



Update from the European Commission initiatives on Carbon Capture and Storage from the research and innovation perspective

**International Forum on Recent Developments of CCS
Implementation, Athens, 26-27 March 2015**

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EU Energy policy goals and priorities



Competitiveness

Smart infrastructure

Competitive markets

Diversified supply

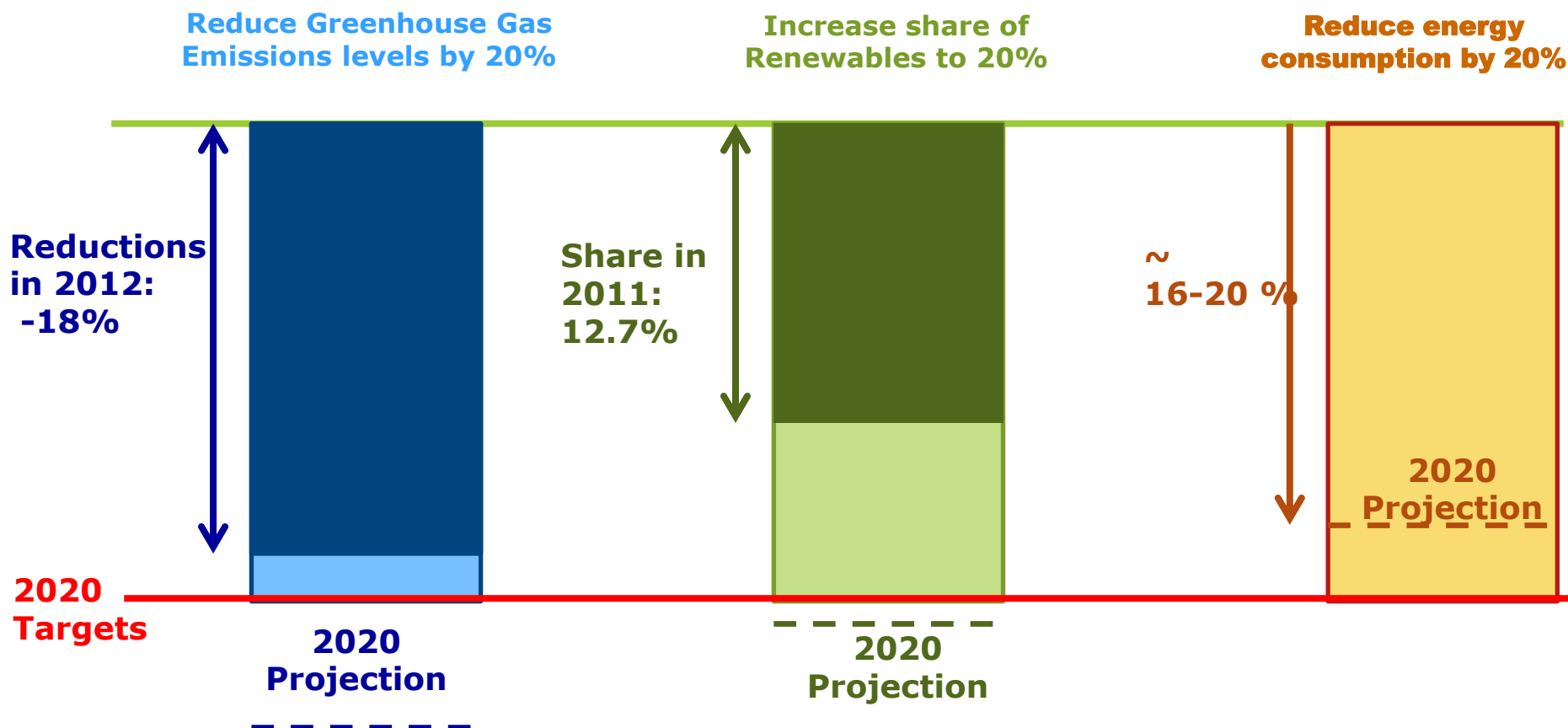
Energy efficiency

Renewable sources

**Security of
supply**

Sustainability

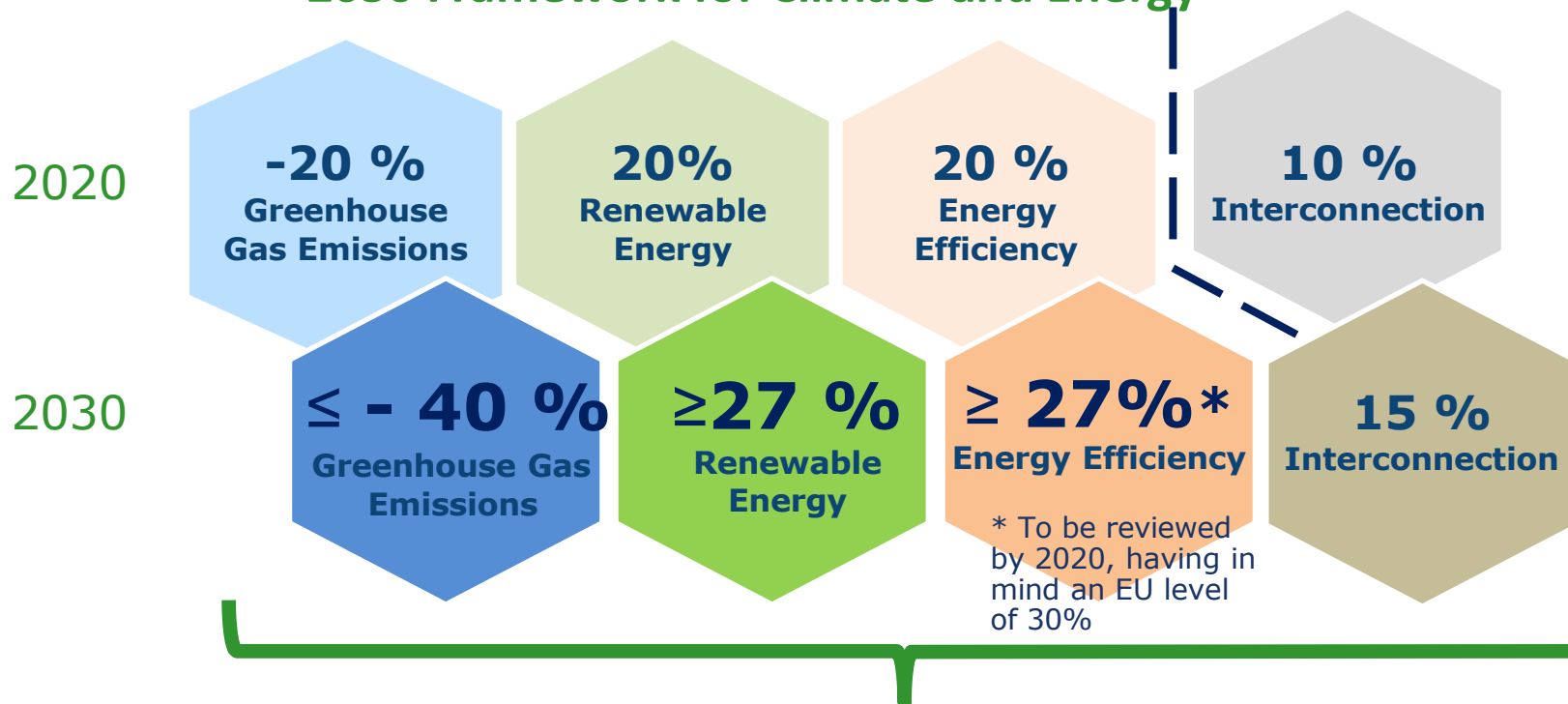
2020 Climate and Energy Framework : where do we stand?





