Opportunity for CCS in Portugal, under low carbon pathways

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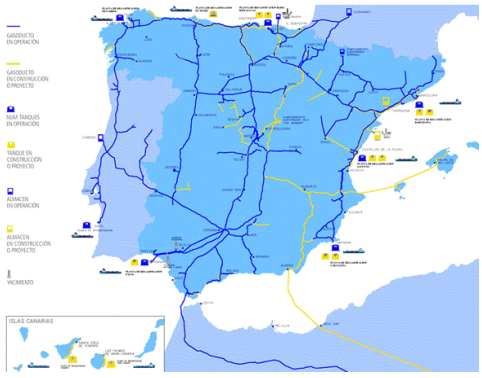
1. Context and goals
2. PT energy system today (2010)
3. TIMES_PT-ES-MO and Scenarios analysed
4. Opportunities for CCS
1. Key findings

Context and goals

COMET aims at identifying and assessing the most cost effective infrastructure(s) of CO_2 transport and geologic storage that will be able to serve the West Mediterranean area (Portugal, Spain and Morocco)**.**



Existing pipeline network linking Portugal, Spain and Morocco – Source: IGME

Context and goals

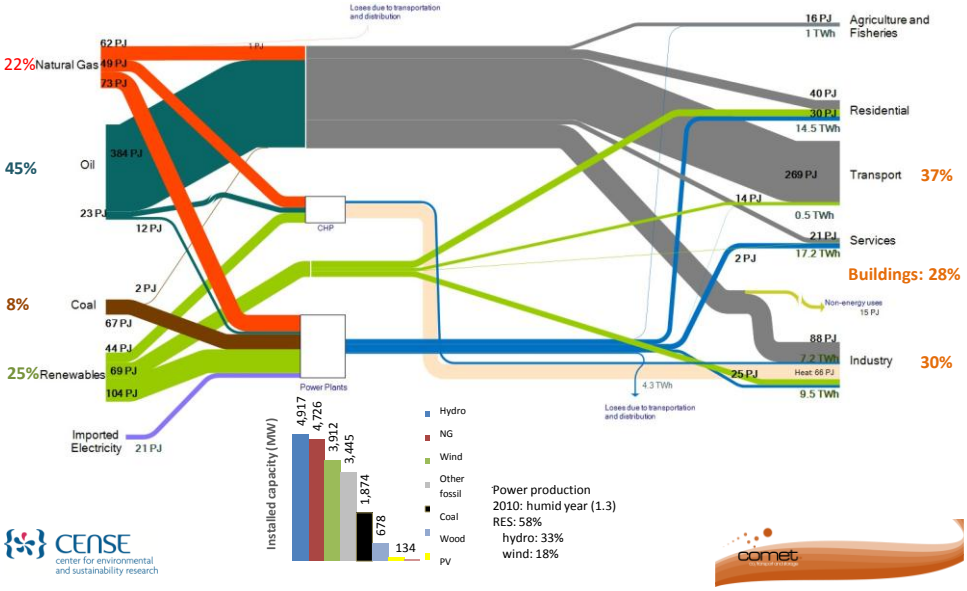
➔ **Optimizing transport costs requires a balanced decision on transport modes and a rigorous matching of CO_2 sources and sinks over time.**

What is the forecasted evolution of energy and industry sectors and is it possible to implement a common CCS strategy?

COUNTRY LEVEL

- Evolution of CO2 sources, under low carbon scenarios
- Cost-effectiveness of CCS as a mitigation option compared to other options

PT Energy system today (2010)



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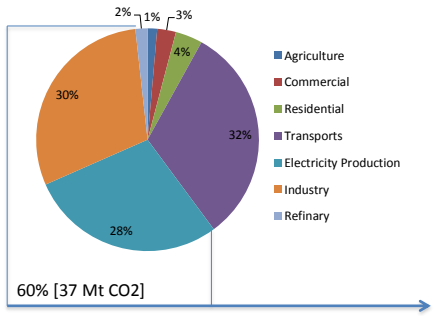
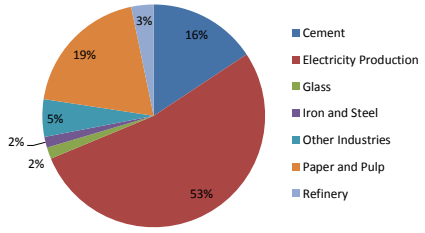
PT Energy system today (2010)

National CO_2 emissions: 62 Mt



CO_2 emissions in activities with CCS: 37 Mt



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Scenarios analysed

TIMES-PT-ES-MO

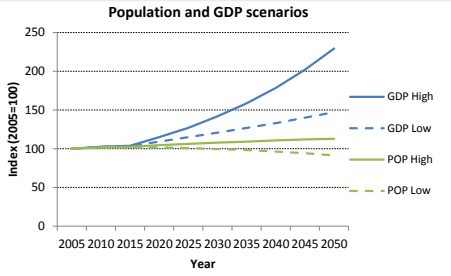
SCENARIOS:

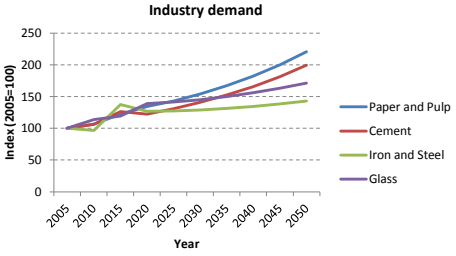
A. **GDP & POP**: High *vs.* Low demand

B. **CCS**: Available *vs.* No available

C. **Mitigation targets**:

- **Base:** CO_2 emissions with no restrictions
- **-20%:** CO_2 emissions target in 2020 [EU policy] kept until 2050.
- **-40%:** emissions linearly decrease to -40% in 2050 from 2020.
- **-80%:** emissions linearly decrease to -40% in 2050 from 2020.





