



CSLF Technical Group Meeting

5.11.2019

CCUS in the EU



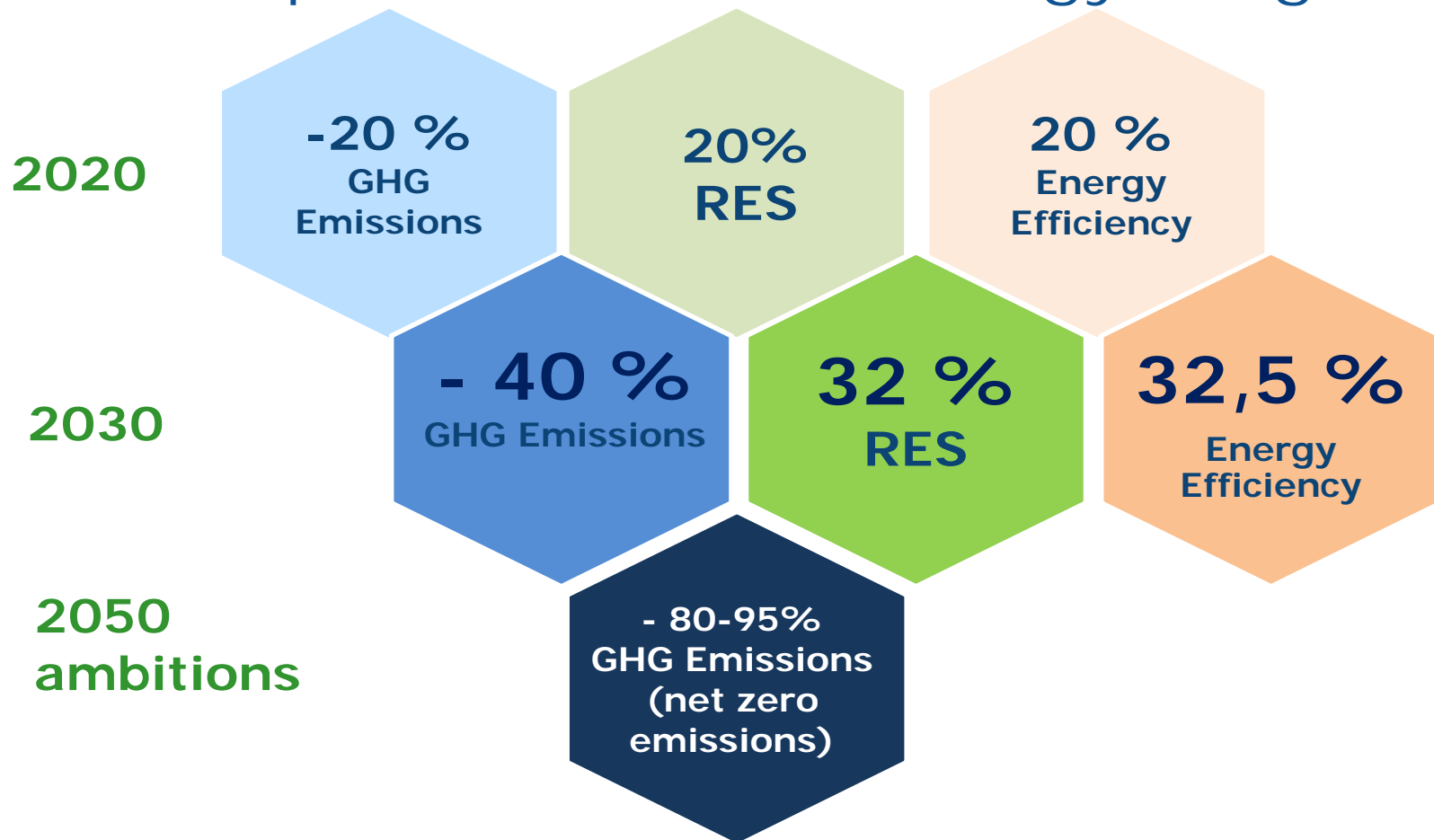
Wolfgang Schneider
European Commission
Unit D1 :Clean Energy Transition,
DG Research and Innovation



CCUS in the EU

- Targets
- Clean Planet for All
- A European Green Deal
- Innovation Fund
- Mission Innovation
- Energy Union & SET Plan
- Horizon 2020
- Horizon Europe