Agreed headline targets Oct. 2014 European Council

2030 Framework for Climate and Energy



**New governance system +
indicators**

Energy Union Package:

- ***"A forward-looking approach to CCS and CCU is needed for the power and industrial sectors, which will be critical to reaching the 2050 climate objectives in a cost-effective way.***
- ***This will require an enabling policy framework, including a reform of the Emissions Trading System and the new Innovation Fund, (NER 400) to increase business and investor clarity, which is needed to further develop this technology"***

EU Energy Security Strategy paper:

Further efforts in research, development and deployment of CCS are needed

GHG Emissions



Innovation fund

400 million allowances, amount depending on carbon price

Building on **existing NER300** programme for carbon capture and storage and renewables

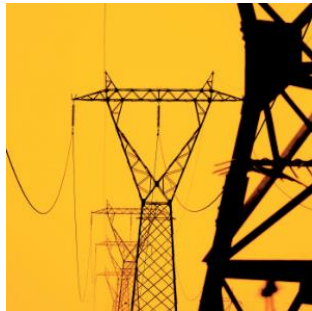
New: extension of scope to low carbon innovation in industrial sectors

Open for **projects** in **all Member States**



SET-Plan

...in motion



SETIS
Information For Decision-making

SET-Plan – the technology pillar of EU energy and climate change policy

Objective

To accelerate the development of a portfolio of low carbon technologies leading to their market take-off

Implementation

- European Energy Research Alliance (EERA)
- European Industrial Initiatives (EIIs)

*Communication on Energy Technologies and Innovation
2 May 2013:*

TOWARD AN INTEGRATED ROADMAP AND ACTION PLAN OF PUBLIC INVESTMENTS (EC AND MSS)

➤ **SET Plan Conference 2014, Rome 10,11 December 2014**



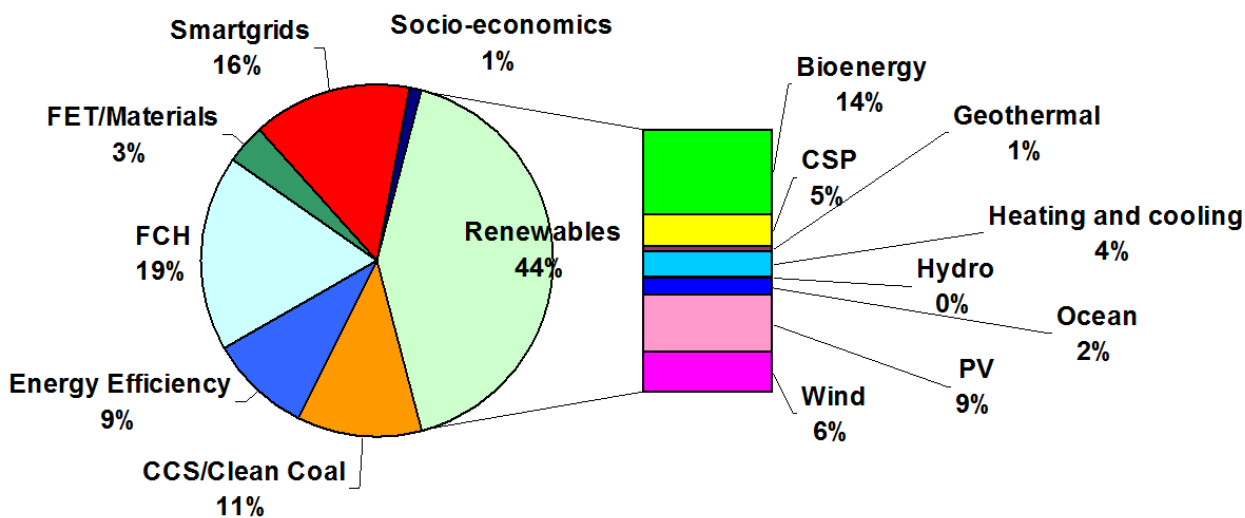
- **Economic Recovery Programme (EPR) 1 B€**
ongoing projects ROAD and Don Valley
- **European Emission Trading Scheme (NER 300-)**
White Rose project award decision of up to 300M€)
- **CCS Demonstration Project Network** (a Knowledge sharing network)
- **CCS Directive under revision**
- **R&D Funding: FP7, H2020 Research areas: Capture, Transport, Storage, Utilisation, Public acceptance,**
- **SET-Plan**
- **European Industrial Initiative (EII) on CCS**
- **European Energy Research Alliance-Joint Programme on CCS**



