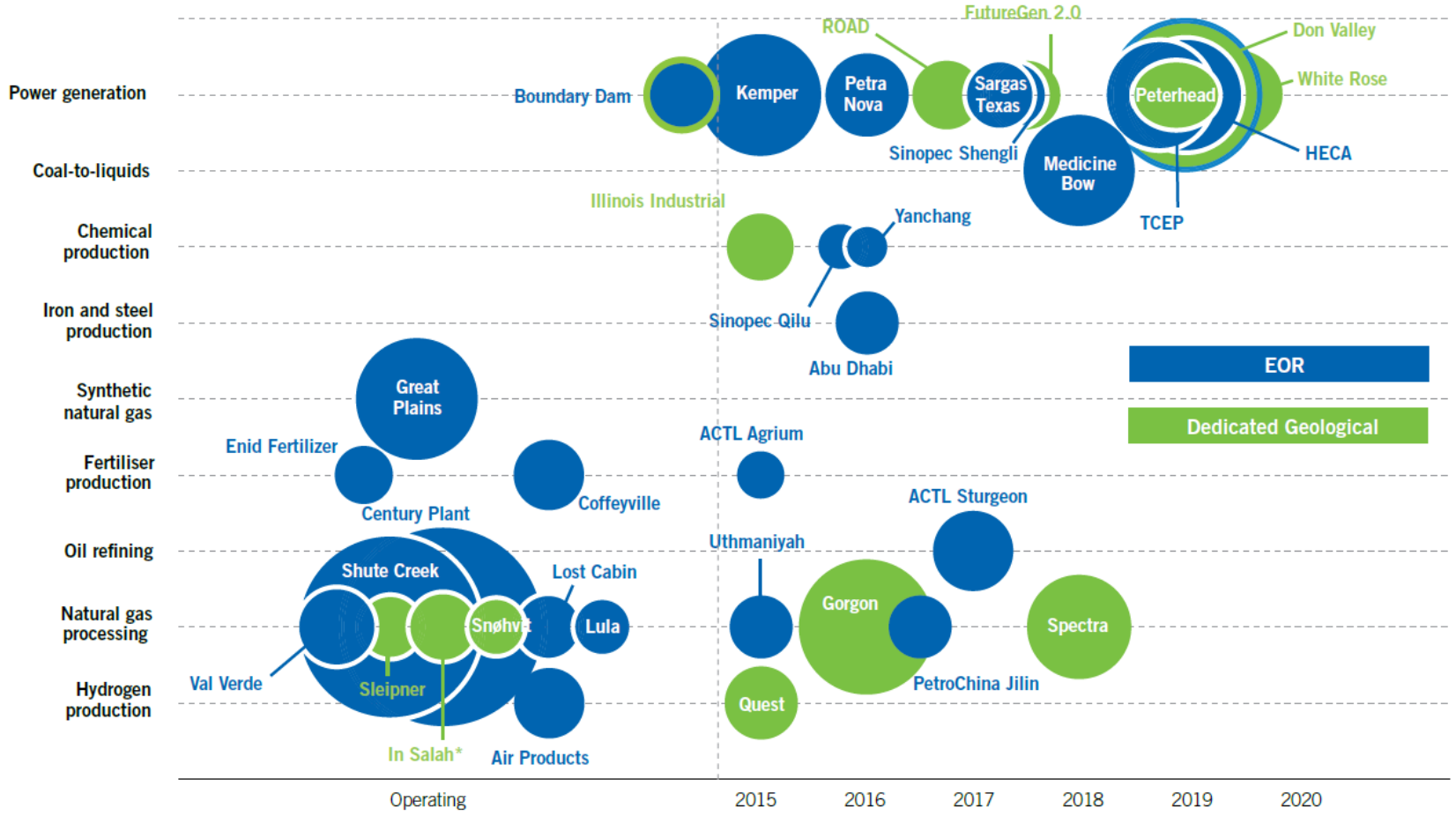

Scotford Upgrader (Source: Shell)

