

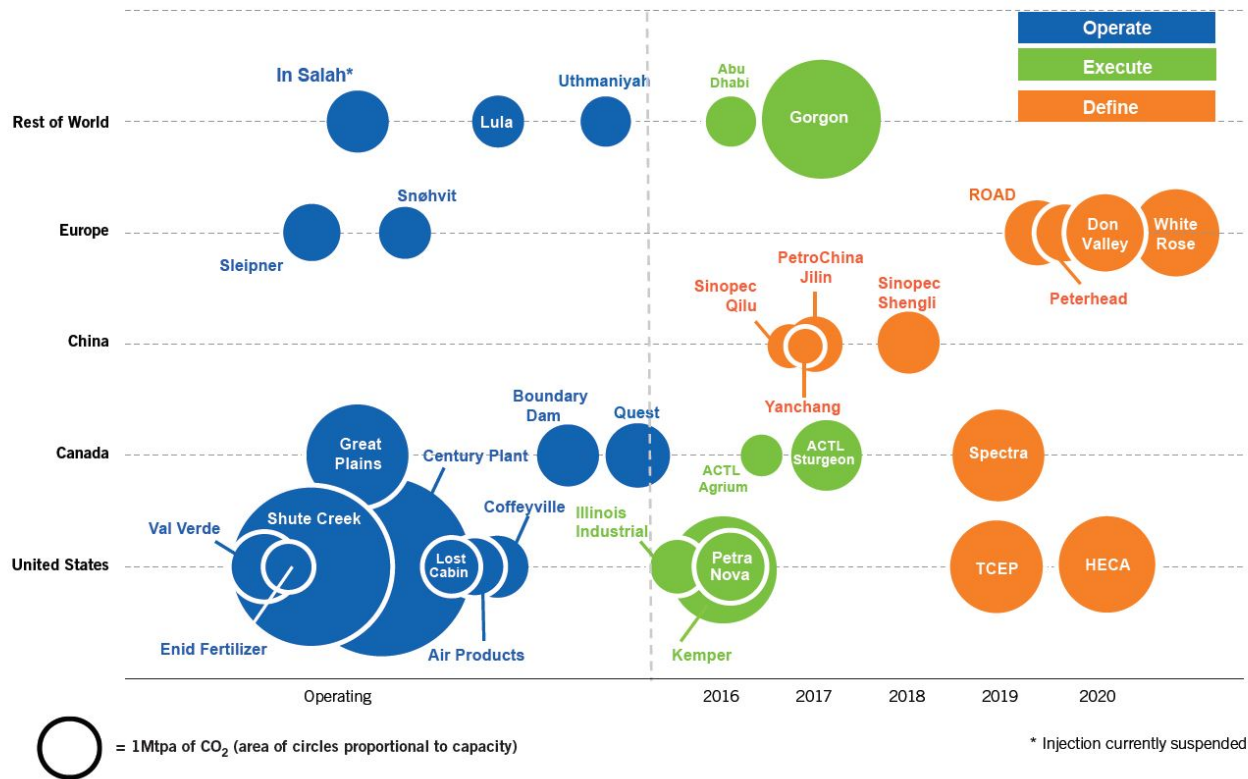


Perspectives on CCS

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European Commission, Directorate-General for Energy

