Demo: CO_2 geological storage pilot

SCCER SoE

SWISS COMPETENCE CENTER for ENERGY RESEARCH
SUPPLY of ELECTRICITY

M. Mazzotti

& Stefan Wiemer (ETHZ)

Sion, 13.9.2016

In cooperation with the CTI

Energy funding programme
Swiss Competence Centers for Energy Research

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

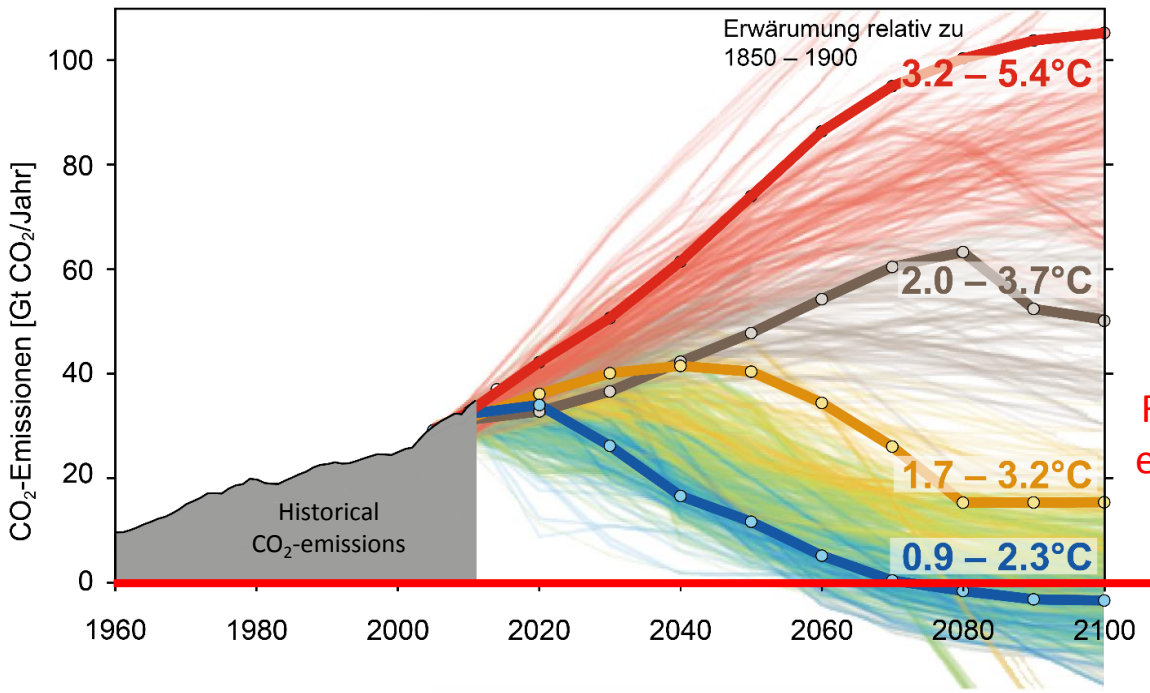
Commission for Technology and Innovation CTI

