



# CSL Forum

## 2nd Ministerial Meeting

### ITALIAN ROADMAP: Project's Proposal for CSLF

- ∅ **SEPCA**: Advanced Technologies for CO<sub>2</sub> Separation and Capture for Existing and Innovative Fossil Fired Power Plants
- ∅ **CO<sub>2</sub>STOIT** : Italian Geological survey for CO<sub>2</sub> storage and experimental tests
- ❖ **CCP**: already proposed during Rome CSLForum

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*Italian Delegate in the CSLF Technical Group*



## Development and demonstration of new generation plants for electricity and hydrogen production from fossil fuels

- Technologies, components and new systems for hydrogen production and for H<sub>2</sub>/CO<sub>2</sub> separation
- Oxy firing: H<sub>2</sub>-O<sub>2</sub> combustion with steam recycling
- Gasification of coal (and biomass) + CCS
- High efficiency / ultra low - zero emissions combustion
- Plant Integration; Pre combustion technologies integrated in advanced high temperature gas turbine cycles



# SEPCA: Short term objectives

- Improvement and optimisation of **high-sulphur coals gasification**
- Testing and evaluation of different **high and low temperature desulphurization** processes
- Development and validation of **simulation models**, collection of experimental data for the scaling-up of pilot plant sections
- Optimisation of **water-gas shift process** and catalysts characterisation
- Testing and evaluation of different **CO<sub>2</sub> Separation processes**
- Lab testing on **membrane separation processes** (CMR in particular)
- Pilot scale testing on **sorbent capture processes**
- Development of **hydrogen purification systems**



# SEPCA: Short-mid term milestones

## Short/medium-term milestones

- Realization of pilot plant (1 MW) for coal gasification and H<sub>2</sub>/electricity generation
- Realisation of low scale integrated test rig for H<sub>2</sub> and electricity production from coal
- Experimental tests for development of advanced technologies

## Medium/long – term milestones

- Realization of industrial scale demonstration plant (10 to 100 MW) for coal gasification and H<sub>2</sub>/electricity generation
- Demonstration of processes, components and integrated system



# SEPCA: Partners and funds

## Partners

- ANSALDO – ENEL – CESI – SOTACARBO - CSM
- ENEA - UNIVERSITIES: Genoa, Cagliari, Rome, Milan, Naples, etc..
- ENI (in CCP)