QUEST (CA)
1Mt pa

Source:
Oil sands / H_2

Storage:
Saline aquifer

Around two dozen other projects at earlier stages of development



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

Source: GCCSI 2014

* Injection currently suspended

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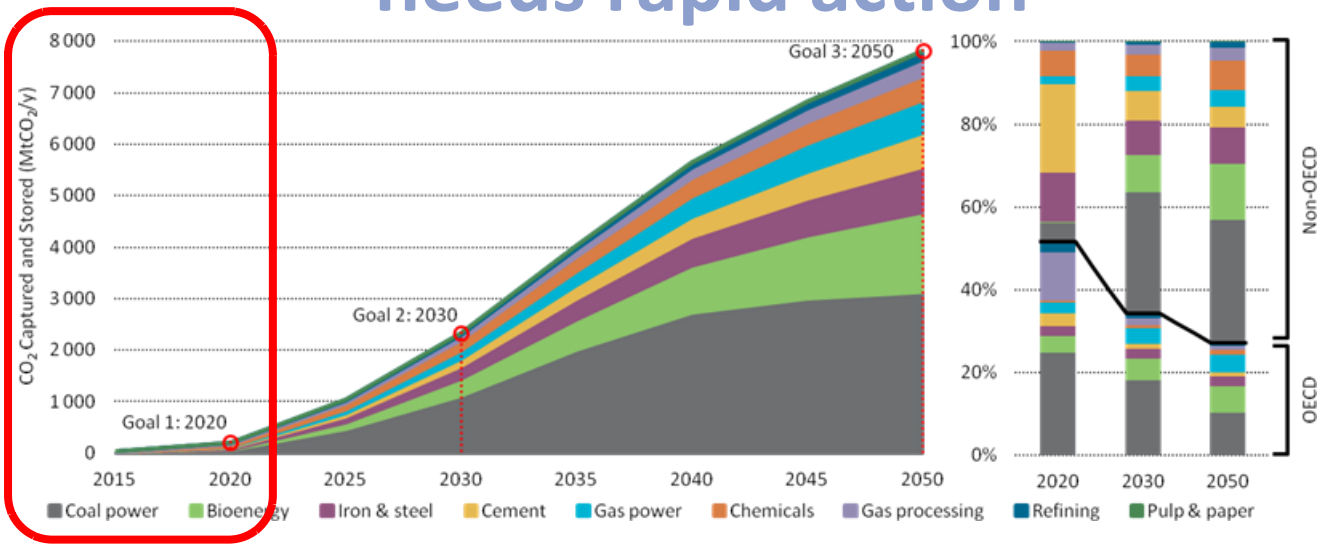
Challenging CCS deployment needs rapid action