Motivation

IPCC AR5

Paris Agreement

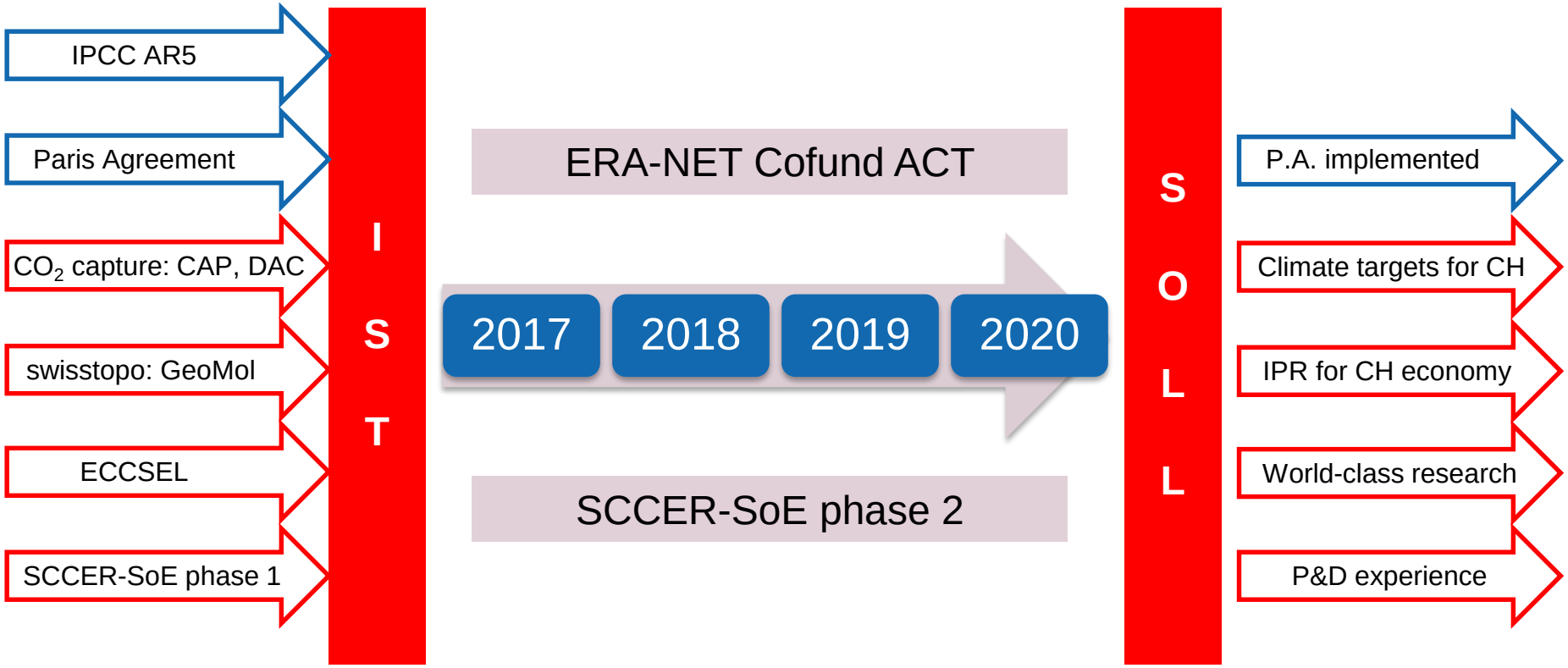
I S T



Reducing emissions

„Producing“ negative emissions

Motivation


IPCC AR5
Paris Agreement
CO_2 capture: CAP, DAC
swisstopo: GeoMol
ECCSEL
SCCER-SoE phase 1
I
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T
ERA-NET Cofund ACT
2017
2018
2019
2020
SCCER-SoE phase 2
S
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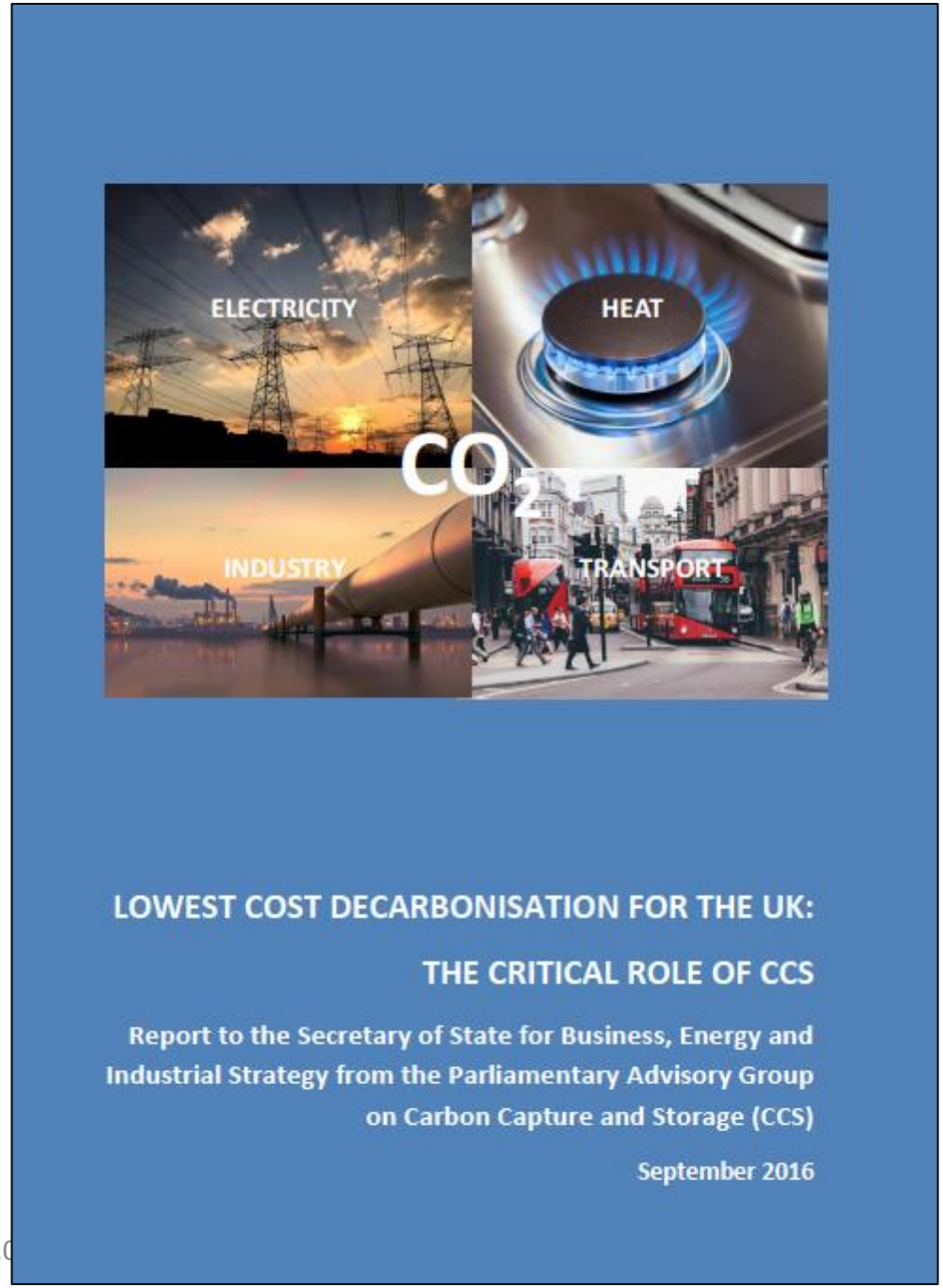
P.A. implemented
Climate targets for CH
IPR for CH economy
World-class research
P&D experience


ELECTRICITY
HEAT
CO2
INDUSTRY
TRANSPORT
LOWEST COST DECARBONISATION FOR THE UK:
THE CRITICAL ROLE OF CCS
Report to the Secretary of State for Business, Energy and Industrial Strategy from the Parliamentary Advisory Group on Carbon Capture and Storage (CCS)
September 2016

UK case

I have been surprised myself at the absolutely central role which CCS has to play across the UK economy if we are to deliver the emissions reductions to which we are committed at the lowest possible cost to the UK consumer and taxpayer.

While some of the recommendations may at first reading appear unconventional, they are absolutely focused on the delivery of least cost solutions.