- EC Membership at: **IEA, CSLE, Global CCS Institute**
- Bilateral S&T cooperation:
 - **China** – NZEC project, Phase IIA under preparation,
– multiple Chinese participation in FP6 & FP7
 - **USA** – EU-US Energy Council, 11-13 May 2015, EU-US knowledge sharing event on Demonstration plants,
 - **India** EU-funded demo-gasifier OPTIMASH
 - **South Korea** – EU-Korea twinning workshop on CCS, 9 Feb. 2015, Twinning topics identified: dry sorption, wet sorption and membranes,
 - **Australia** – EC visit to Australia, Dec. 2011, March 2014
– AU Gov. visit to EU, Oct. 2012, June 2013
 - Twinning in FP7 2013 call on high efficiency capture processes - 6 on going twinning projects
 - EU-AU Workshop on CCS foreseen, Jun. 2015

FP7 : 2.3 b€ for Energy for 2007-2013

Distribution of budget (projects and contributions 2007-2011)



- ***Around 220 M€ in FP7 for CCS and Clean Coal***

FP7: EC support to CO₂ storage

Call (2007): *Support to regulatory activities for CCS*
STRACO₂

Call (2008)

- ✓ **Qualification of deep saline aquifers -**
MUSTANG
- ✓ **Public acceptance - NEARCO₂**

Call (2009)

- ✓ **Storage safety - RISCS**



Call 2010

- **Site characterisation - SITECHAR**
- **Site abandonment - CO2CARE**
- **Trans-national cooperation - CGS EUROPE**

Call 2011

Understanding the long-term fate of stored CO2
- **ULTIMATECO2, PANACEA, CARBFIX**

Call 2012

Sizeable pilot tests for CO2 geological storage
TRUST

Call 2013

Remediation and mitigation of CO2 leakage -
MIRECOL

FP7: EC support to CO₂ Capture/Transport

Call 2007

- ***Advanced capture techniques:
CESAR, CAESAR, DECARBit)***

Call 2008

- ***Transport infrastructure:
CO₂EUROPIPE***

Call 2009

- ***Advanced capture technologies:
DEMOYS, CAOLING, CACHET II, INOCCUOUS, Icap,
EU funding: 18 M€***
- ***Transport infrastructure:
COCATE, COMET, CO₂PIPEHAZ***

Call 2010 : Demonstration of advanced capture technologies – no project funded

Call 2011

- ***New liquid solvents for post-combustion capture: IOLICAP, CAPSOL***
- ***IGCC for high-ash coal (India) - OPTIMASH***

Call 2012

- ***Impact of the quality of CO₂ on transport and storage behaviour - IMPACTS, CO₂QUEST***

Call 2013

- ***Scale-up of advanced high-efficiency capture processes: SCARLET :4.8 M, and SUCCESS: 7.1 €***
- ***New generation high-efficiency capture processes - twinning with Australia:6 projects-EC funding 33M€***

EU-Australia Cooperation on CO2 Capture



Project	EC Contribution	EC Coordinator	Australian Participant/ Partner
GREEN-CC	5.46 M€	JUELICH (DE)	UNIVERSITY OF QUEENSLAND
MATESA	2.97 M€	SINTEF (NO)	UNIVERSITY OF MELBOURNE, MONASH UNIVERSITY
INTERACT	4.78 M€	TECHNICAL UNIVERSITY OF DORTMUND (DE)	CSIRO
M4CO2	7.93 M€	TUDEFT (NL)	UNINERSITY OF SYDNEY
ASCENT	6.84 M€	ENEA (IT)	AUSTRALIAN NATIONAL UNIVERSITY, CO2CRC
HiPerCap	4.83 M€	SINTEF (NO)	CSIRO