## Funding

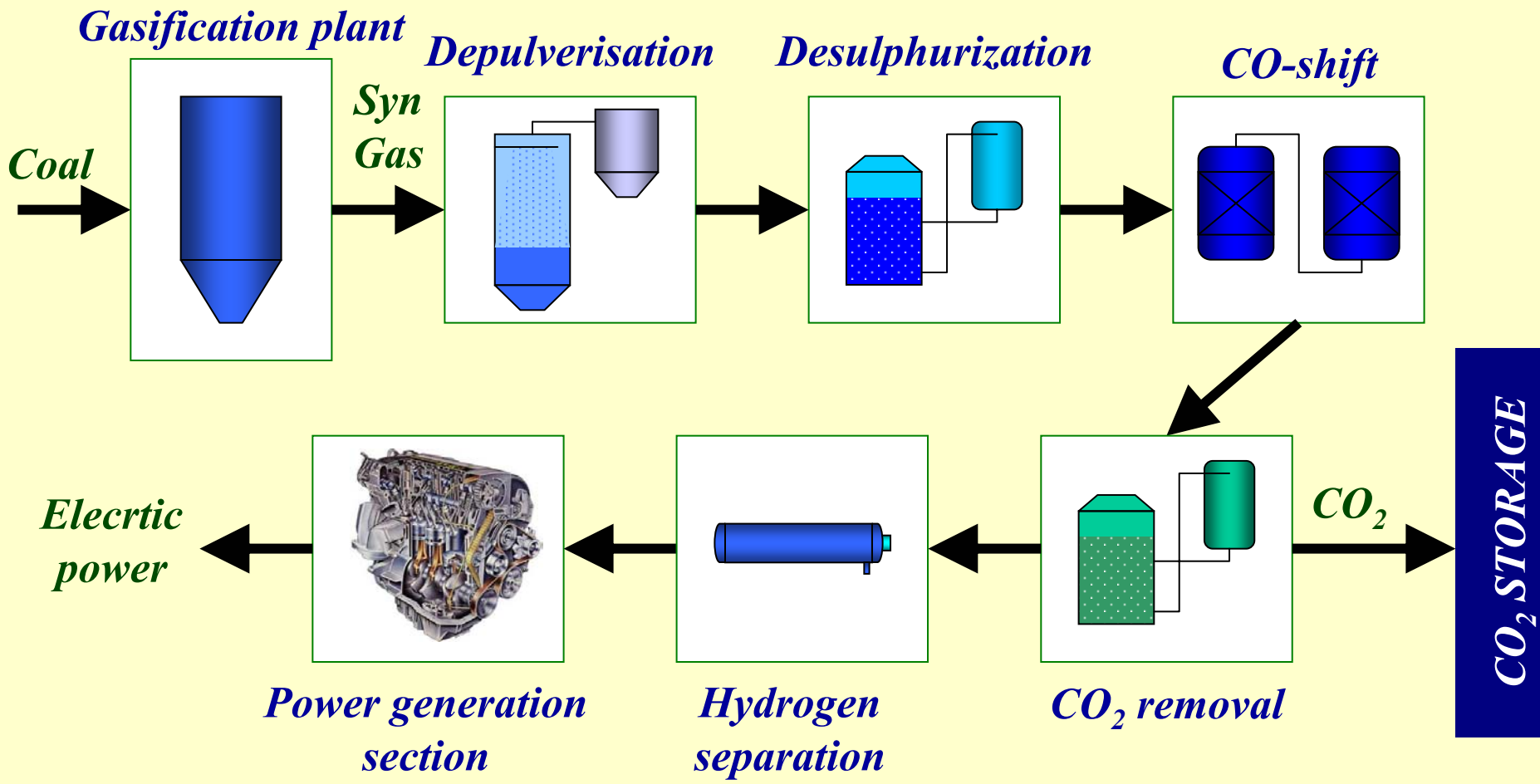
- Ministry of Productive Activities (onward MAP)
- Special fund for R&D on the Electricity System (MAP Decree 26/01/2000)
- Ministry of University Instruction and Research (onward MUIR):
  - **National Research Programme**
  - **Other funds**