Location of CCS Projects

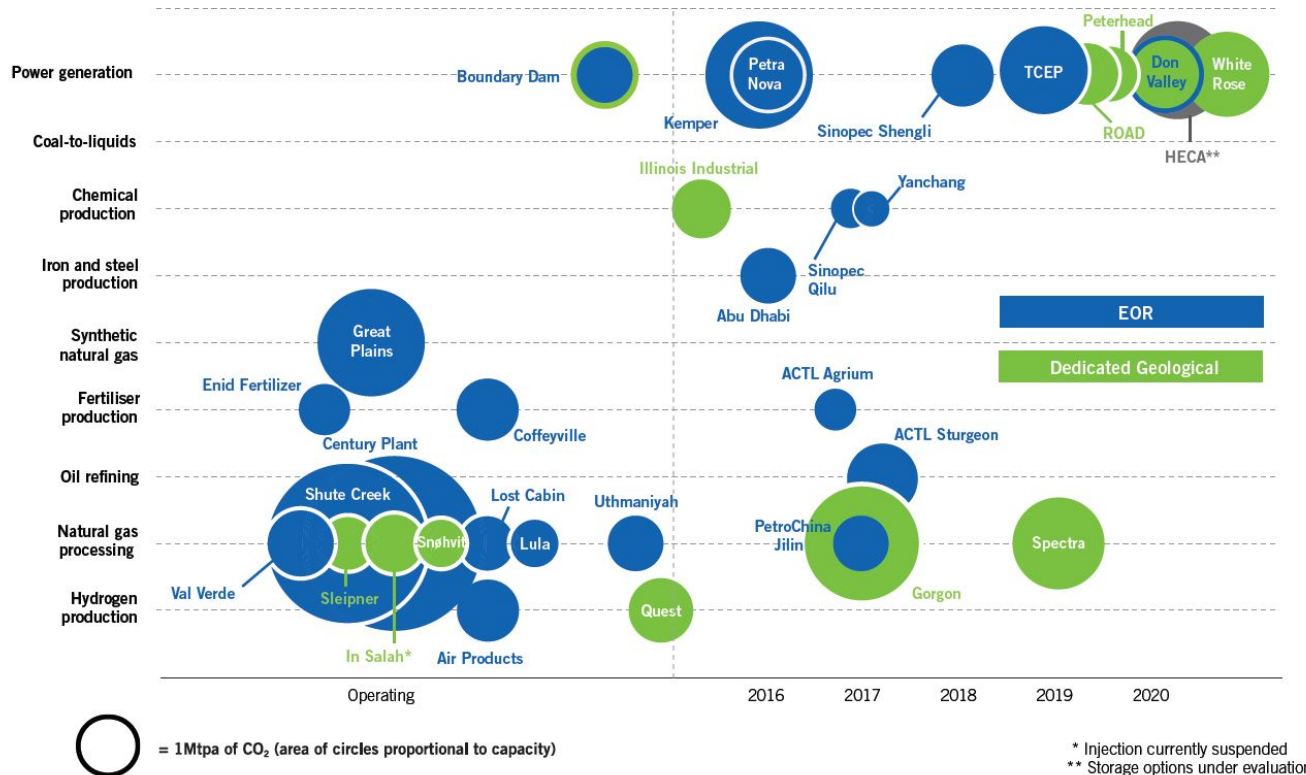


Actual and expected operation dates for large-scale CCS projects in the Operate, Execute and Define stages by region and project lifecycle stage
 Source: Global CCS Institute, Global Status of CCS 2015



