The Research Council of Norway

Update on ACT (Accelerating CCUS technologies)

and

The status for the Clean Energy Transition Partnership (CETP)

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RESEARCH FOR INNOVATION AND SUSTAINABILITY

Accelerating CCS Technologies

ACT- updates

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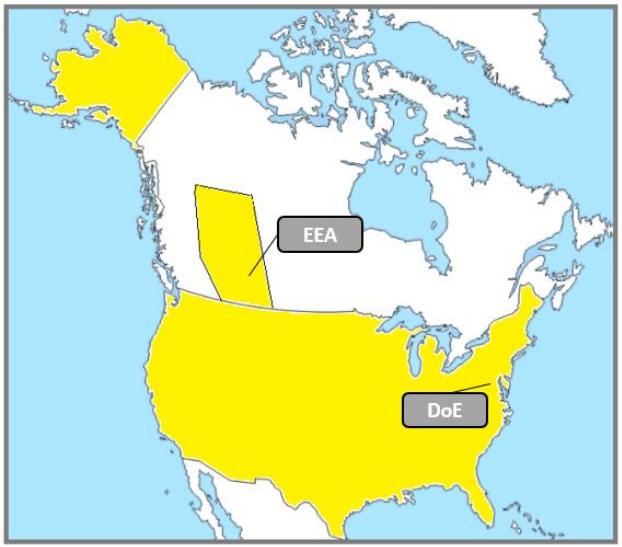
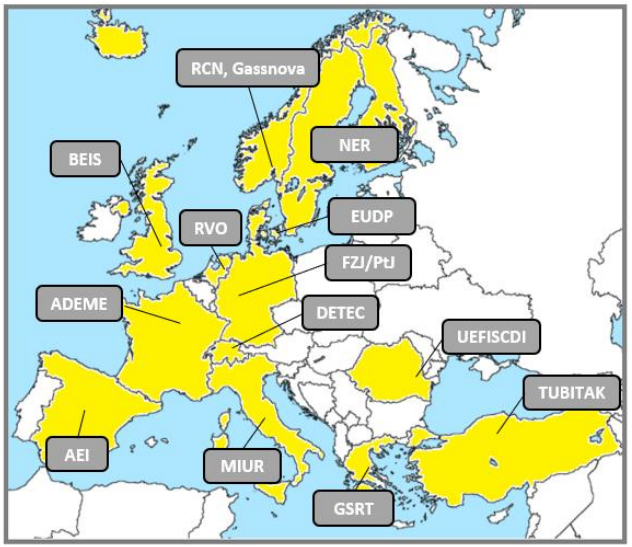
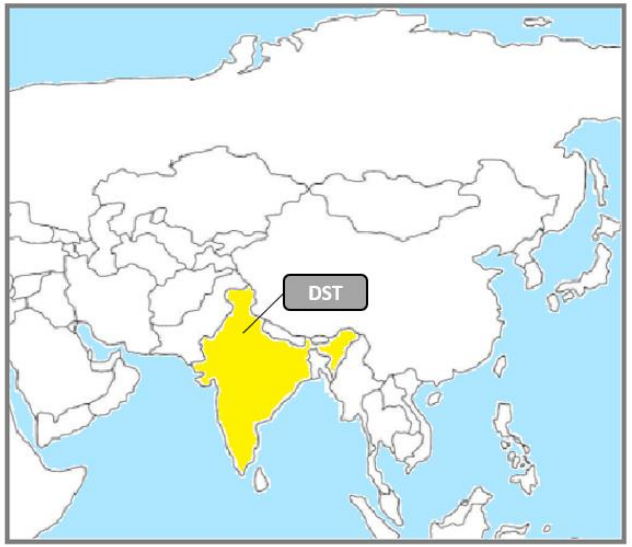
Co-funded by the European Commission within the Horizon 2020

This is ACT

Funding agencies from 16 countries, regions, and provinces are collaborating on calls and knowledge sharing within CCUS