**18M EURO actually**

- Cofunded by partners



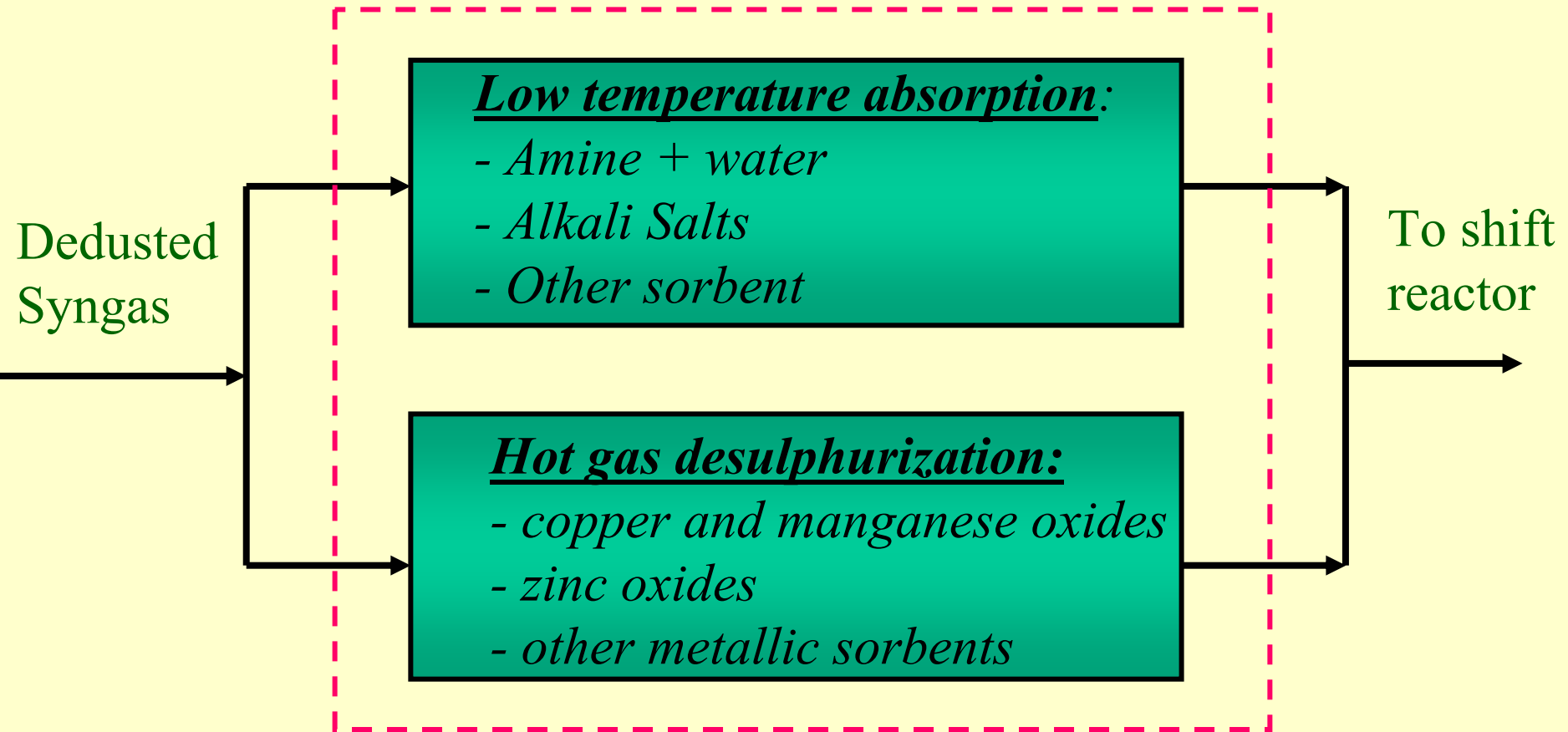
# 1 MW pilot plant





# Syngas cleaning section (2)

## Desulphurization Section



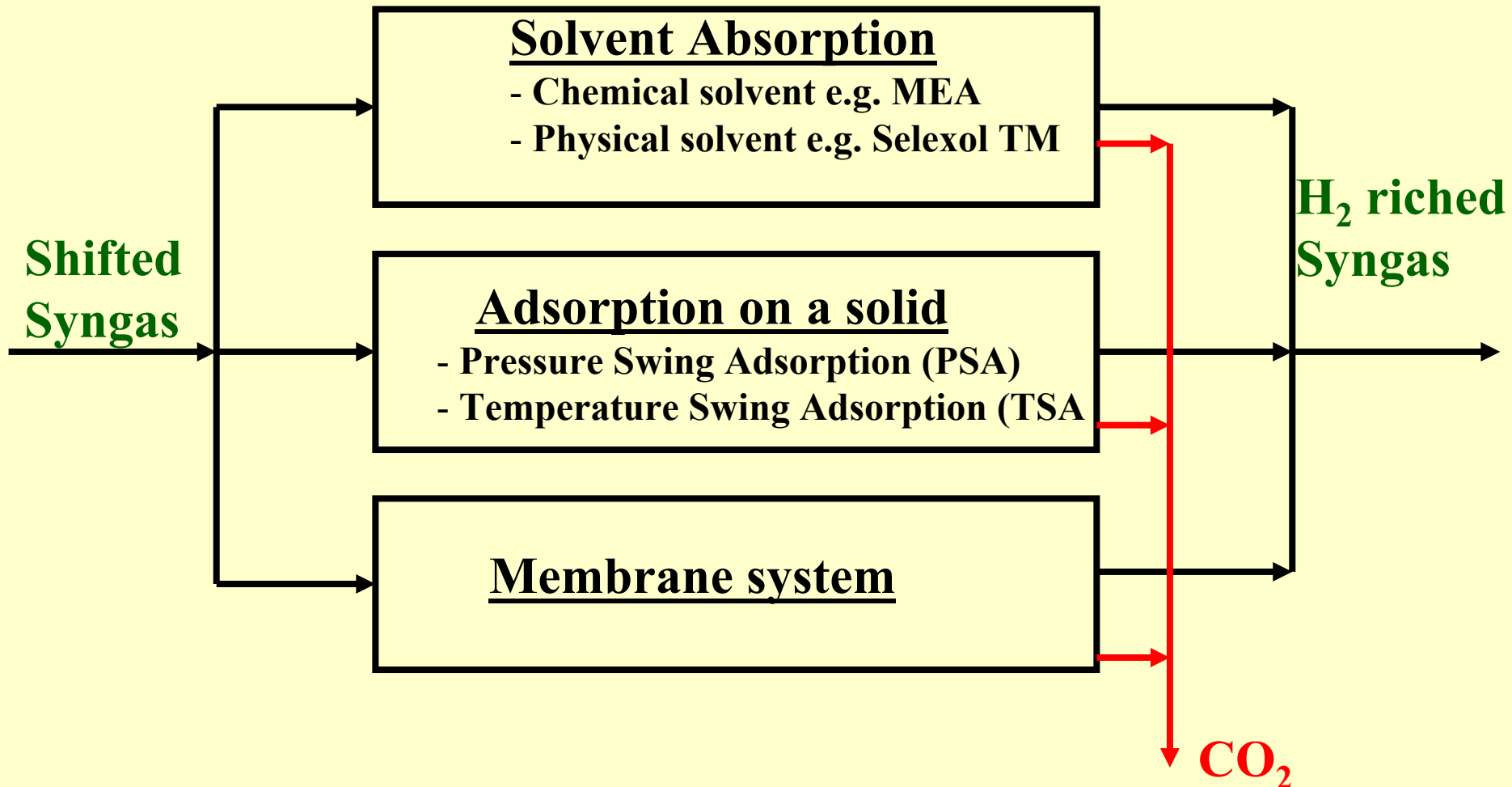


# CO<sub>2</sub> Capture Technologies

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## CO<sub>2</sub> capture technologies to be tested







Italian Geological survey for CO<sub>2</sub> storage and experimental tests.

it is divided in 3 lines:

- ∅ **CONFIGEOLIT:** Italian Geological Survey for CO<sub>2</sub> - from Electricity and Hydrogen Production Plants - storage
  
- ∅ **SIBILLA:** EOR in Adriatic sea
  - ∅ feasibility study
  - ∅ demonstration tests
  
- ∅ **PROMECCAS:** ECBM prefeasibility study in Sardinia



# CONFIGEOLIT: Strategy and objectives

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- to create an interdisciplinary group of stakeholders, and an agreement toward Policymakers and consequently the population
- to define the feasibility in Italy of the “CO<sub>2</sub> geological sequestration”
- ⊘ **to localise possible storage sites in Italy**
- ⊘ **to characterize and assess CO<sub>2</sub> storage capacity**
- ⊘ **to define the better localization sites for fossil fired hydrogen hubs**

**Geological sequestration in Italy has a wider interest, as it is a good example of storage in a tectonic active area**



# CONFIGEOLIT: 2 stages (3+5 years)

## first stage

- the selection of the best sites in the different geologic domains
- the location of the main industrial CO<sub>2</sub> sources and sites for the storage
- to define the better localization sites for fossil fired hydrogen hubs