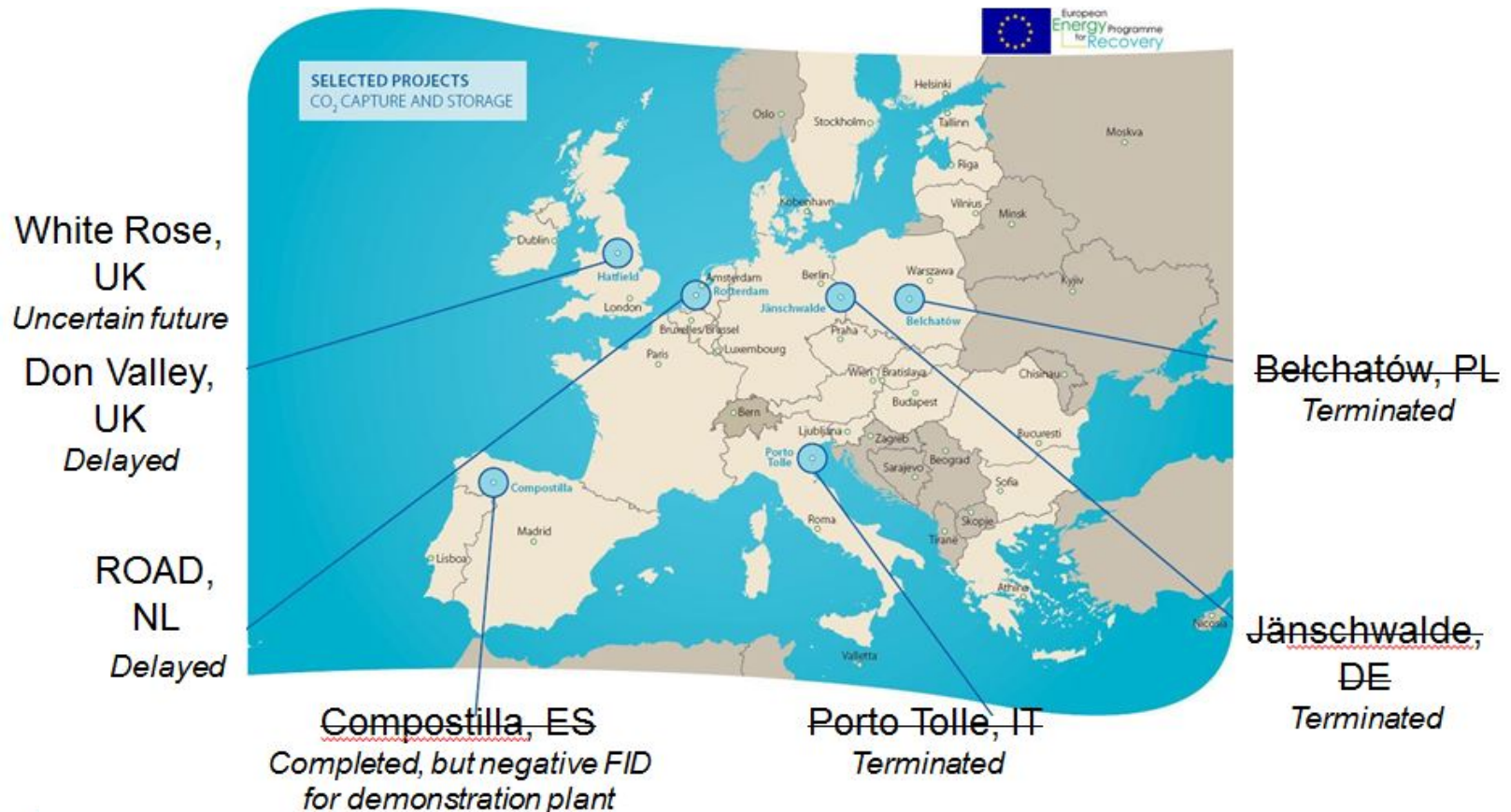
European Commission

Types of CCS Projects

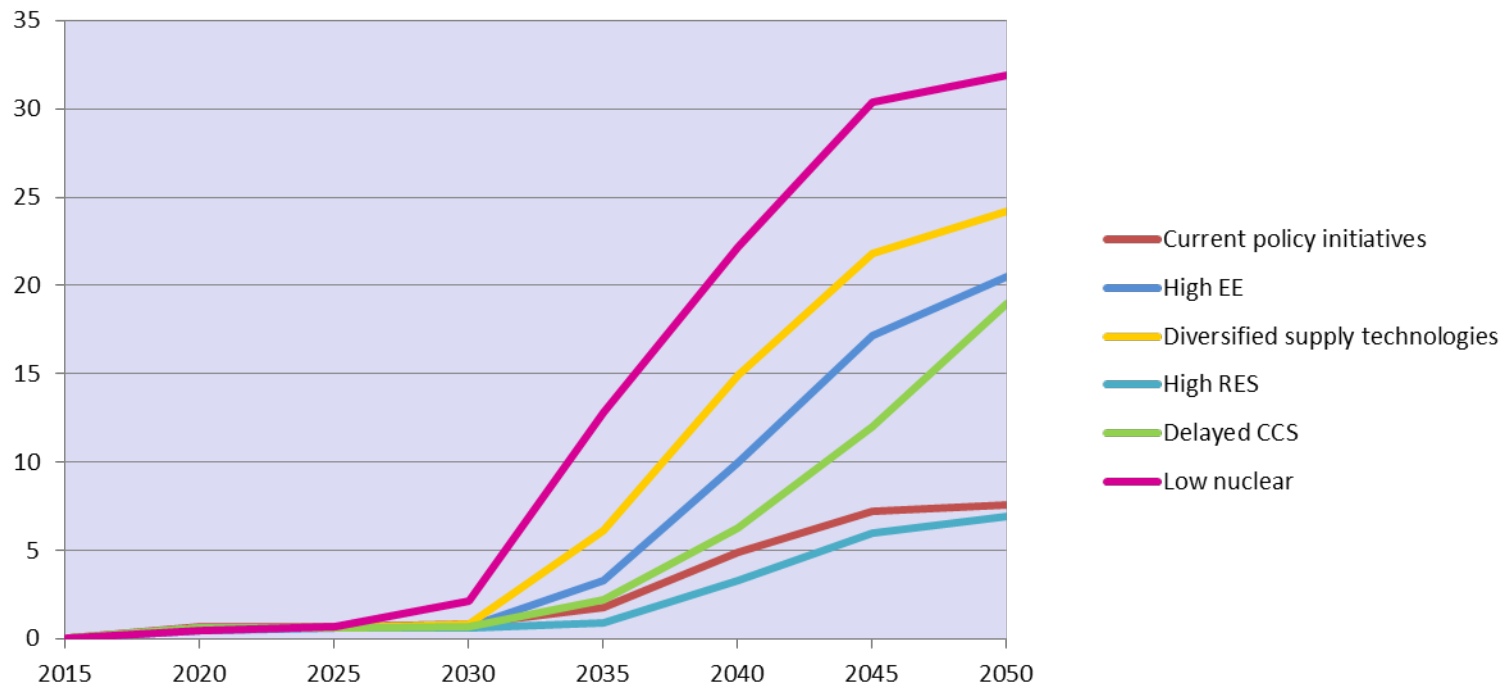


Actual and expected operation dates for large-scale CCS projects by industry and storage type
 Source: Global CCS Institute, Global Status of CCS 2015