- Alberta (Canada)
- USA

- Denmark
- France
- **Germany**
- **Greece**
- Italy

- **The Netherlands**
- **Norway**
- Nordic countries
- **Romania**

- **Spain**
- **Switzerland**
- **Turkey**
- **UK**

- India

Bold= countries from the start 2016

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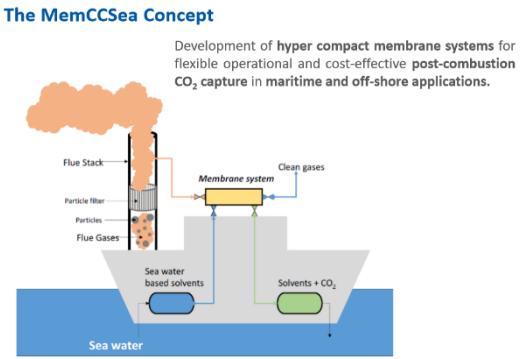
ACT – An ambitious initiative

- Fund research and innovation projects that can lead to safe and cost effective CCUS technology development
- Establish international cooperation for accelerated CCUS deployment in the power and industry sectors
- Cooperating on joint calls and knowledge sharing, in alignment with
  - **SET Plan implementation, CCUS, Action 9**
  - **Mission innovation Research priorities**


Norcem Cement Plant, Norway


Rotterdam Harbour



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… CCUS is needed ….

- The IPCC 1.5 degrees report makes it very clear that CCUS must be part of an affordable and socially acceptable energy transition.
- The thematic priority CCUS is essential to the climate-neutrality goal of Europe.
- Underlined in a number of policy documents issued by EC and others.

….and ACT has a role….

- **ACT-deliver:** International projects with high impact.
  - Results relevant to the industry and policy makers
- **The European Commission** has stated that ACT is one of the most important CCUS tools in Europe.

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ACT – Calls, projects and budget

- ACT raises significant amount of national funding to R&D within a broad CCUS domain
  - **ACT1** (2016) 36 M€ (incl. 11,8 M€ from the EC): 8 projects completed
  - **ACT2** (2018) 32 M€: 12 projects funded, mid term now
  - **ACT3** (2020) 36-38 M€: evaluation of 36 projects in progress

- We have a growing consortium with new members and active partners
  - National contribution for funding projects varies between 300.000 € up to 8 M€
- We have achieved excellent transnational collaborations built on trust and a lean and effective governance

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Knowledge Sharing

- The projects must learn from each other
- The projects should lead to accelerated CCS deployment
- Focus on communication of results to CCUS stakeholders, industry, and decision makers
- ACT Knowledge Sharing Workshop
  - Romania, 2017
  - Germany, 2018
  - Greece, 2019
  - Virtual workshop 16-17 November 2020

ACT OPEN Call

- There is no fixed date for submitting applications.
- The application process starts by contacting the national contact points in order to get feedback on the relevance of your idea and to get advices for how to establish an application.
- Countries participating: **Germany**, **Norway**, **Switzerland** (**Canada/Alberta** open for discussion on a project-to-project basis).

- ***Ambition to attract CCUS projects operating at high TRL.***
- ***Applications must have high industrial involvement and it must be documented that the project can lead to deployment of full scale CCUS projects.***

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Bridging to Horizon Europe Parnership

CCUS trends in an international perspective has become wider the last years

- CCS/CCU integrated in industrial facilities
- Hydrogen production combined with CCS
- CO_2 utilization (new products)
- Direct Air Capture (DAC)
- Bio Energy with CCS (BECCS)

Horizon Europe Cluster 5 (quoting):

- *CCUS will play a crucial role in Horizon Europe/EU Green Deal in particular for the **transition of energy-intensive industries** and the **power sector** towards climate neutrality*
- ***Particularly important in those industries where other alternatives do not yet exist***
- *If CCUS combined with sustainable **biomass**, it could create negative emissions*
- ***Low carbon hydrogen** from natural gas with CCUS*
- *Demonstration of the full **CCUS chain***
- *Conversion of captured **CO2 to useful products***