- a first analysis on the CO<sub>2</sub> pipelines costs and safety

**The project will then (5 years) develop new techniques and efforts to find and characterize other CO<sub>2</sub> storage sites, in view of siting advanced fossil fired hydrogen hubs.**



# CONFIGEOLIT: Partners

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- OGS
- INGV
- ENI
- ENEA
- CESI
- ENEL
- Universities (La Sapienza Rome, Roma3, Padua, Polytechnic School of Milan, ..)
- Consortium of universities and CNR institutes dealing with CO2 storage research
- Consortium of private companies involved in CO2 storage expertises



- Ministry of Environment (onward MATT)
- Ministry of Productive Activities (onward MAP)
- Special fund for R&D on the Electricity System (MAP Decree 26/01/2000)
- Ministry of University Instruction and Research (onward MUIR)
- Industry
- CO<sub>2</sub> emissions stakeholders consortium (steel/power/refinery industries, environmental protection agencies, etc...)



# WHERE IN ITALY



- The saline aquifers, oil and gas depleted reservoirs, either on-shore or off-shore, are particularly well distributed in the Padanian back-arc basin and in the Adriatic see.
- These geological structures are extended from the Padania Valley to the Sicily. They offer the presence of different natural analogues and depleted oil and gas reservoirs, useful for the project.





# SIBILLA: Italy EOR Demonstration Site

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## Objective 1

sequestration of 1.5 million tonnes of CO<sub>2</sub> now produced (vented) by the Falconara gassifier.

Captured @ 550 tonnes/day (83 Bars) peak. 10 years.