2014

1.3 GW Power generation equipped with CCS

25 $MtCO_2$/y Captured from industrial applications

6 $MtCO_2$/y Transported and stored

2020

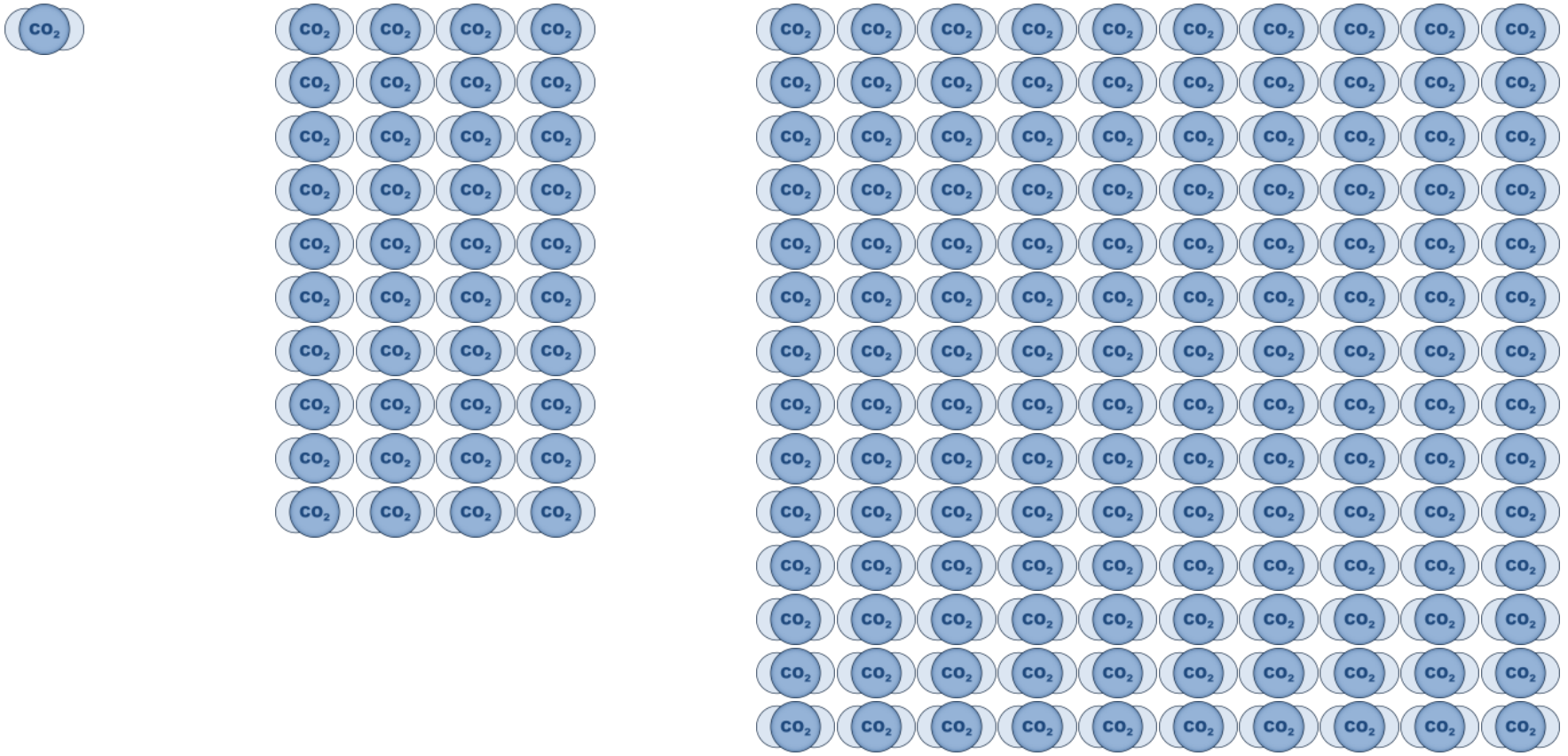
4 GW Power generation equipped with CCS

33 $MtCO_2$/y Captured from industrial applications

50 $MtCO_2$/y Transported and stored

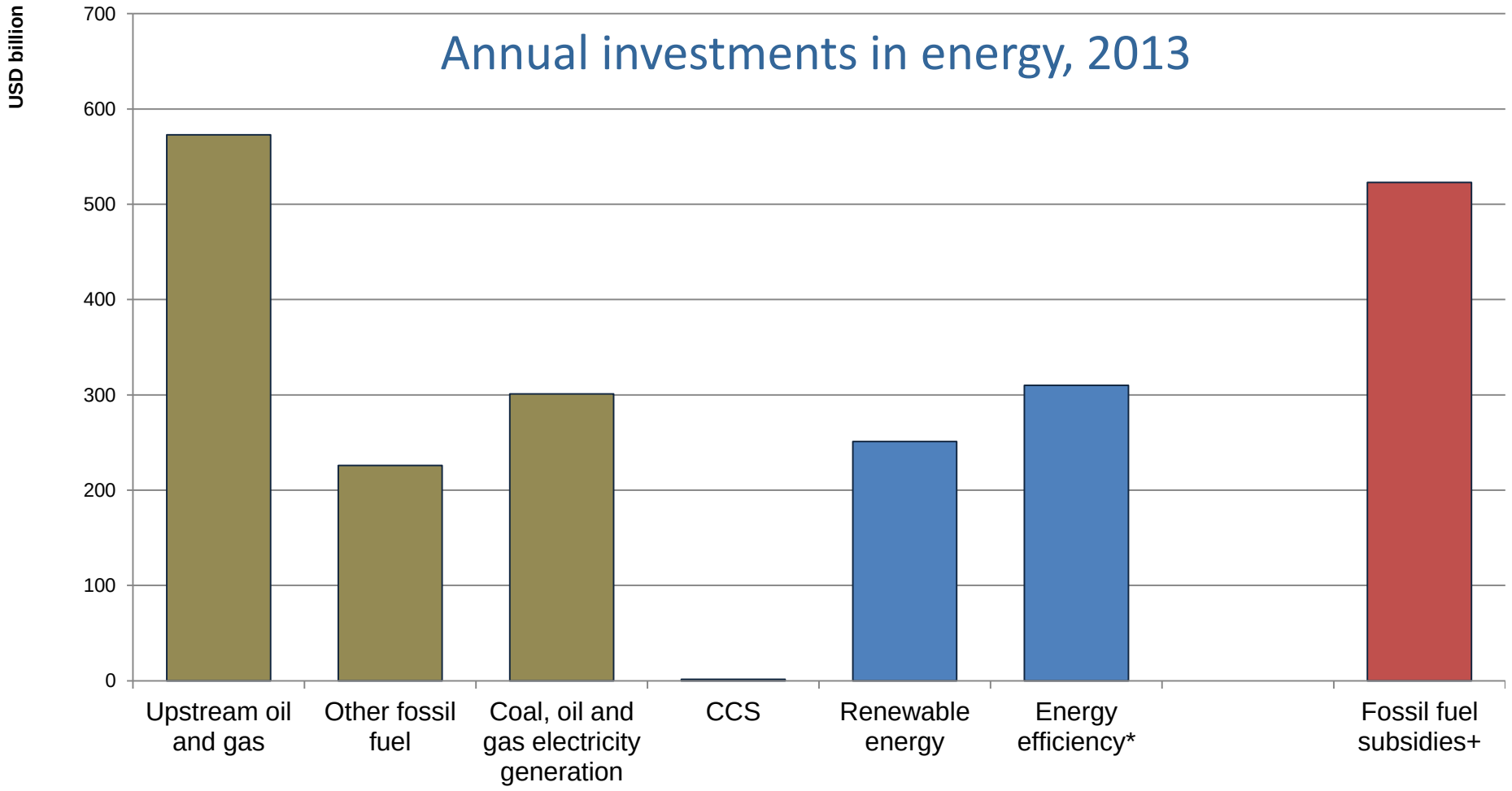
A whole new industry must be created

2020: 50Mtpa → **2030: >2Gtpa** → **2050: >7Gtpa**



= 50Mt CO_2captured and stored

Strong policy drives investment



Source: IEA WEO special report on investments, 2013 and IEA Energy Efficiency Market Report, 2014

Drivers and supportive policies are essential

* **Long-term vision for CCS deployment**

Technology RD&D framework

- * Research and development policy and programmes
- * Demonstration funding

Incentive framework

- * Targeted deployment incentives
- * Prices or limits on emissions

Permitting framework

- Efficient resource management
- * Regulation for safe, effective storage

* *UNFCCC process critical for shaping policy environment for clean energy including CCS: Ambitious climate targets, Technology Mechanism, Green Climate Fund, CDM, incl. modalities and procedures etc.*

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How could UNFCCC mechanisms consider CCS?

LIMA COP20 / CMP10
UN CLIMATE CHANGE CONFERENCE 2014

United Nations
Framework Convention on
Climate Change

Relevant UNFCCC mechanisms

MITIGATION

KYOTO PROTOCOL

CDM

JI

IET

Pre-2020

INDC

NAMAs

NMA

FVA

NMM

FINANCE

GCF

GEF

TECHNOLOGY

TEC

CTCN

- mechanisms under the negotiations
- agreed mechanisms under implementation

Intended Nationally Determined Contributions

INDCs will form the foundation for Parties' contribution "bottom-up".

WAYS TO INCLUDE CCS:

- **Indicative %** of the role CCS could play, based on analysis
- **Mt of CO_2** captured and stored by 2030, 2040 etc.
- Target % or GW of **power generation capacity** equipped with CCS
- Policy **actions and mechanisms** supporting CCS
- Investments in **R&D** and long-term CCS development
- **Industrial** CO_2 emission policies that encourage CCS

Technology Mechanism

The Technology Mechanism aims at enhancing action on technology development and transfer to support mitigation and adaptation.