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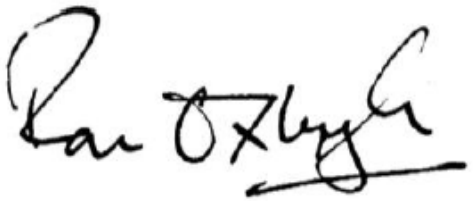
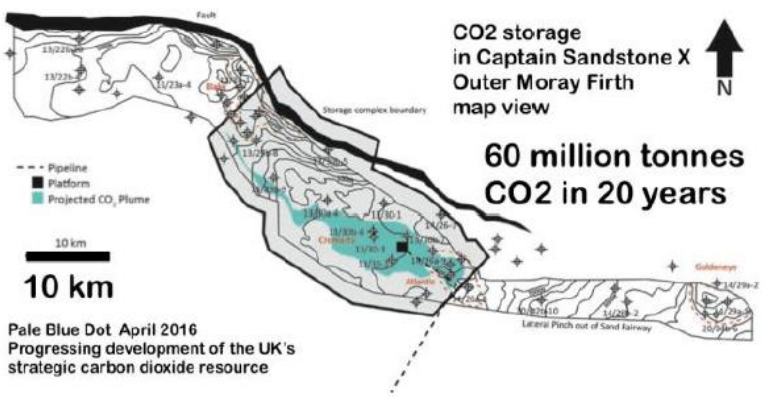
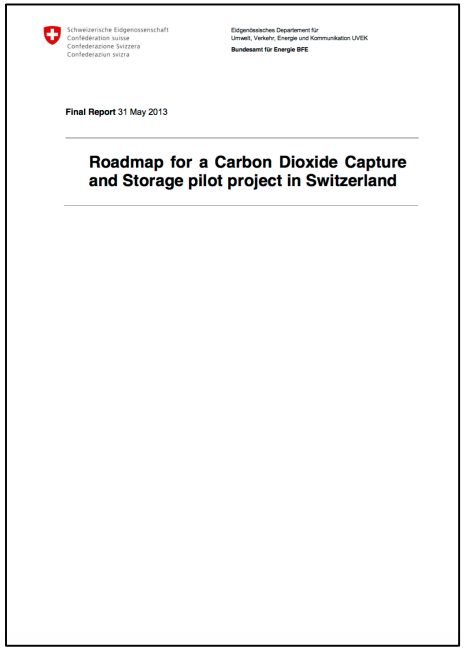


Ron Oxburgh



CCS activities in Switzerland

Very limited activities since CARMA, limited support within CH!



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Eidgenössisches Departement für
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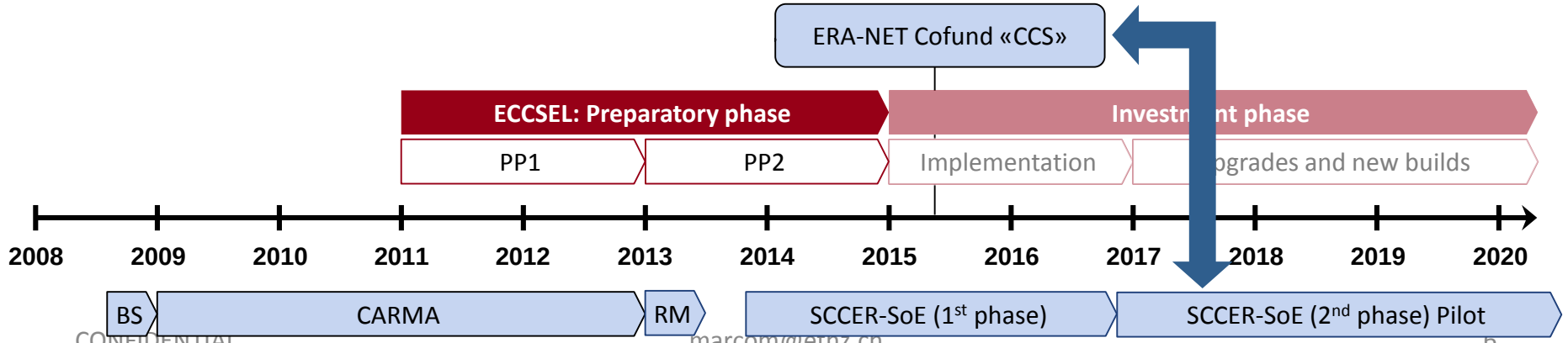
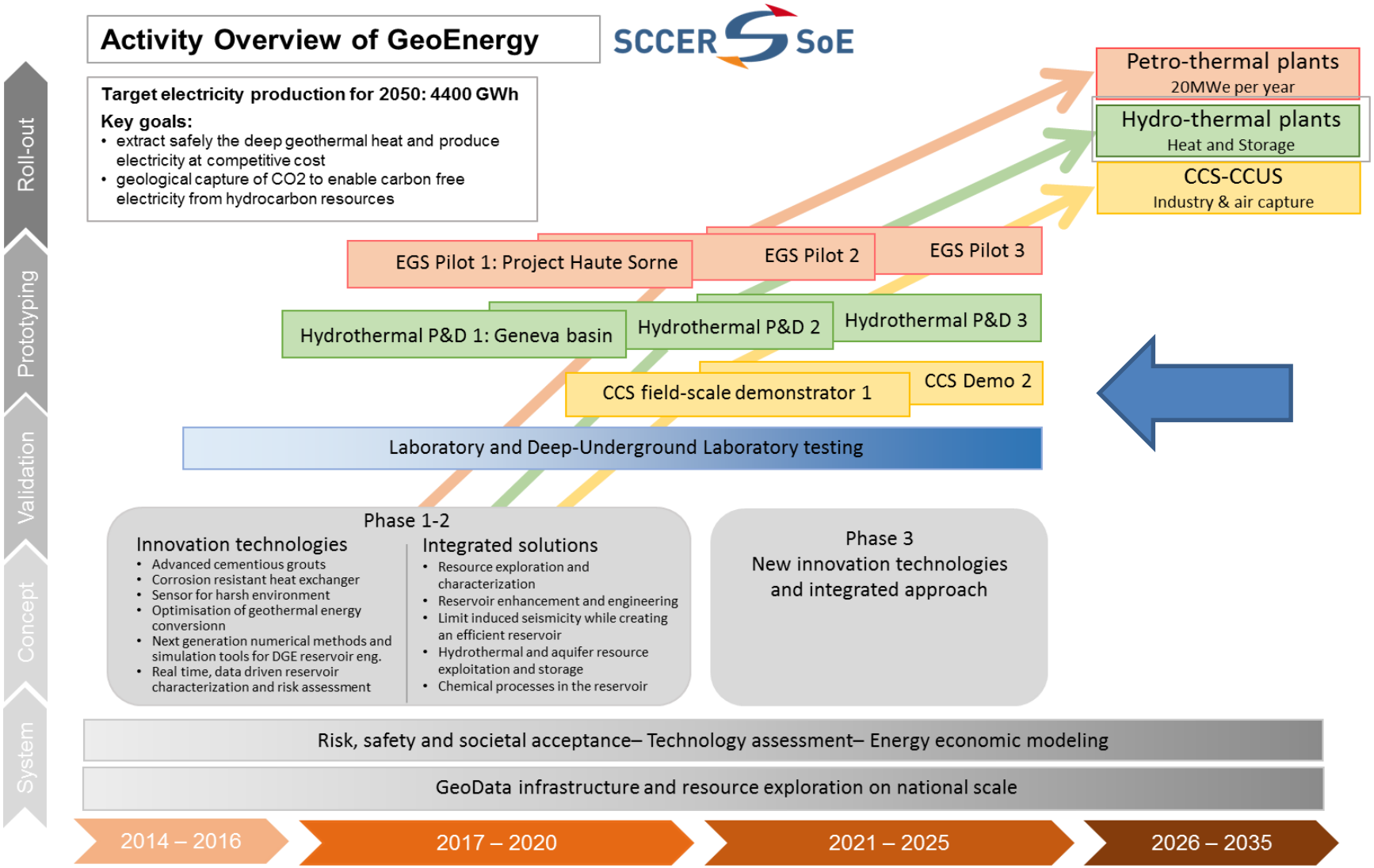
Bundesamt für Energie BFE