Horizon 2020

*The EU Framework
Programme for
Research and Innovation
2014-2020*

HORIZON 2020

Research and
Innovation

Horizon 2020 - What's new

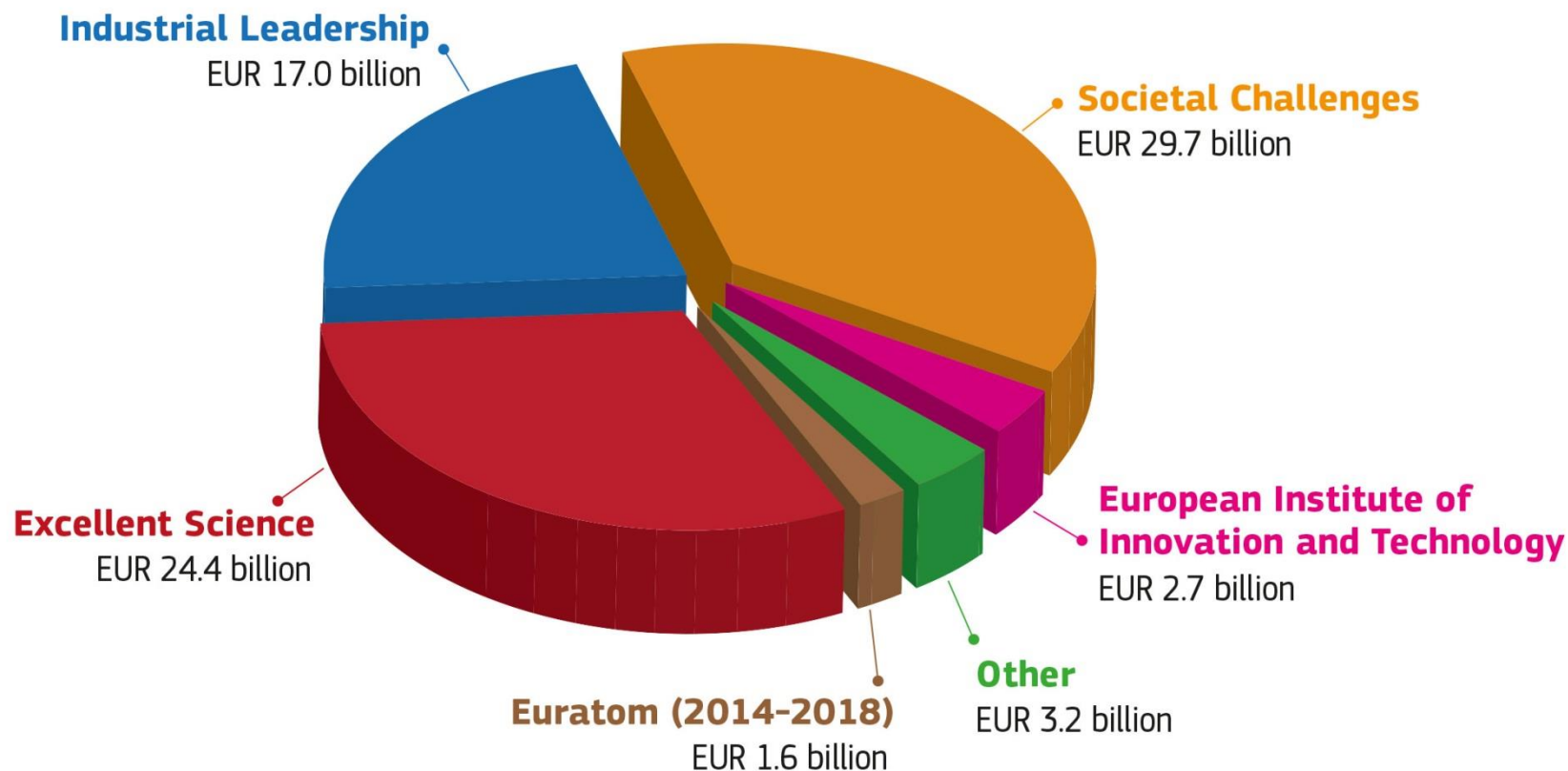
- **A single programme** bringing together three separate programmes/initiatives (former FP7, CIP, EIT)
- **Coupling research to innovation** – from research to retail, all forms of innovation
- **Focus on societal challenges** facing EU society, e.g. clean energy, health and transport
- **Simplified access**, for all companies, universities, institutes in all EU countries and beyond
- **New approach** to international cooperation (EU interests will be protected better but all calls are open to international participants)
- Focus on **SME's (20% of total budget for societal challenges)**