European Climate & Energy Targets



A Clean Planet for all

**A European strategic
long term vision for a
prosperous, modern,
competitive and
climate neutral
economy (11/2018)**





Our Vision for a Clean Planet by 2050

- The Paris Agreement objective is to keep temperature increase to well below 2°C and to pursue efforts to limit it to 1.5°C
- The IPCC report confirms that limiting climate change to 1.5°C has to be pursued to avoid the worst impacts
- For the EU to lead the world in climate action, it means achieving net-zero greenhouse gas emissions by 2050 through a socially-fair transition in a cost-efficient manner
- The Long Term Strategy outlines the economic and societal transformations required and gives message that change is possible and beneficial
- It sets the direction of travel in line with the UN Sustainable Development Goals



7 Building Blocks

1. Energy Efficiency
2. Deployments of Renewables
3. Clean, safe & connected Mobility
4. Competitive industry and circular economy
5. Infrastructure and inter-connections
6. Bio-economy and natural carbon sinks
7. Tackle remaining emissions with carbon capture and storage



7th Building Block: Carbon Capture and Storage

- ✓ Rapid deployment of renewable energy and new options to decarbonize industry reduce the need for CCS
- ✓ Still, CCS has a crucial role to close the circle for a net-zero economy:
 - ✓ Energy intensive industries will require it where other alternatives do not exist
 - ✓ If combined with sustainable biomass it could create negative emissions
- ✓ CCS is facing barriers: lack of demonstration plant and proof of economic viability, regulatory barriers in some Member States, public opposition
- ✓ An enabling framework is needed to spur large-scale demonstration, scale up private investments, provide the right signals to the markets and reassure public opinion

A European Green Deal

- ✓ **Becoming the world's 1st climate-neutral continent**
- ✓ **1st European climate law to enshrine 2050 climate-neutrality target**
- ✓ **More ambitious than 40 % GHG emission reduction (50 – 55 %)**
- ✓ **Extend ETS to cover maritime, traffic and construction sector, reduce free allowances to airlines**
- ✓ **World leader in circular economy + clean technologies + decarbonise energy-intensive industries**
- ✓ **Invest record amount in cutting-edge R&I**
- ✓ **Prepare legislative proposal within 100 days**



INNOVATION FUND

Driving clean innovative technologies towards the market



First call for
projects in 2020



€10 billion to invest up to 2030
in EU's climate neutral future



Avoid emissions and
boost competitiveness

Supporting innovation in:



Energy intensive
industries



Renewables



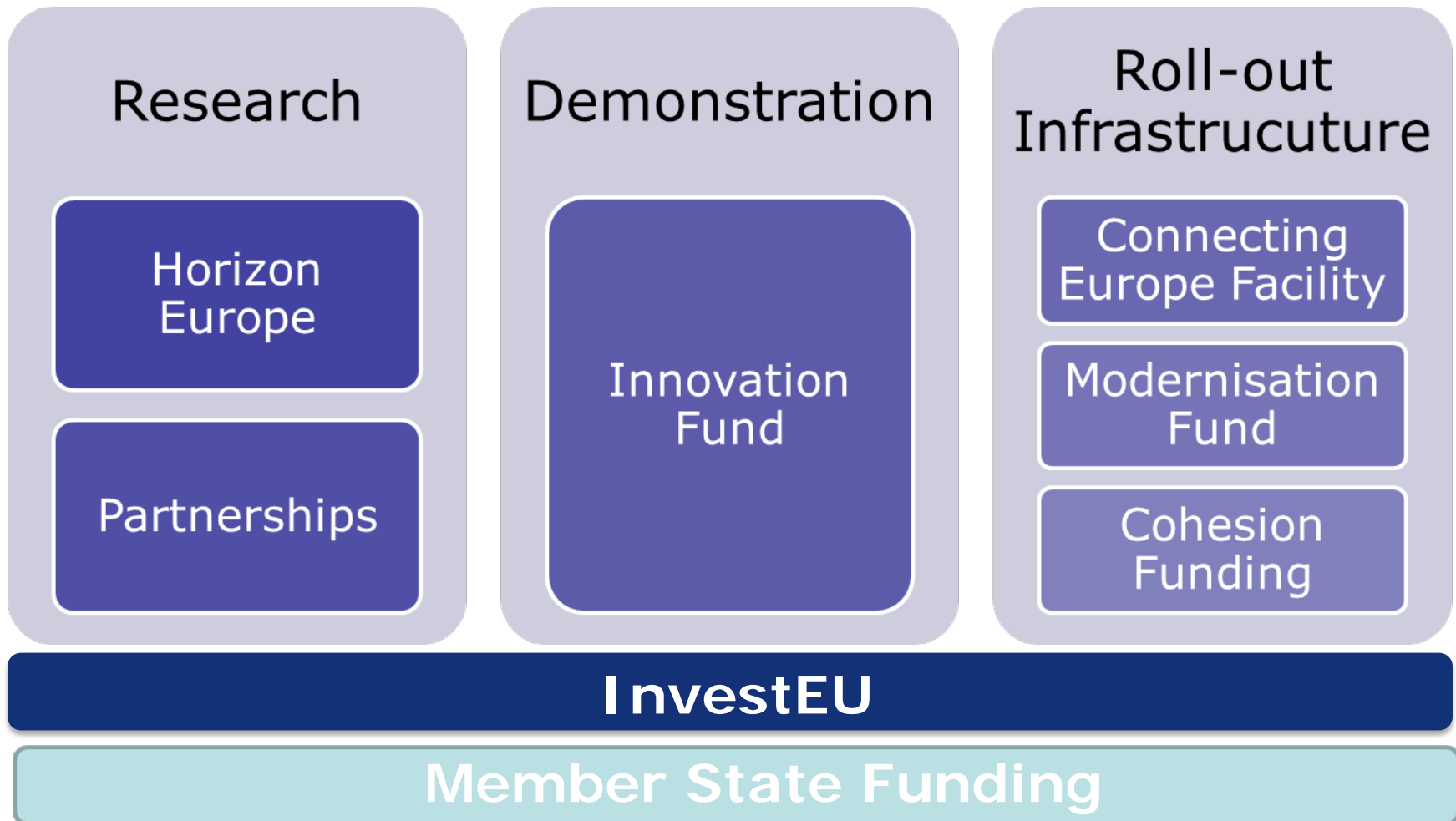
Energy storage



Carbon capture,
use and storage

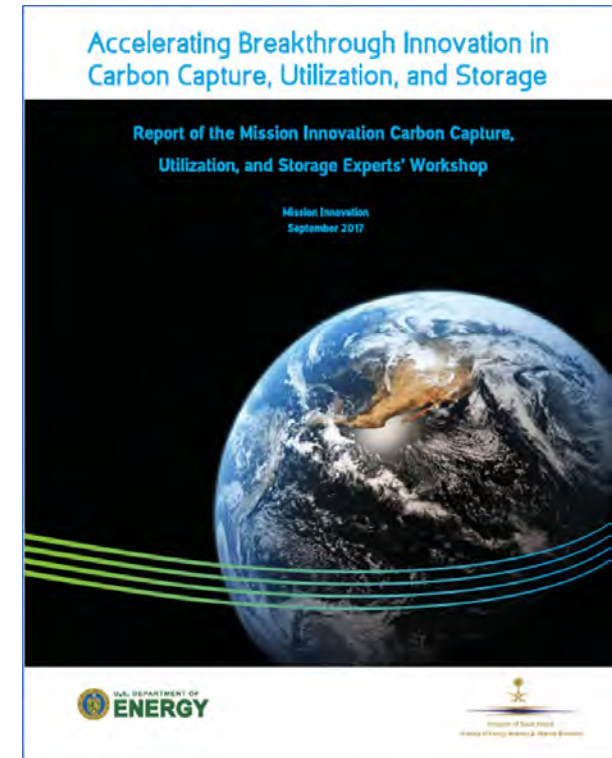
Funded by: EU Emissions Trading System

Synergies – Innovation Fund



Mission Innovation Challenge #3 – CCUS

- Following EC commitment in COP21 to be member of Mission Innovation move to multilateral cooperation
- The Mission Innovation (MI) CCUS Challenge has 21 participating countries and is now co-led by the UK, Mexico and Saudi Arabia
- 4 themes: CO₂ Capture, CO₂ storage, CO₂ Use and Cross-cutting
- The MI report (workshop Houston Sept. 2017) describing the Priority Research Directions between MI countries published in May 2018
- 2nd Workshop: 19/20 June 2019 in Trondheim



2030 Climate - Energy Package



Energy Union (5 pillars)

- *Energy security, solidarity and trust*
- *A fully integrated internal energy market*
- *Energy efficiency first*
- *Transition to a low-carbon society*
- ***An Energy Union for Research, Innovation and Competitiveness***

Strategic Energy Technology Plan (SET-Plan)

- *Integrated Roadmap*
- *EC Communication on Integrated SET-Plan with key actions on CCUS*



What's the SET Plan ?