## Objective 2

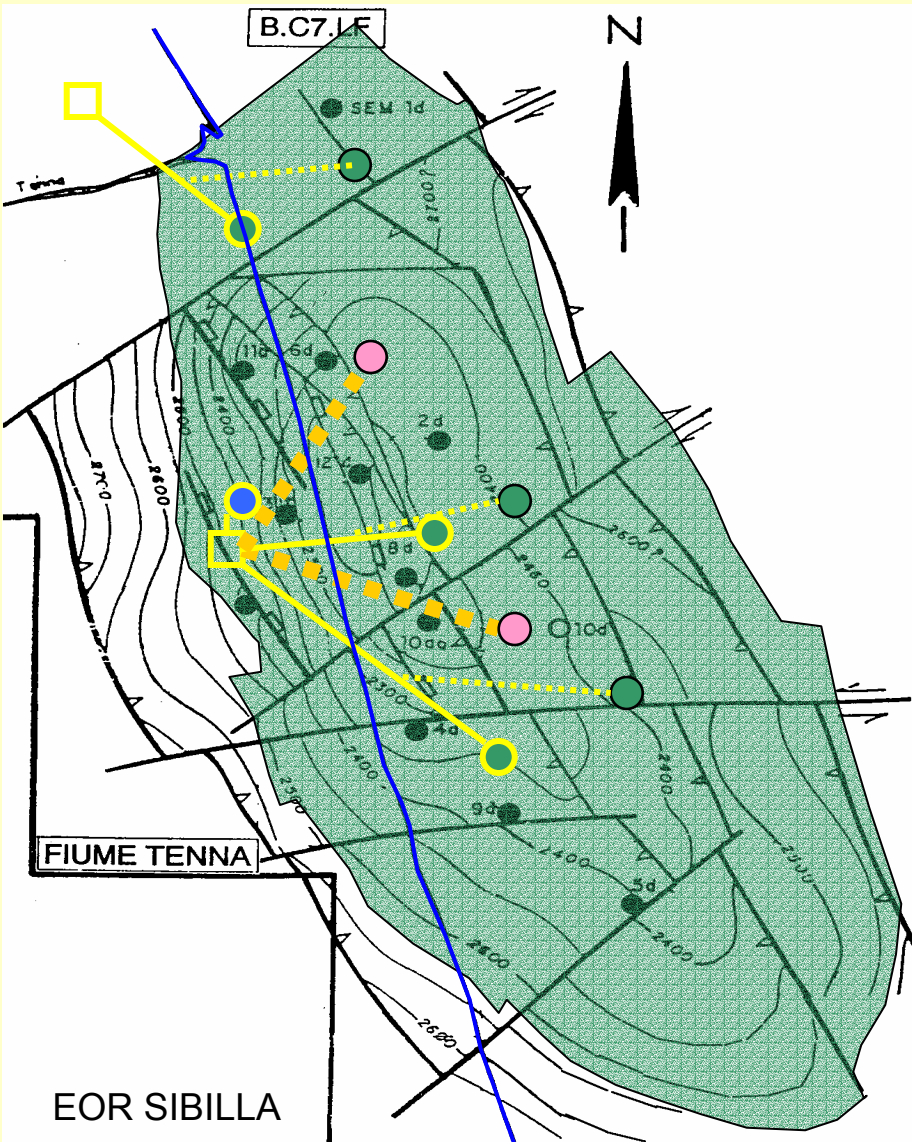
Recovery of approx. 6 million barrels of crude oil in 10 years.