Three priorities

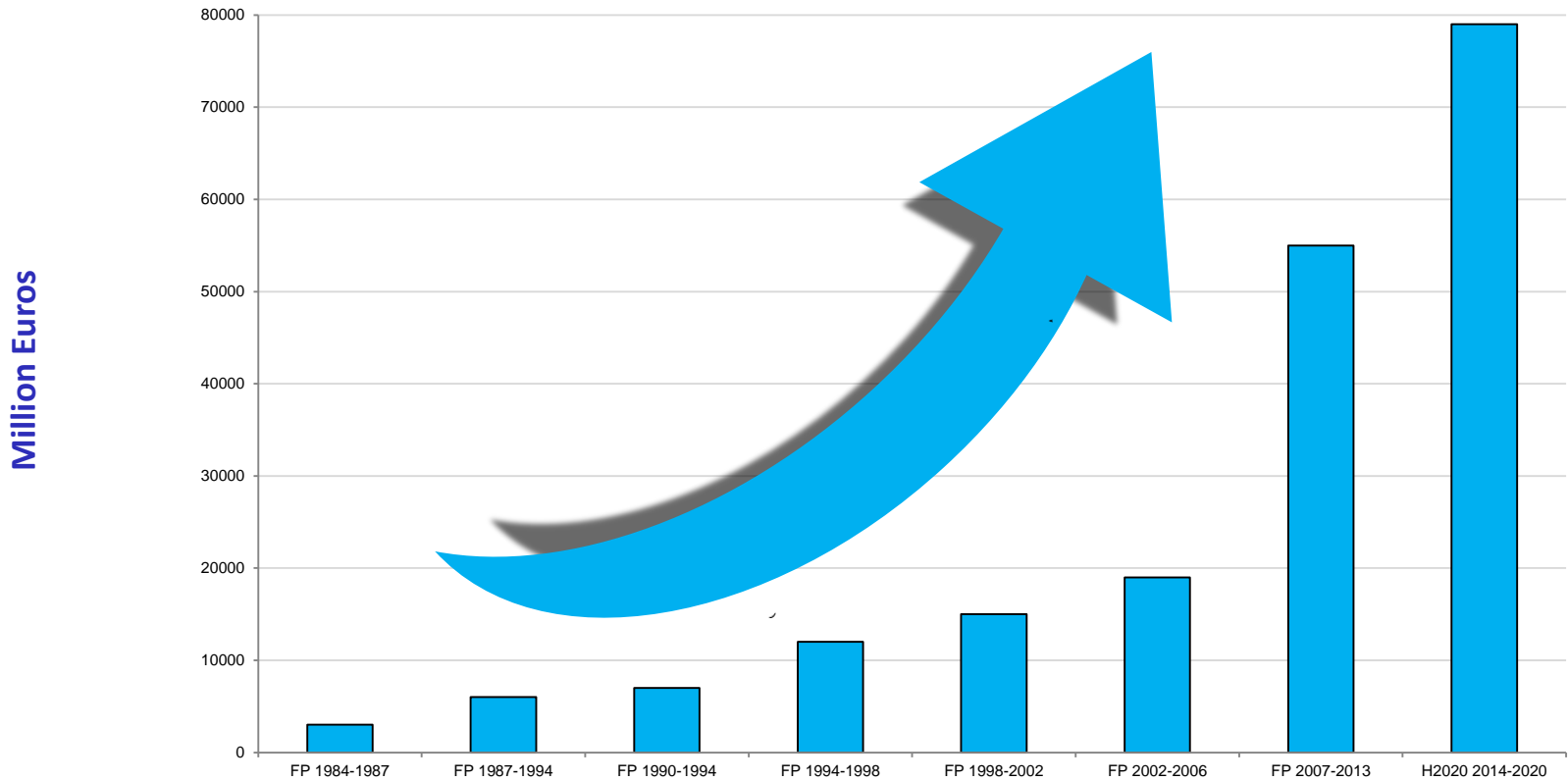


€ 79 billion from 2014 to 2020

HORIZON 2020 BUDGET (in current prices)