CCS Projects Co-Funded by EU



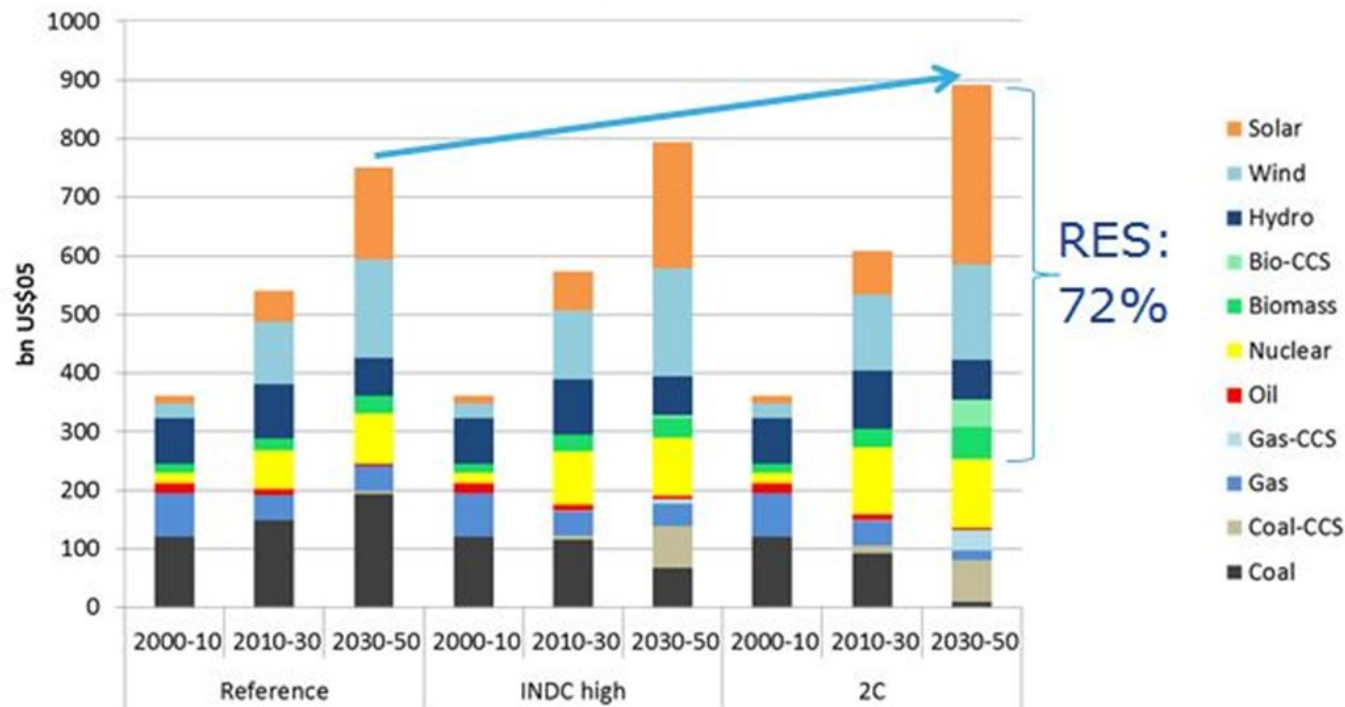
Role of CCS in the Electricity Mix



Share of CCS (%) in power generation towards 2050 –
EU Energy Roadmap 2050

Expected Investments Power Sector

World, average yearly investment



"High INDCs" = including INDC pledges which are conditional

Source: Joint Research Centre, Global Energy & Climate Outlook, <https://ec.europa.eu/jrc/en/geco>

Reasons for Lack of Progress in EU

Condition	OK?	Comments:
1) Legislative Framework	Yes (?)	Storage enabled by CCS Directive, but Member States can restrict storage
2) Successful Demonstration	-	Worldwide 15 large-scale projects operating, but none in the EU
3) Commercial Viability	No	ETS price too low, no support schemes at Member State level
4) Public Acceptance	-	Challenges particularly with onshore storage
5) Infrastructure	Yes (?)	Potentially Project of Common Interest (PCI), but additional funding needed
6) Innovation	Yes	Horizon 2020, Strategic Energy Technology Plan (SET-Plan)

The Energy Union's 5 dimensions

1. Energy security, solidarity and trust,
2. A fully integrated internal energy market,
3. Energy Efficiency first,
4. Transition to a long-lasting low-carbon society,
5. An Energy Union for Research, Innovation and Competitiveness.

5

GUIDING
DIMENSIONS

The **Energy Union's** 5th dimension in practise

Research,
innovation and
competitiveness
strategy

Integrated **SET Plan**
Accelerating the
energy system
transformation

Initiative on EU
global technology
and innovation
leadership

Strategic **transport**
research and
innovation R&I
agenda



European Commission

Integrated SET-Plan

*Integrated Roadmap Themes**

Energy Union 4+2 R&I priorities

SET-Plan Communication Ten Priority Actions

- T10: Wind, PV, CSP, SHC
- T1: Engaging consumers
- T2: Activating consumers
- T6: Smart grids
- T7: Energy storage
- T8: System flexibility
- T9: Smart cities
- T3: En. eff. buildings
- T4: En. eff. H/C
- T5: En. eff. industry
- T13: Biofuels, FCH
- T11: CCS
- T12: Nuclear

RES

- 1. Develop RES
- 2. Reduce cost

Smart

- 3. Smart home
- 4. Smart System

Efficiency

- 5. Building
- 6. Industry

Transport

- 7. Battery
- 8. RES-fuels

CC(U)S

- 9. R&I on CC(U)S

Nuclear

- 10. Safety Nuclear



Projects of Common Interest (PCI)