# Santa Maria Oil Field

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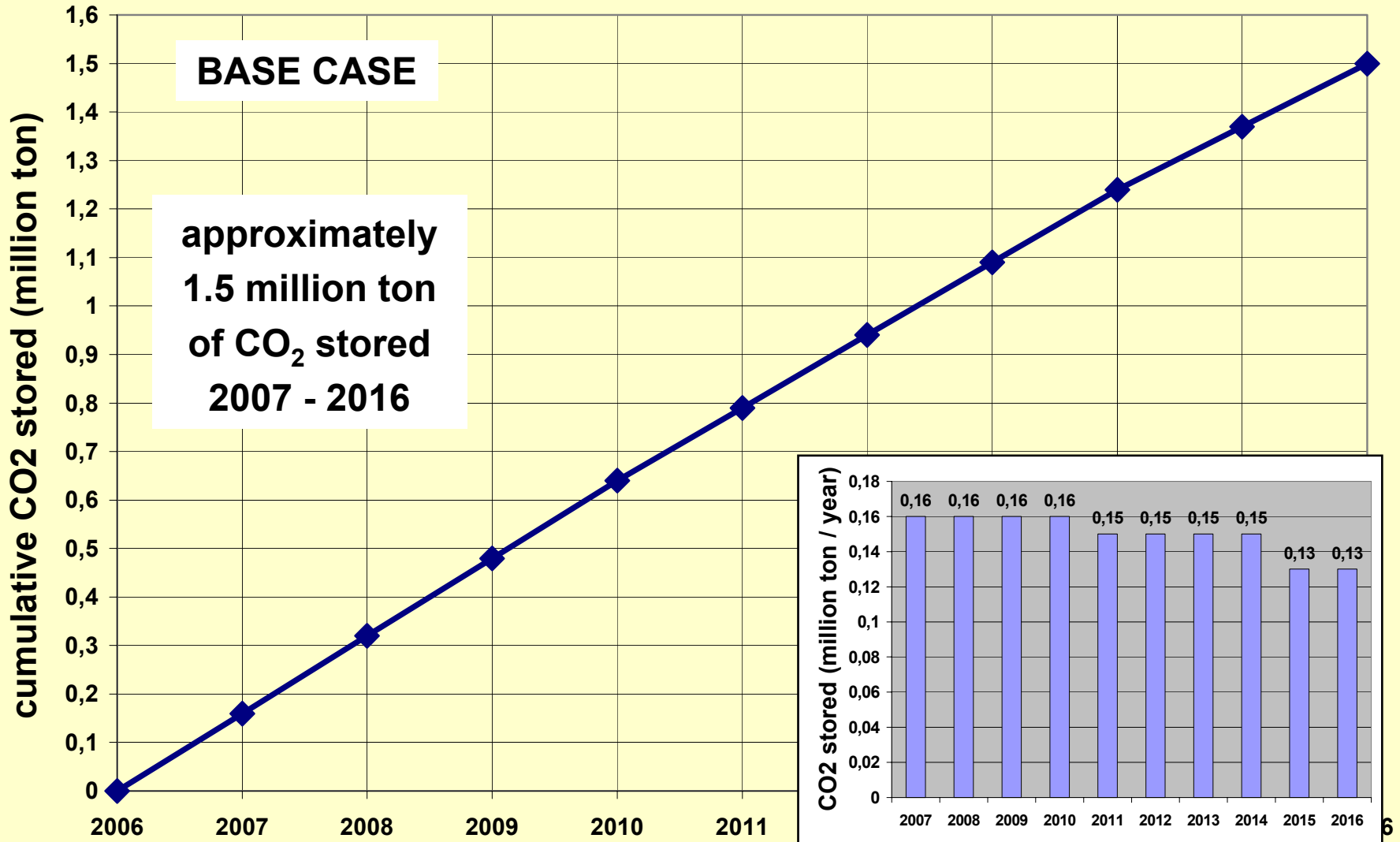
-  Existing water injector (1)
  -  Existing oil producer (3)
  -  New oil producer (3)
  -  New CO2 injector (2)
  -  Existing well site (2)
  -  Existing well (4)
  -  New well (2)
  -  New sidetrack (3)
- Water Alternating gas





# Projected CO<sub>2</sub> Stored

net of recycled CO<sub>2</sub>



CONFIDENTIAL



# SIBILLA: Partners and Funding

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## PARTNERS

- **INGV (Project management and know how)**
- **API (refinery, petrol retailing: CO<sub>2</sub> producer)**
- **Indipendent Energy Solution (know how)**
- **Edison (oil wells)**

## FUNDING

- **Ministry of Environment (onward MATT)**
- **Cost: 0.5 Meuro (MATT)**



## a prefeasibility study for ECBM in Sardinia

The **SULCIS** coal basin exhibits a general deepening of the productive strata reaching 800 m injection depth.

### main goal:

to exploit an ECBM technique throughout the *Sulcis Coal Province*, mainly aimed at CH<sub>4</sub> production

### Main expected results:

- ∅ feasibility study for the ECBM technique development for the coal bed strata deeper than 800 m to inject CO<sub>2</sub> at supercritical conditions
- ∅ Environmental / energetic analysis