Final Report 31 May 2013

Roadmap for a Carbon Dioxide Capture and Storage pilot project in Switzerland



SCCER Roadmap (Phase I & II)



eccsel

European Carbon Dioxide Capture and Storage Laboratory Infrastructure

"Enabling low to zero CO2 emissions from industry and power generation"

Pan European World Class Research Infrastructure for CCS

- 9 European countries
- 20+ labs (all elements)
- Open access to promote excellence
- Pilot phase started 2015
- Fully operational 2016/17
- Investment ~€200 Million (KRW 260 billion), €35Million already invested

http://www.eccsel.org/

ERANET Cofund ACT

What is ACT?

ACT aims to **A**ccelerate and mature **C**CS **T**echnologies by making available funds for research and innovation activities.

A new instrument under Horizon 2020 called ERA NET Cofund is a new tool for European countries together with the European Commission (EC) to establish large common calls.

Ten partners from nine countries have established ACT, an ERA NET Cofund on CCS, with the objective of accelerating deployment of CCS.

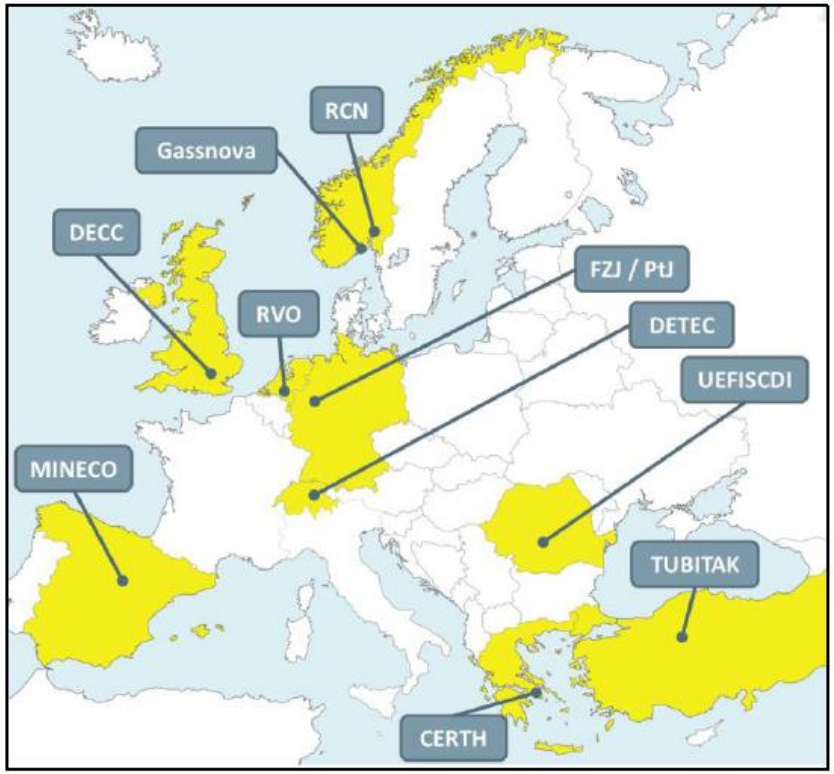
What will ACT do?

Early in 2016, ACT will publish a joint call for RD&D proposals. The budget for the call is close to **41 million euro** and the call will ask for large transnational projects that facilitate the incorporation of CCS in the energy and industrial sectors.

Stay informed

Information will be available at the ACT web site that will be up and running in February 2016: www.ACT-CCS.eu

ACT members



ERANET Cofund ACT

ACT Timeline

February 2016: Preannouncement of the call.

June 2016: Call text to be published.

September 2016: Due date for proposals, stage 1. Only sketches of how the projects will look like are required.