Growth of EU Framework Programme Funding



HORIZON 2020

Basic principles

- **2-year work programme** to allow for better preparation of applicants
- **Challenge-based** approach
 - Definition of specific challenge to be tackled - broader scope of topics
 - Applicant can propose the most appropriate solution to the challenge
- Integration of **cross-cutting issues** (social sciences, international cooperation, etc.)
- Cross-thematic cooperation in strategic '**focus areas**'
- Covering the **full innovation cycle** (use of TRLs to specify scope of activities)

Evaluation criteria



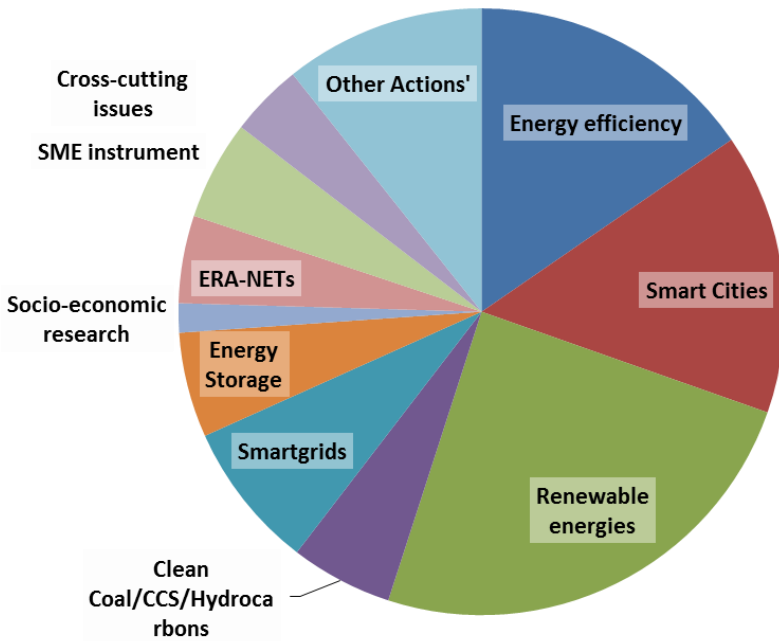
- ✓ **ERC** frontier Research actions >> only EXCELLENCE
- ✓ **Innovation actions** >> higher weighting for "IMPACT"

Proposal evaluated by the experts "as it is"
and not as "what could be" = no need for negotiation

Key challenge "Secure, clean and efficient energy"

- **Objective:** towards a reliable, sustainable and competitive energy system
- Support the implementation of the SET-Plan.
- Broad lines of activities for WP 2014-2015:
 - **Energy Efficiency**
 - **Competitive low-carbon energy**
 - **Smart Cities and Communities**

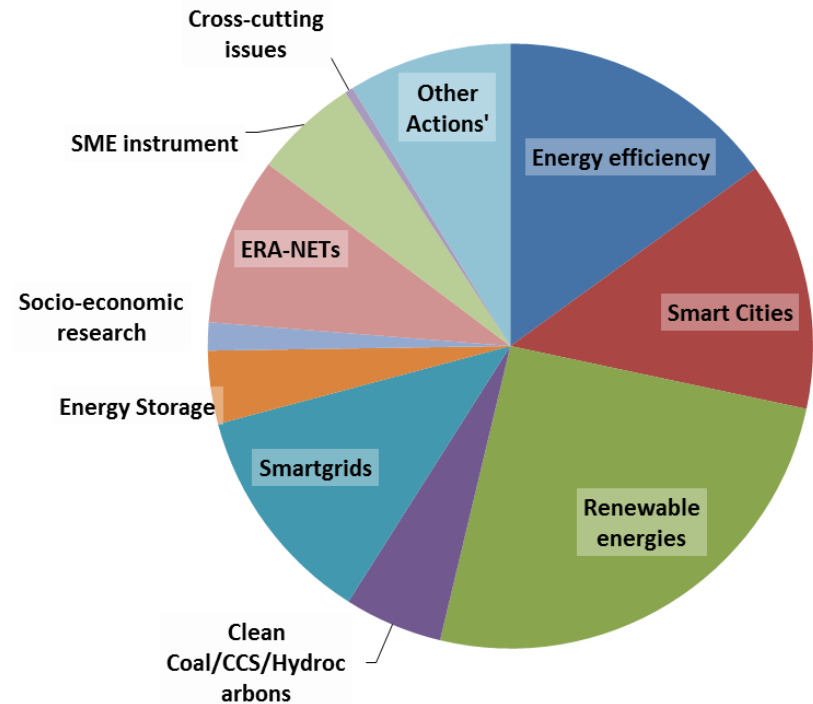
Budget allocation of the Energy WP (2014)