Criteria / CBA

2nd list: 195 PCIs

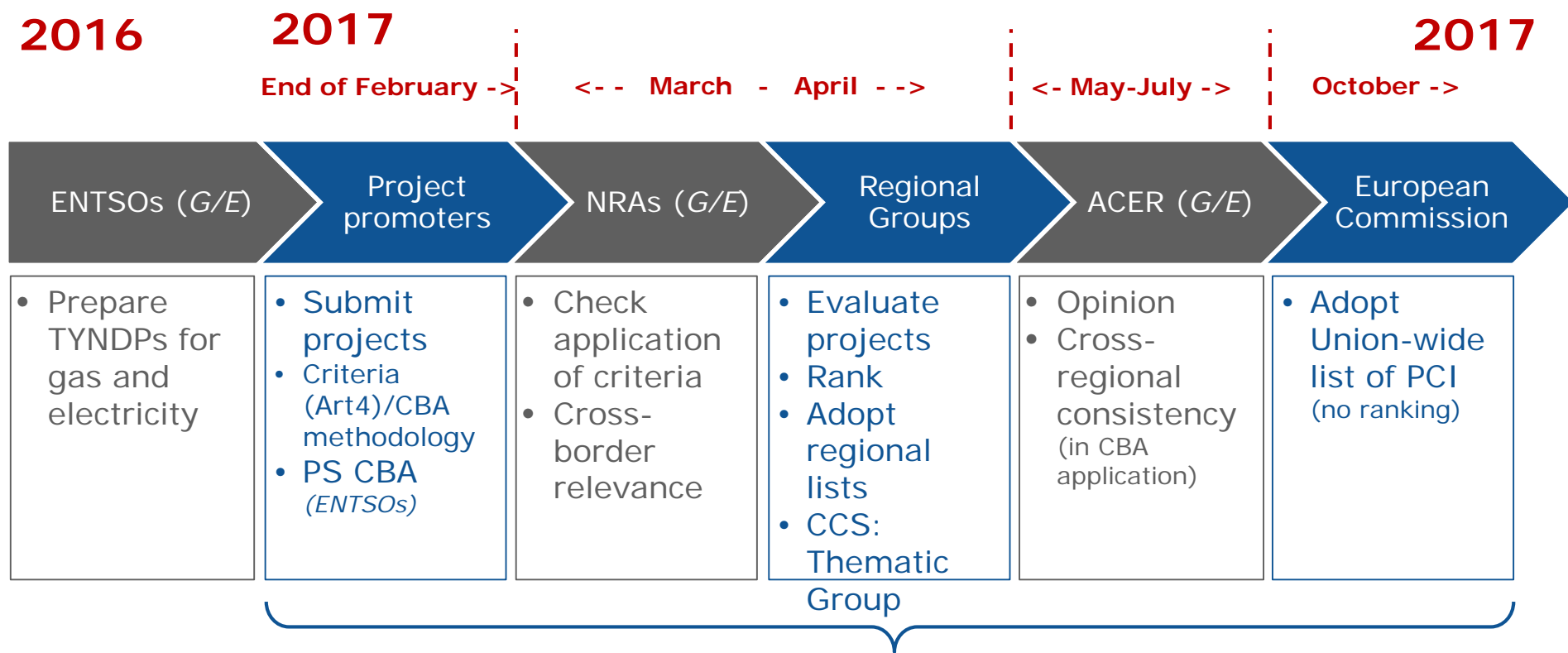
November 2015

**108 Electricity
transmission
& storage
(27 Electricity
Highways)**

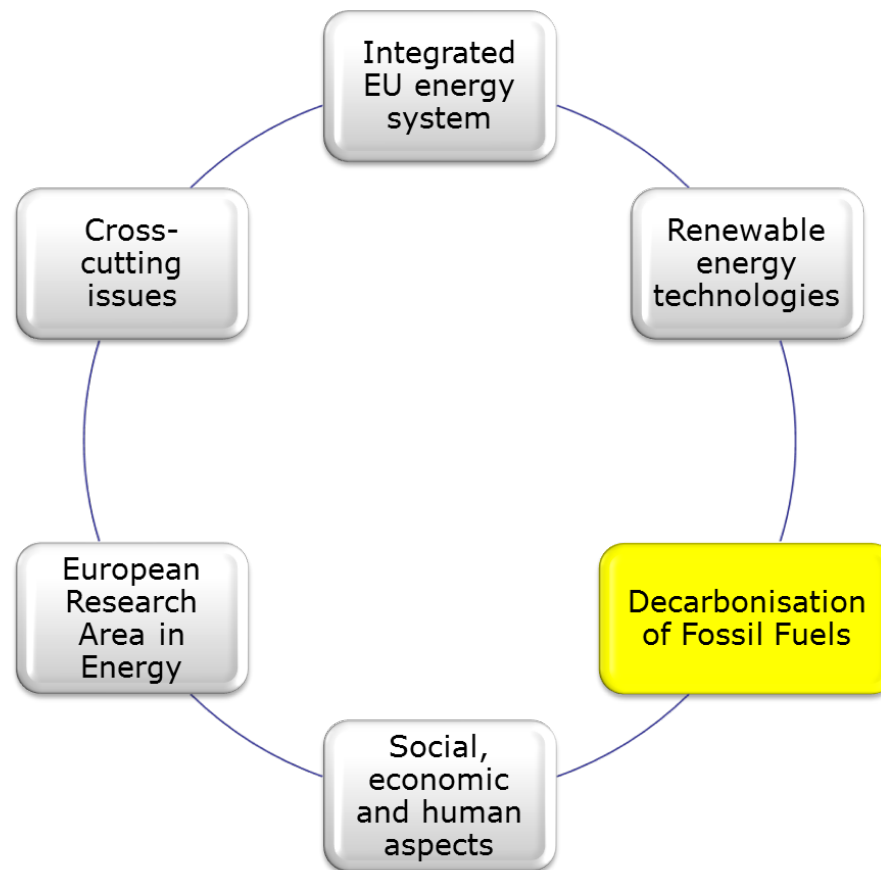
**77 Gas
transmission,
storage & LNG**

**3 Smart Grids
7 Oil
None yet in
CCS**

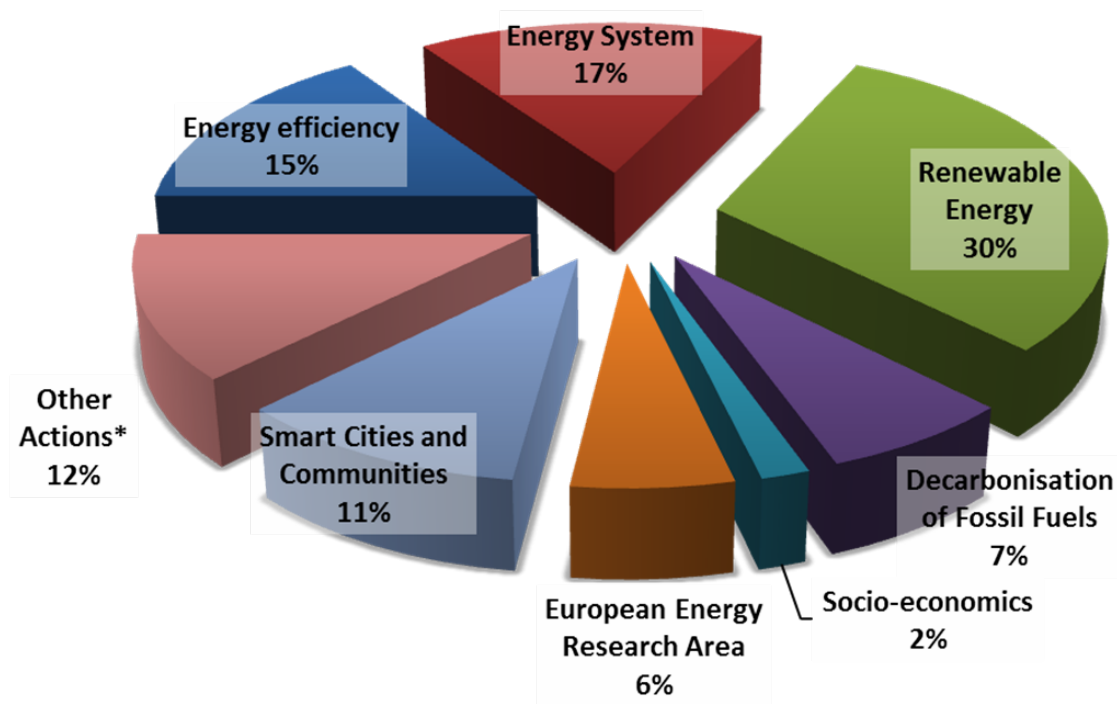
Process to Identify PCIs



Horizon 2020 Energy Challenge



Indicative Budget Distribution per Area for Energy Calls 2016-2017



Total budget 2016-2017: EUR 1 344 million

Horizon 2020: Ongoing CCS Projects

- **Total funding CCS 2014/2015: 75,8 M€**

CCS in Industry

CEMCAP

CO₂ capture from cement production

EU Contribution 8.8 M€; *Coordinator: SINTEF*

STEPWISE

SEWGS Technology Platform for cost effective CO₂ reduction in the Iron and Steel Industry

EU Contribution 12.97 M€; *Coordinator: ECN*

LEILAC

Low Emissions Intensity Lime and Cement

EU Contribution 11,93 M€; *Coordinator: CALIX (EUROPE) (UK)*

Horizon 2020: Ongoing CCS Projects

CO2 Storage

STEMM-CCS