September 2016: Invitation to second stage for all application passing stage 1

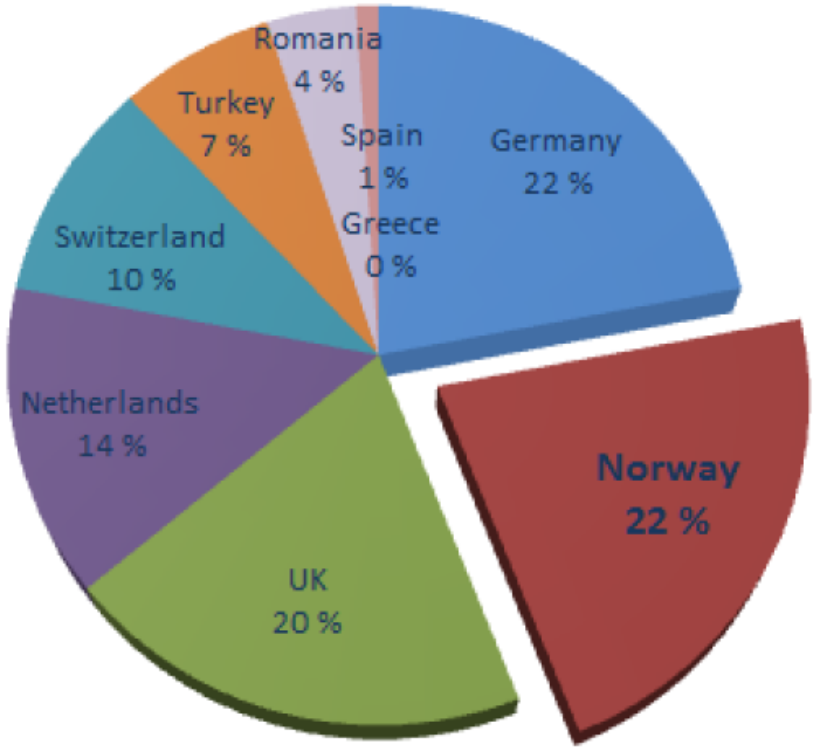
January 2017: Due date for proposals, stage 2. Full proposals are required.

July 2017: Evaluation of proposals completed

July 2017: Signing contracts with new projects

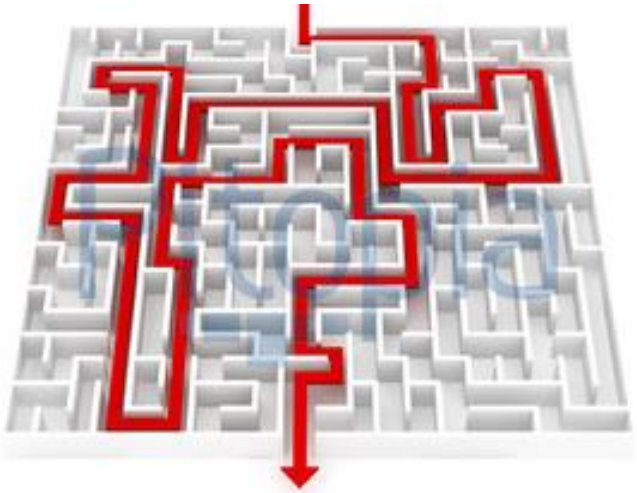
July 2020: Projects closing

Indicative distribution of the budget



The total budget for the 2016 ACT call is close to 41 million euro.

CH ACT roadmap



ELEGANCY

Enabling the Low Carbon Economy by Hydrogen and CCS

Call:	ACT stage 1, pre-proposal, deadline 2016-09-07
Contact person:	Chief Scientist Svend Tollak Munkejord, SINTEF ER, +47 47378042
Project partners:	SINTEF ER, BGS, ECN, ETH, ICL, PSI, RUB, SCCR-SoE, TNO, Arntzen de Besche, Casale, Climeworks, First Climate, Scottish Enterprise, Shell, Swerea MEFOS

Lead: SINTEF (Norway)