The Clean Energy Transition Partnership (CETP)

2021-2027

Clean Energy Transition Partnership (CETP) at a glance

- Co-funded Partnership under Horizon Europe – **Cluster 5: Climate, energy and mobility**
- Collaboration of funding organisations (Ministries, R&I funders)
- From all EU Member countries, Associated countries, and beyond
- Financial support from Horizon Europe/European Commission

- CETP will organise joint calls and accompanying activities
- Stimulating R&I projects and joint learning

- 2021: establishment of CETP
- 2022: first joint call(s)

…and CETP has a link to Cluster 4: **Digitalization, Industry and space**.

…and to Cluster 6: Food, Bioeconomy, Natural Resources, Agriculture and Environment

CETP in a broader policy context

UN Sustainable Development Goals

EU Climate Ambition

- A Clean Planet for All
- The European Green Deal
  - Energy System Integration strategy and Hydrogen Strategy
  - Renovation Wave strategy
  - Off shore Renewable Energy strategy
  - Biodiversity strategy

- National Energy and Climate Plans
- EU Competitiveness Progress Report

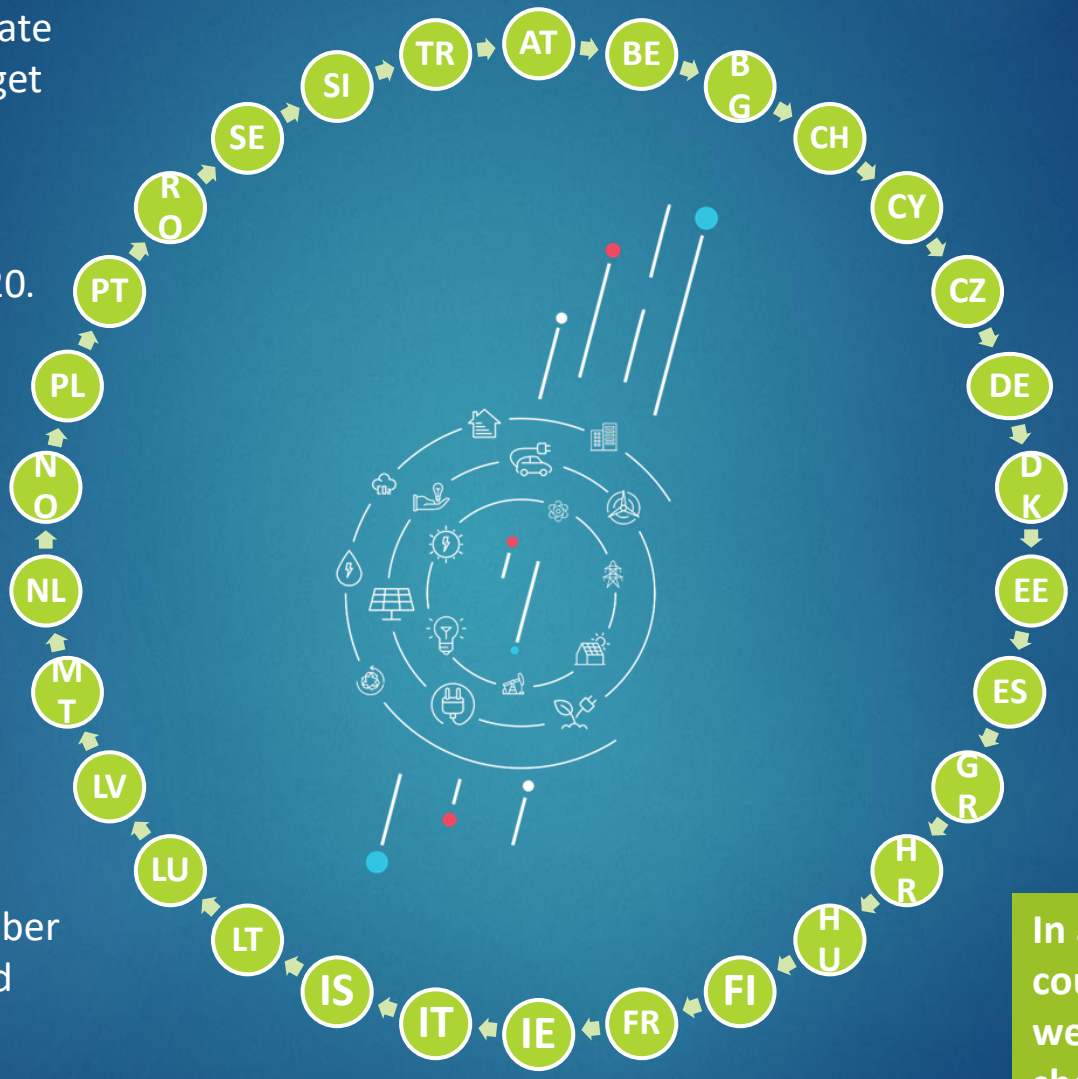
- Recovery and Resilience Facility, within the Next Generation EU Programme
- EU Taxonomy