TOTAL budget for 2014: **EUR 607 million**

Contribution to fossil fuels in 2014: **EUR 33 million**

Budget allocation of the Energy WP (2015)



TOTAL budget for 2015: **EUR 647 million**

Contribution to fossil fuels in 2015: **EUR 35 million**

Call Low Carbon Energy : areas to be addressed in relation to Fossil Fuels

	AREA	TRL	TYPE
Enabling the decarbonisation of the use of fossil fuels			
LCE 15	Enabling decarbonisation of the fossil fuel-based power sector and energy intensive industry through CCS	4-5 > 6	RIA
LCE 16	Understanding, preventing and mitigating the potential environmental impacts and risks of shale gas exploration and extraction		RIA
LCE 17	Highly flexible and efficient fossil fuel power plants	3 > 4-6	RIA
Supporting the development of a European Research Area in the field of Energy			
LCE 18	Supporting Joint Actions on demonstration and validation of innovative energy solutions	5-6 > 6-7	ERA-NET
LCE 19	Supporting coordination of national R&D activities	2 > 5	CSA

Technology Readiness Levels

- TRL 0: Idea.** Unproven concept, no testing has been performed.
- TRL 1: Basic research.** Principles postulated and observed but no experimental proof available.
- TRL 2: Technology formulation.** Concept and application have been formulated.
- TRL 3: Applied research.** First laboratory tests completed; proof of concept.
- TRL 4: Small scale prototype** built in a laboratory environment ("ugly" prototype).
- TRL 5: Large scale prototype** tested in intended environment.
- TRL 6: Prototype system** tested in intended environment close to expected performance.
- TRL 7: Demonstration system** operating in operational environment at pre-commercial scale.
- TRL 8: First of a kind commercial system.** Manufacturing issues solved.
- TRL 9: Full commercial application,** technology available for consumers.

Call Deadlines



2014 Call (LCE 15, LCE 16): calls closed

2015 call (LCE 15, LCE 17):

03/09/2014 (Stage 1) closed

05/05/2015 (Stage 2)

LCE 18 –2015 : ERA-NET (a CCS ERA-NET is under preparation)

05/05/2015

Calls:

<http://ec.europa.eu/programmes/horizon2020/en/h2020-section/secure-clean-and-efficient-energy>

Calls 2014 Successful projects:

CEMCAP: CO₂ capture from cement production, EU Contribution 8.8 M€, Coordinator: SINTEF

STEPWISE: SEWGS Technology Platform for cost effective CO₂ reduction the in the Iron and Steel Industry, EU Contribution: 12.97 M€, Coordinator : ECN

GATEWAY: Developing a Pilot Case aimed at establishing a European infrastructure project for CO₂ transport, EU Contribution: 787,701 € Coordinator: SINTEF

2016/2017

Foreseen initiatives

- Twinning cooperation between EU and Korea on new generation high efficiency CO₂ Capture technologies.
- Support to Zero Emission Technology Platform
- Utilisation of captured CO₂ as feedstock for the process industry
- *CCS in industry, including Bio-CCS (possible twinning with China)*
- *Geological Storage pilots*
- *ERA-NET Cofund on Large-Scale Demonstration of CCS*



HORIZON 2020

**Thank you
for your attention!**

Find out more:
www.ec.europa/research/horizon2020