ELEGANCY

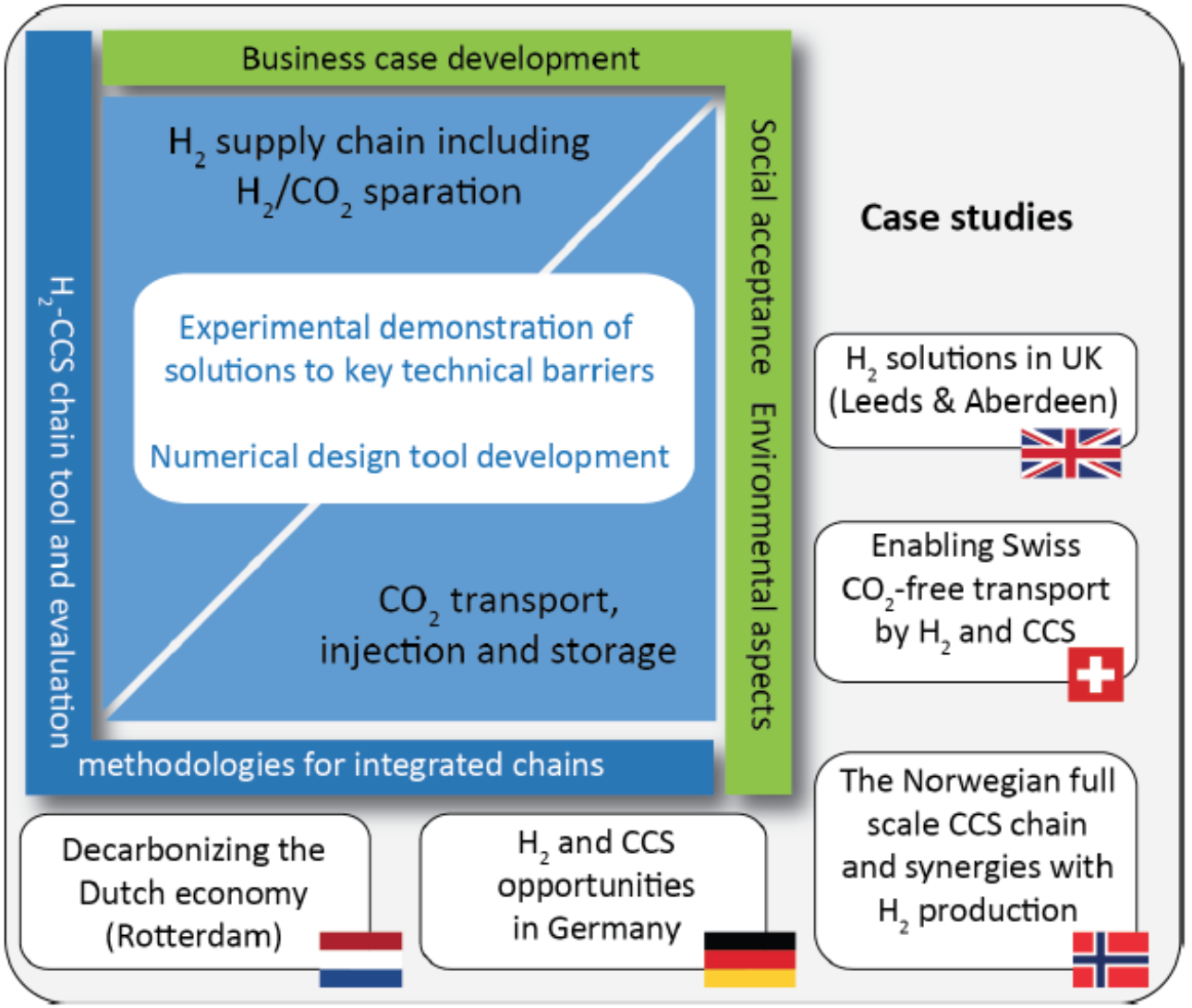


Figure 1: ELEGANCY research overview.

ELEGANCY

Case studies incl. social acceptance, environmental aspects and CCS/H_2 market considerations:
UK (Leeds & Aberdeen), Netherlands (Rotterdam), Norway (full scale CCS chain and offshore activities), Switzerland (decarbonisation of transport sector), Germany (centralized and decentralized decarbonization) **WP5**

H_2-CCS chain tool and evaluation methodologies for integrated chains:
(ICL, SINTEF, PSI, RUB, TNO) **WP4**

Business case development:
(Arntzen de Besche, FirstClimate, Sustainable Decisions) **WP3**

H_2 supply chain including H_2/CO_2 separation

WP1

- H_2 from natural gas (Casale, ETH, PSI)
- H_2 from other sources (ECN)
- Characterization of $CO_2/CO/H_2$ mixtures (RUB)

CO_2 transport, injection and storage

WP2

- CO_2 pipeline transport (SINTEF)
- CO_2 transport – injection interface (SINTEF)
- Site selection for storage (ICL, BGS, ETH)
- Intermittent supply (BGS)
- Optimizing capacity (BGS, ETH)
- De-risking storage (ICL, BGS, ETH)

ELEGANCY project management
(SINTEF) **WP6**

Figure 2: ELEGANCY work breakdown structure.

Swiss Case study: Capture

- Today, transport is responsible for about 25% of global CO_2 emissions, almost 80% of which due to road transport. In Switzerland, CO_2 emissions from transport currently reach 40% of the total. Therefore, decarbonization of the transport sector is key for a successful reduction of the total CO_2 emissions.
- ELEGANCY postulates the decarbonization of the road transport through the use of **hydrogen**, which is produced from fossil fuels while capturing and storing the by-product CO_2. ELEGANCY explores the value- and supply-chain of hydrogen from the fossil fuel raw material to its distribution to the end users, as well as the associated CCS value-chain.
- ELEGANCY will focus on the H_2-CO_2 separation from a natural gas derived mixture in small-to-medium scale H_2 production plants