- **Key innovation pillar of the Energy Union, 2 key objectives:**
 - Lower cost of clean energy
 - EU industry at forefront of low-carbon technology
- **SET Plan countries [EU28 + CH, IS, NO, TR]**
- **Stakeholder Platforms (ZEP, EERA, ECRA, CEMBUREAU, EUROFER ...)**
- **But:** The SET Plan is not a funding instrument
- **SET Plan Main Objectives for CCUS:**
 - Demonstrate & deploy commercial scale full CCUS value chain
 - Reduce costs of CO₂ capture
 - Demonstrate safe CO₂ storage



EU Implementation Plan No. 9 on CCUS R&I actions identified

- *R&I activity 1:* Delivery of a commercial scale CCS project
- *R&I activity 2:* Delivery of regional CCS clusters
- *R&I activity 3:* Project of Common European Interest for CO₂ transport infrastructure
- *R&I activity 4:* Establish a European CO₂ Storage Atlas
- *R&I activity 5:* CO₂ storage pilots
- *R&I activity 6:* CO₂ capture pilots
- *R&I activity 7:* CCU Action
- *R&I activity 8:* Modelling and communicating the role of CCS



New Directions for CCUS in COM R&I

- Currently no business case for CCUS in power generation
- Emphasis is shifting from CCUS in power plants to CCUS in energy-intensive industry such as steel and cement, for which CCUS is the only way to further reduce their CO₂ emissions
- CCU (CO₂ utilisation) in the process industry, such as transforming CO₂ into fuels, chemicals and materials, attracts more and more attention
- CCS in hubs and industrial clusters (with decoupling of capture, transport and storage) is probably the best business model



CCUS Support in Horizon 2020

CCUS in industry has been supported in the Calls for Proposals of 2014 – 2018

- **5 CCS projects: 3 cement, 1 steel, 1 refinery**
- **2 CCU projects (CO₂ to methanol/ethanol)**
- **Total budget >100 M €, EU contribution 80 M€**

Calls 2019 - 2020 earmark another 60 M €

Projects in Horizon 2020



CEMCAP (2014)

**CO₂ capture from
cement production**

Total cost: 10 M€

EU Contribution: 8,8 M€

Coordinator: SINTEF (NO)

Projects in Horizon 2020



STEPWISE (2014)

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

Total cost: 13 M€

EU Contribution: 13 M€

Coordinator: ECN (NL)

Projects in Horizon 2020



LEILAC (2015)

**Low Emissions Intensity
Lime and Cement**

Total cost 20,8 M€

EU Contribution 11,9 M€

Coordinator: CALIX (UK)

Projects in Horizon 2020



CLEANKER (2017)

**CLEAN clinker
production by Calcium
looping process**

Total costs 9,2 M@

EU Contribution 8,9 M€

Coordinator: Laboratorio
Energia Ambiente Piacenza
(IT)

Projects in Horizon 2020



CHEERS (2017)

**Chinese-European
Emission-Reducing
Solutions**

Total cost 16,8 M€

EU Contribution 9,7 M€

Coordinator: SINTEF (NO)

CCU projects in Horizon 2020

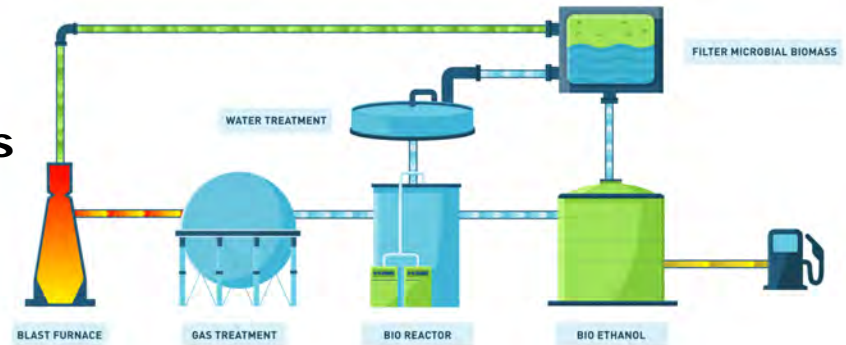
STEELANOL (2014)