Strategies for Environmental Monitoring of Marine Carbon Capture and Storage
EU Contribution 15,92 M€; *Coordinator*: NERC(UK)

ENOS

Enabling Onshore CO2 Storage in Europe
EU Contribution 12,58 M€; *Coordinator*: BRGM (F)

CCS infrastructure

GATEWAY

Developing a Pilot Case aimed at establishing a European infrastructure project for CO2 transport
EU Contribution: 0,79 M€; *Coordinator*: SINTEF

ERA-NET

ACT

Accelerating CCS technologies as a new low-carbon energy vector
EU Contribution 12,81 M€; *Coordinator*: The Research Council of Norway (NO)

Horizon 2020: Topics 2016

Activities supported in 2016

LCE-24: New generation high-efficiency capture processes

- TRL 2/3 -> 5; Budget: EUR 17 million (~ 2-5 M€/project)
- Twinning with South Korean projects

LCE-25: Utilisation of captures CO₂ as feedstock for the process industry

- TRL 5/6 -> 6/7; Budget EUR 10 million (~ 6-10 M€/project)

LCE-26: ERA-NET on Applied Geosciences

- Covering ground water, raw materials and geo-energy
- Produce reliable scientific information on resources and potential consequences of their exploitation
- Budget: EUR 10 million; ERA-NET Cofund

Horizon 2020: Topics 2017

Activities
supported
in **2017**

LCE-27: Measuring, monitoring and controlling the risks of CCS and unconventional hydrocarbons

- Scope to be defined in 2016

LCE-28: Highly flexible and efficient fossil fuel power plants

- TRL 3 -> 4-6; Budget EUR 15 million (~ 3-6 M€/project)

LCE-29: CCS in industry, including Bio-CCS

- TRL 4/5 -> 7; *Budget EUR 20 million (~ 4-9 M€/project)

LCE-30: Geological storage pilots

- TRL 4/5 -> 6; *Budget EUR 20 million (~ 9-16 M€/project)

Conclusions

- **CCS in Europe needs a new approach**
- **More research needed on CO₂ use: CCU could complement but not replace CCS**
- **More focus on CCS in industrial applications?**
- **New funding instrument in proposal for reform of Emission Trading System: the Innovation Fund**
- **EU, Member States and stakeholders should use SET-Plan governance to align efforts**