Swiss Case study: Storage

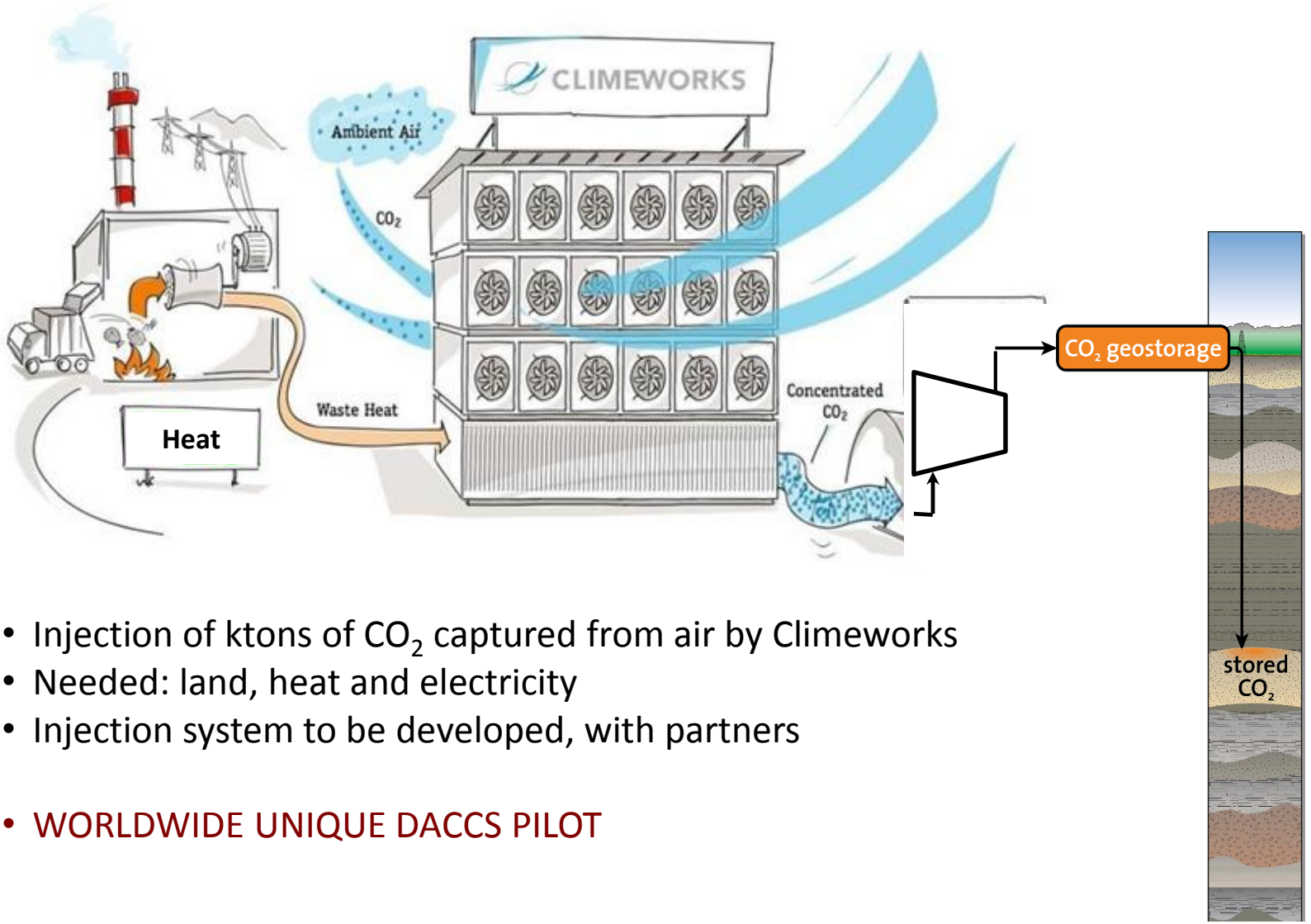
- The SCCER-SoE Phase II proposes to installs as Pilot and Demonstration project 4 ,a CCS field demonstrator, including a CO_2 geological storage test-site. These would move the ongoing conceptual and validation work based in the laboratory to the next level: prototyping.
- Funds request within ELEGANCY for the Swiss case study will be used to enable and accelerate this CCS field demonstrator in Switzerland and therefore focus on **accelerating the national Swiss CCS roadmap**.
- The major obstacles for implementation of CCS in Switzerland are

  1. an unclear business case;

  2. the uncertainty whether the targeted saline aquifers are safe and economically viable options;

  3. the challenges due to societal acceptance

DACCS pilot in Switzerland: Demo 4



- Injection of ktons of CO_2 captured from air by Climeworks
- Needed: land, heat and electricity
- Injection system to be developed, with partners

- WORLDWIDE UNIQUE DACCS PILOT

Swiss Case study: Storage

- **Task 1:** Developing a 'clean' source of CO_2 for the field demonstrator.
- **Task 2:** Understanding societal readiness for CCS, DACCS and CCSU
- **Task 3:** Site identification and characterization.
- **Task 4:** Reservoir modelling and validation.
- **Task 5:** Risk assessment, monitoring and mitigation.

→ Knowledge Transfer from key partners.

→ All storage funds requested (~1.8M Euro) to the SCCER-SoE.

→ Management by a steering group.

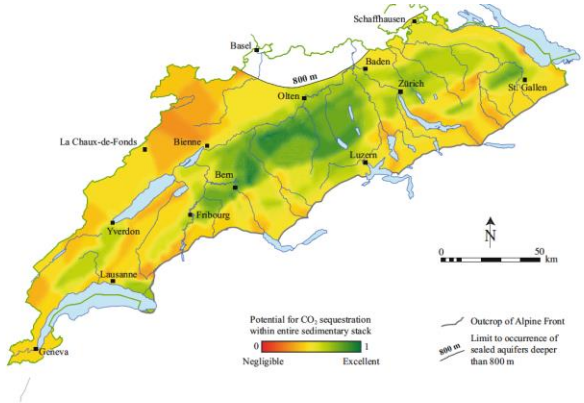
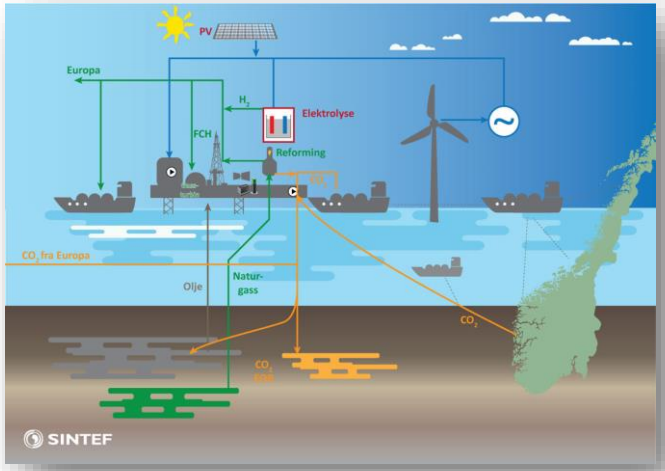
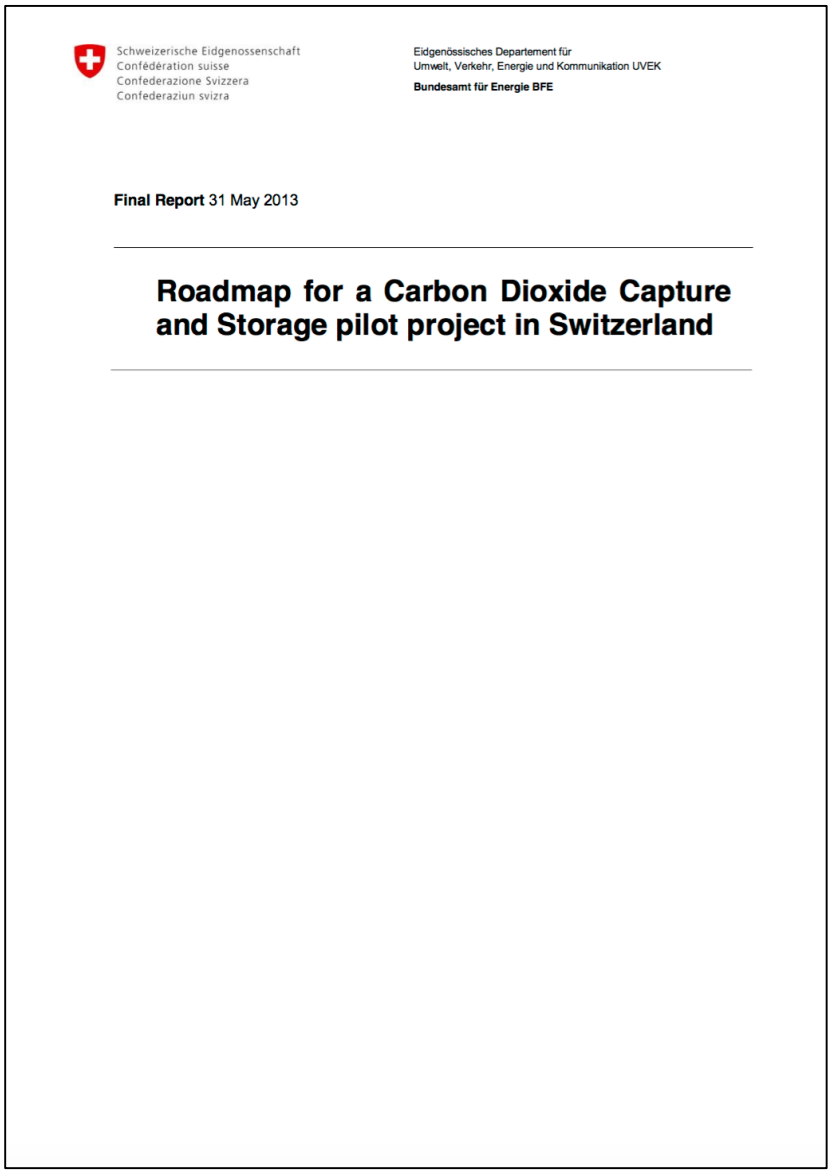