Advanced biofuels from steel gases

Total cost 14,6 M€

EU Contribution 10,2 M€

Coordinator: ArcelorMittal



FReSMe (2016)

From residual steel gases to methanol

Total cost 11,4 M€

EU Contribution 11,4 M€

Coordinator: I-DEALS

MefCO2 (2014)

Methanol from captured carbon dioxide using surplus electricity

Total cost 11,4 M€

EU Contribution 8,6 M€

Coordinator: I-DEALS



Horizon 2020 Energy –WP 2018-2020

Topics on CCUS

- *NZE-1: Pilots for advanced capture technologies (2018)*
- *NZE-2: Pilots on CO₂ conversion to fuels (2018)*
- *NZE-3: Strategic planning for CCUS deployment (2018)*
- *NZE-4: Integrated solutions for flexible power plants using power-to-X and energy storage (2019)*
- *NZE-5: CCS in industry (2019, 2020)*
- *NZE-6: Geological storage pilots (2020)*

LC-SC3-NZE-5-2020: Low-carbon industrial production using CCS

- ✓ Focus on the integration of CO₂ capture in industrial installations, while addressing the full CCUS chain, TRL 6 - 7
- ✓ No need to demonstrate CO₂ utilisation, transport or storage, but address issues relevant to the whole chain
- ✓ Elaborate a detailed plan on how results can be used, i.e. what could be done with the captured CO₂ if this were to be a full-scale operational system
- ✓ Budget 15 M € (2020); IA
- ✓ Call opens 5 May 2020 with deadline 1 September 2020

LC-SC3-NZE-6-2020: Geological Storage Pilots

- ✓ Identification and geological characterisation of new prospective storage sites for CO₂ (onshore or offshore)
- ✓ New data, knowledge and detailed models of potential storage complexes (geology, behavior of storage formations, capacity, risk assessment, ...)
- ✓ Identify and engage relevant end users and societal stakeholders, analyse concerns, address regional consequences if CO₂ from power sector or industry
- ✓ Budget 14 M € (2020); RIA
- ✓ Call opens 5 May 2020 with deadline 1 September 2020



Horizon Europe

is the Commission proposal for a **€100 billion** research and innovation funding programme for seven years (2021-2027)



to strengthen the EU's scientific and technological bases



to boost Europe's innovation capacity, competitiveness and jobs



to deliver on citizens' priorities and sustain our socio-economic model and values

Horizon Europe: Preliminary structure

Pillar 1 Excellent Science

European Research Council

Marie Skłodowska-Curie
Actions

Research Infrastructures

Pillar 2 Global Challenges and European Industrial Competitiveness

Clusters

- Health
- Culture, Creativity and Inclusive Society
- Civil Security for Society
- Digital, Industry and Space
- Climate, Energy and Mobility
- Food, Bioeconomy, Natural Resources, Agriculture and Environment

Joint Research Centre

Pillar 3 Innovative Europe

European Innovation Council

European innovation
ecosystems

European Institute of Innovation
and Technology

Widening Participation and Strengthening the European Research Area

Widening participation and spreading excellence

Reforming and Enhancing the European R&I system

Cluster 5 'Climate, Energy and Mobility'





Key R&I Orientations: Accelerate the development of CCUS as a CO₂ emission mitigation option in electricity generation and industry applications (incl. BECCS)

Potential research challenges:

- **Development and demonstration of novel energy efficient, cost-effective and environmentally friendly capture technologies, including using new materials**
- **Development of new storage sites (including operational best practices and public engagement)**
- **Feasibility studies for the development of CC(U)S hubs and clusters**
- **Improving the CO₂ balance and energy performance of CO₂ conversion to value-added products**
- **Conversion of CO₂ to products (synthetic fuels) or storage (mineralisation) in collaboration with cluster 'Digital, Industry and Space' under the Areas of Circular Industries, Low-Carbon and Clean Industry**



Thank you!

#HorizonEU

<http://ec.europa.eu/horizon-europe>