RDI for the clean energy transition

- A new European Research Area (ERA)
- European Strategic Energy Technology Plan (SET Plan)
- International Collaboration: Mission Innovation and the International Energy Agency

30 countries have indicated their interests to participate in and allocate budget to the CETP

Endorsment of the SRIA November 2020.

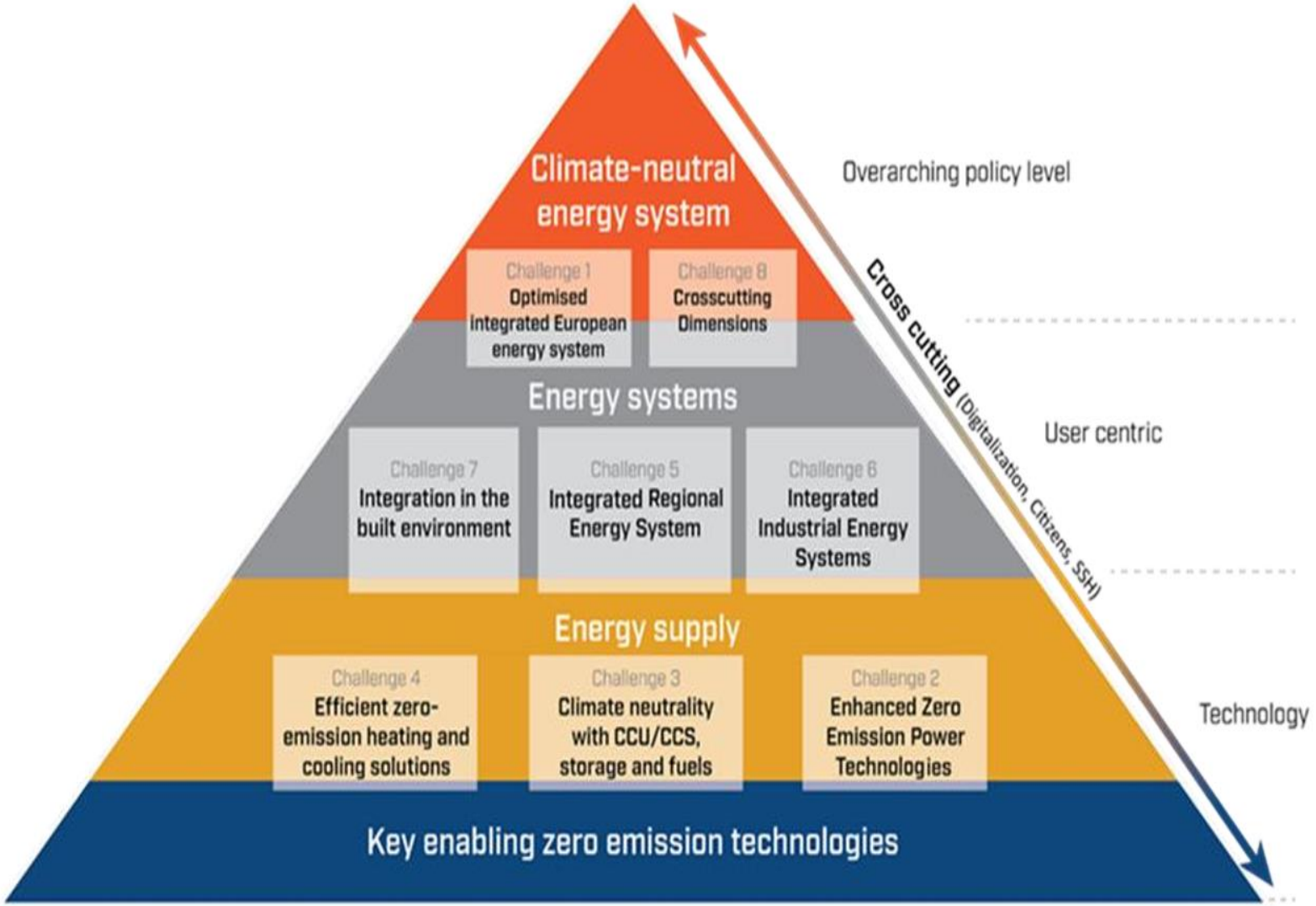


European Commission
~ 210 Million €

Indicated budget contribution of Member states and Associated countries
~ 500 million €
(16 November 2020)

In addition to the countries mentioned, we welcome others to show their interest and take part in the CETP

From enabling Technologies towards an integrated energy system



CETP Challenge 3: **Enabling Climate neutrality with Storage Technologies, Renewable Fuels and CCU/CCS**

1. **Storage technologies** and solutions need to meet short (seconds and minutes) to medium (intra-day and week) and long term (seasonal) energy storage needs for various energy carriers and provide valuable ancillary services to the energy system.
2. Utilization of a wide range of **energy vectors**, in particular hydrogen and renewable fuels, as well as hybrid solutions are expected to support cross-sectoral integration.
3. Appropriate **liquids and gases**, **fuel and chemicals** technologies will serve flexibility and sector coupling needs in the energy system, and are an important enabler for sector integration with, for example, industry or transport.
4. **CCU/CCS technologies** need to be deployed and upscaled to maximise carbon reuse in a circular economy and to remove carbon from the energy system and in particular from hard-to-decarbonize sectors to ultimately deliver negative emissions and to strengthen sector integration with industry.

CH6: Integrated Industrial Energy Systems

- Develop and demonstrate integrated **industrial power**, **heating and cooling systems**, **hybrid solutions and novel technologies** that enable efficient carbon-neutral industrial sites and production.
- A large share of the industrial energy supply shall be based on **renewable sources**.
- Where carbon emissions cannot be avoided, **CO2 shall be captured, utilized for production of preferably long-lifetime products or permanently stored**. To produce negative emissions, capture and storage of biogenic CO2 from the exhaust gases, i.e. **bio-CCS**, is an option.
- Industrial energy systems shall integrate with local, regional and national heat and power networks and systems.
- The energy and industrial systems shall **integrate as renewable power** and also be used to produce hydrogen which can be utilized as energy carrier or raw material in industrial processes or with CO2 utilization (CCU) to synthesize e-products for the replacement of fossil-based fuels and chemicals.
- **E-fuels** may serve as power storage and, as the integration of the energy and industrial systems proceeds, new flexibility sources, e.g. extended industrial demand response, shall be established.