WAYS TO INCLUDE CCS:

- Create **enabling conditions** for CCS deployment through:
  - information on CCS that interested countries can use
  - inclusion of CCS in technology needs assessments
  - assessing regulatory and technical readiness and gaps for CCS deployment
- Broker **project financing** through:
  - international evaluation of CCS projects & international financing partnerships
  - linking defined projects with GCF funding opportunities
- Support existing **international RD&D cooperation** and partnerships by:
  - providing information to Parties on these partnerships
  - possibly covering costs of developing countries' participation in such partnerships
  - reporting on achievements to the UNFCCC

The NAMA framework

The NAMA framework recognises developing countries' contributions through unilateral or internationally supported actions.

WAYS TO INCLUDE CCS:

- Support **legal work** to make CCS a legal activity and define all necessary storage safety requirements
- CO_2 **storage exploration** and site identification
- Support development of **incentive policy** frameworks
- Funding to partly cover capital and/or operating **costs** of a CCS project
- Support **MRV** during operation and/or post-closure

The Green Climate Fund

The Green Climate Fund was established to mobilise funding for developing countries' mitigation and adaptation efforts.

WAYS TO INCLUDE CCS:

- Actively **highlight the availability** of funds for CCS projects
- Potentially include a **specific temporary funding window** for CCS
- Leverage **private sector investments** in CCS

Enhanced pre-2020 climate action

Parties agreed to work on mitigation action pre-2020.

WAYS TO INCLUDE CCS:

- Support development of **incentive policy** frameworks
- Support development of detailed CCS **safety regulations**
- Foster development of CCS **pilot and demonstration projects**
- Support assessment work to identify specific **CO_2 storage sites**
- **Build capacity** for pilot projects in non-Annex I Parties
- Encourage national and international **cooperation on R&D**
- Provide guidance on **CO_2-EOR projects** modalities and procedures as short-term mitigation options in some countries
- Provide recommendations to the **Technology Mechanism** for its work on CCS

How could UNFCCC mechanisms consider CCS?

"Top-down": UNFCCC mechanisms

Technology mechanism
- Knowledge sharing
- Help financing
- Partnerships

Green Climate Fund
- Actively highlight CCS
- Specific CCS window

NAMAs
- Laws & regulations
- Storage exploration
- Funds for CCS

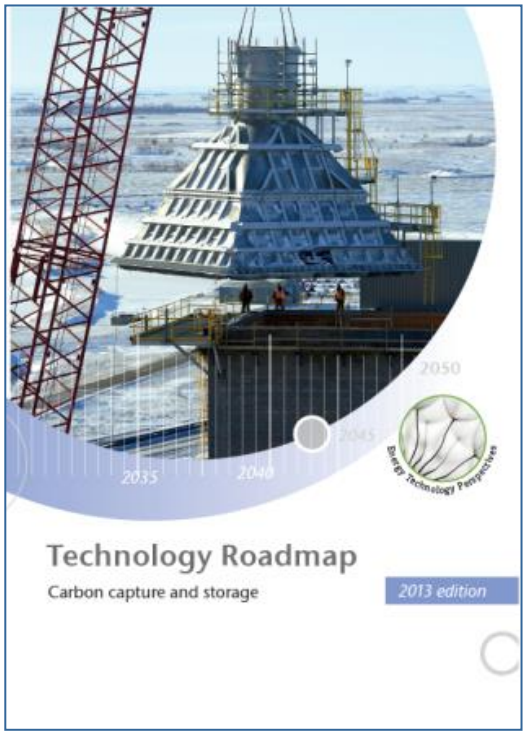
CDM
- Continue to include CCS
- Retain M&P technical work

Enhanced pre-2020 action
- Knowledge sharing
- Policy & regulation

Other multilateral schemes
- Cooperation on CCS

"Bottom-up": Intended Nationally Determined Contributions

INCLUDE CCS AND RELATED METRICS WHERE RELEVANT!



THANK YOU!

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DOWNLOAD THE ROADMAP AT:
http://www.iea.org/topics/ccs/ccsroadmap2013