### Funding

Regional Government of Sardinia, cofunded by partners



# Sulcis-Iglesiente Coal Field

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Sardinia  
S-W area

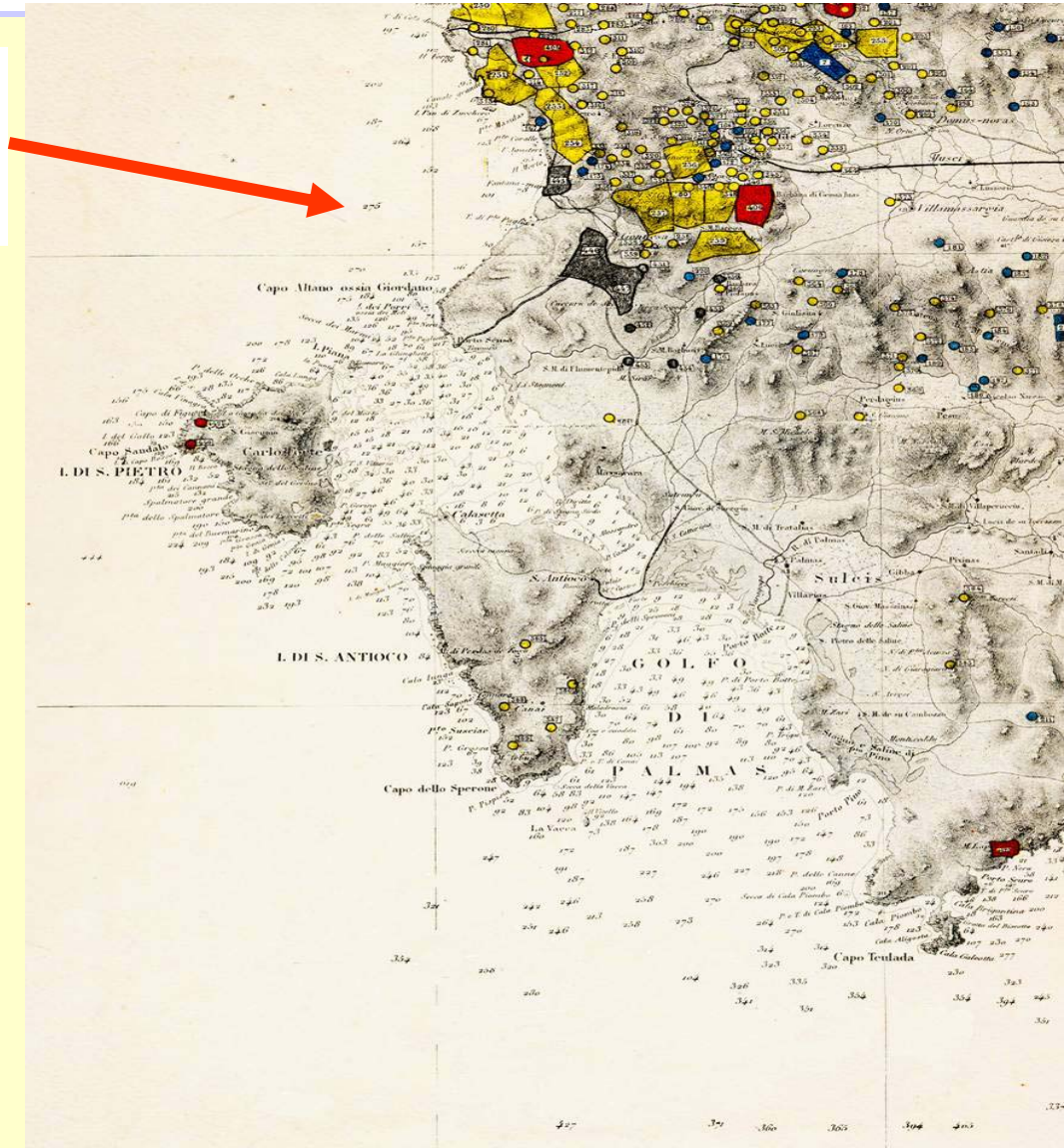
## Partners

SOTACARBO

INGV

ENEA

UNIVERSITY OF CAGLIARI





# PROMECAS Project phases

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**Phase 1 :**  
**Mineralogical, chemical and physical characterisation  
of Sulcis coal**

**Phase 2:**  
**Survey of geological, hydro-geological Sulcis coalfield.**  
**(particularly on deep coal seams (500- 1500 m under sea level)**  
**Verification of ECBM technology applicability**

**Phase 3:**  
**Selection and Evaluation of engineering solutions**  
**Survey of CO<sub>2</sub> sources in the Sulcis area**



# Conclusion

**Italian Companies and Research Institutions  
are cooperating for development  
and application of advanced technologies**