CETP challenges and the links to the Biomass field (biofuels and bioenergy)

STORAGE, FUELS AND CCU/CCS

(CHALLENGE 3)

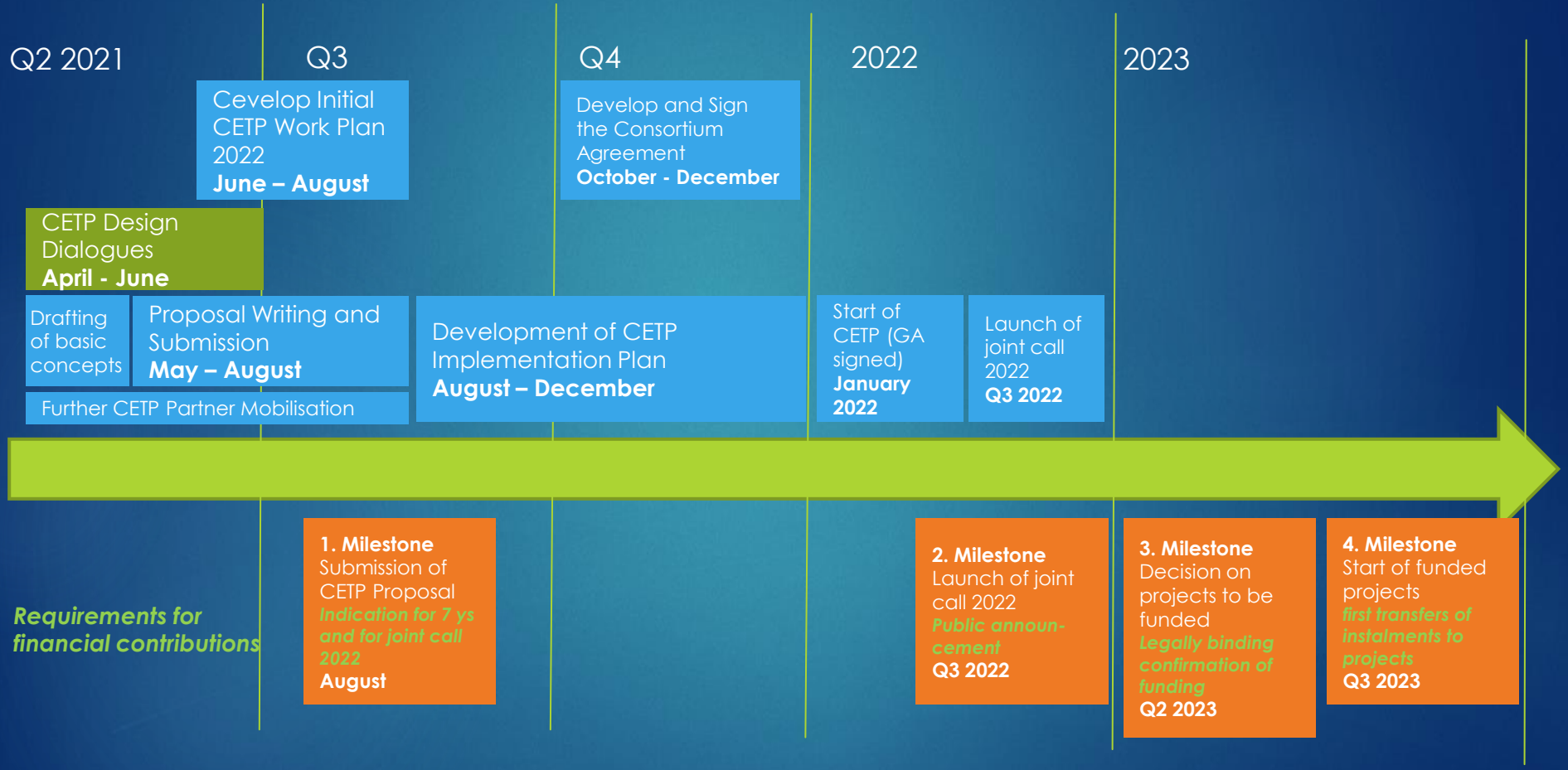
HEATING AND COOLING TECHNOLOGIES (CHALLENGE 4)