Fig. 7 Intrabasinal evaluation of the potential of the Swiss Molasse Basin and adjacent Jura for geological storage of CO_2. *Colours* show map. Approximately 5,000 km^2 of the mapped area exhibits storage potentials above 0.6



Thank you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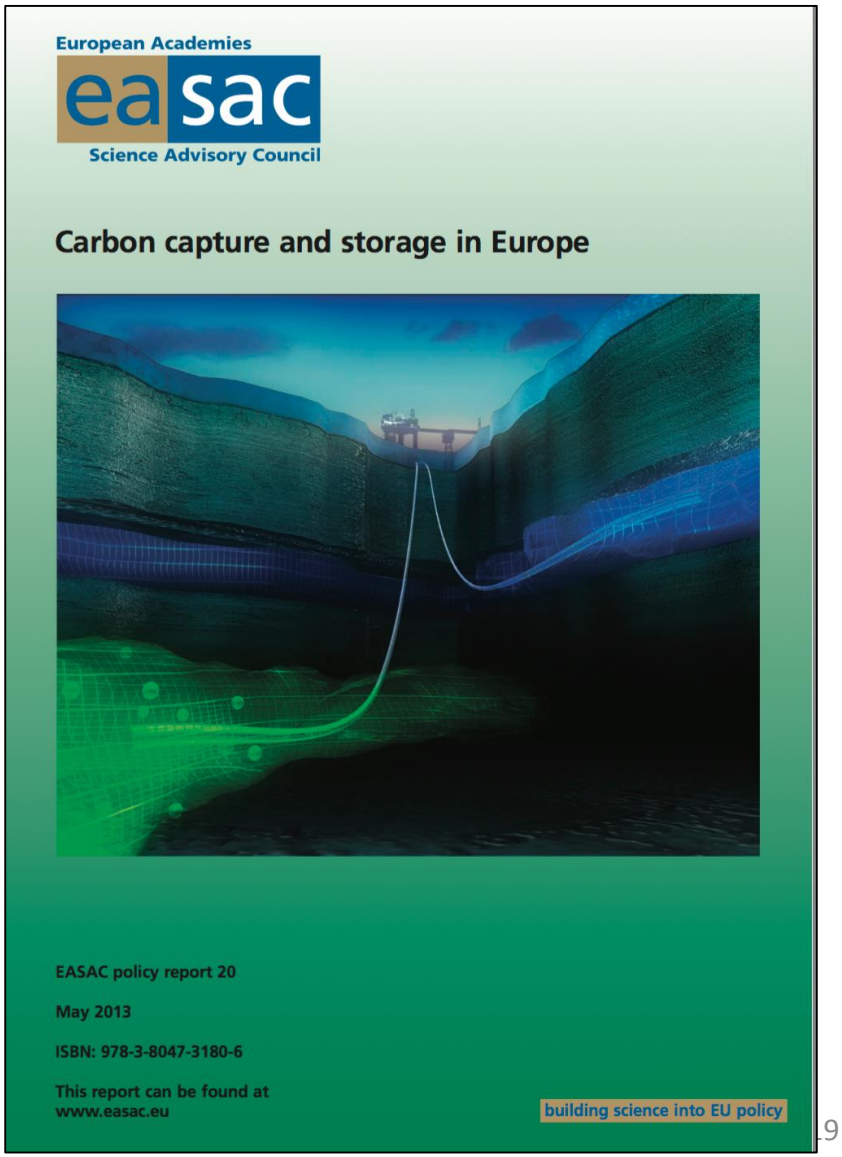
European Academies
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Science Advisory Council
Carbon capture and storage in Europe
EASAC policy report 20
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ISBN: 978-3-8047-3180-6
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building science into EU policy