INDUSTRIAL SYSTEMS

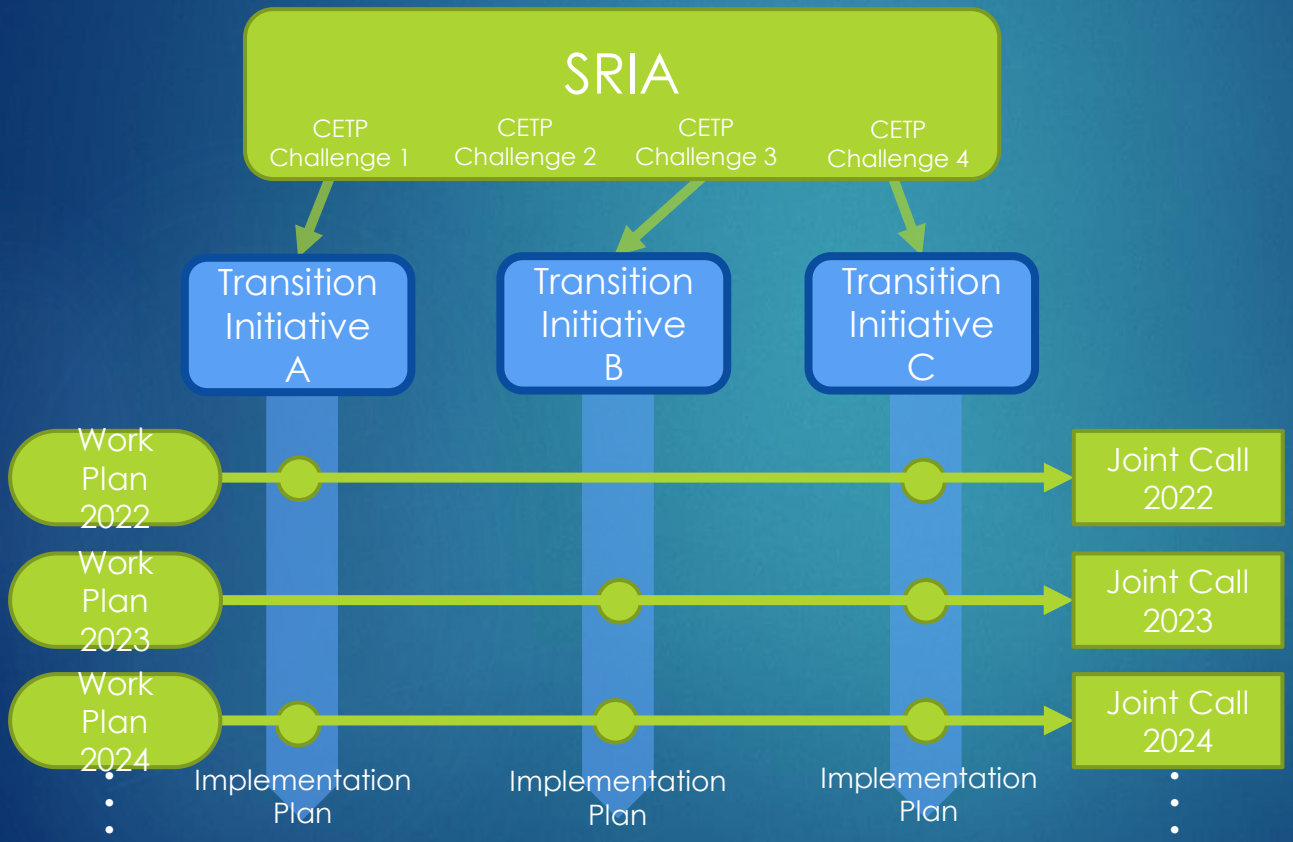
(CHALLENGE 6)

CETP -Big Picture

Setting up and launching the initiative



Transition Initiatives as Main Actors on the Joint Programming Platform



Take away messages

- A long menu to chose from….
- Make sure that “your” country is connected to the CETP core group
- Interlinking system level challenges to technology solutions is critical for success of CETP
- **The Research council of Norway considers to take a lead in challenge 3, and build the development of CETP on the great experience from ACT**

Thank you for your attention !