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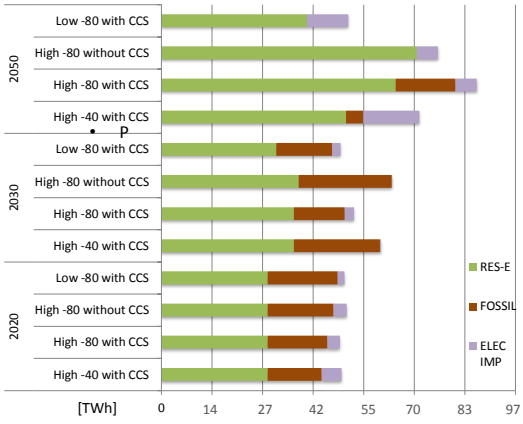
Opportunity for CCS



Power sector

- Moderate CO2 reduction targets: it is cheaper to import elect from Spain than invest in power with CCS;
- High CO2 targets:
  - RES-E will dominate, even with CCS
  - CCS will apply on CCGT (Coal is never cost-effective);
- No CCS available: power sector still accommodates high CO2 reduction, with imports and RES_E, PV and CSP will be important (6GW in2050), and wind offshore will anticipate.
- Low demand: no opportunity for CCS
- Hydro and wind are major technologies

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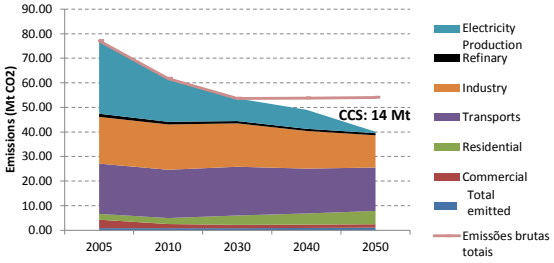
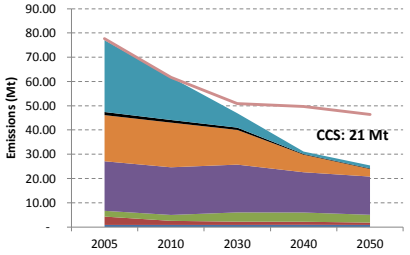
Opportunity for CCS

Moderate CO_2 target: -40% high demand



Aggressive CO_2 target: -80% high demand



CO_2 emissions

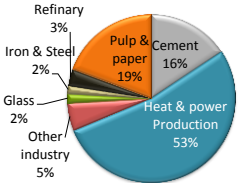
- CCS is an option for <u>cement</u> after 2030 (58% CO2 captured).
- 2050: CCS captures almost 50% of CO2 emissions produced in sectors where CO2 capture can be adopted; represents a quarter of total national CO2 emissions.

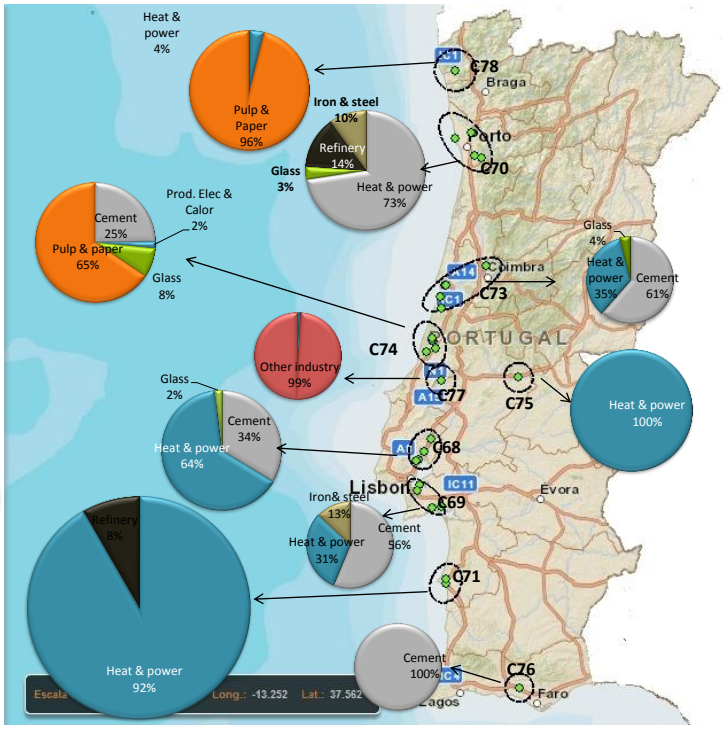
CCS is an option for:

- cement before 2030 (57% CO2 captured); for other sectors, after 2040 (Iron & steel 74%)
- power sector after 2040 (85% CO2 captured)
- 2050: CCS captures more than 80% of CO2 emissions produced in sectors where the tech can be adopted (industry, refinery and power); represents a 45% of total national CO2 emissions.

CO_2 emissions in clusters (> 100 kt CO2) appropriate to be integrated in a CO2 transport network

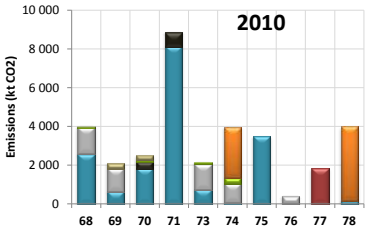
Clusters
2010: 20 Mt
(54%)

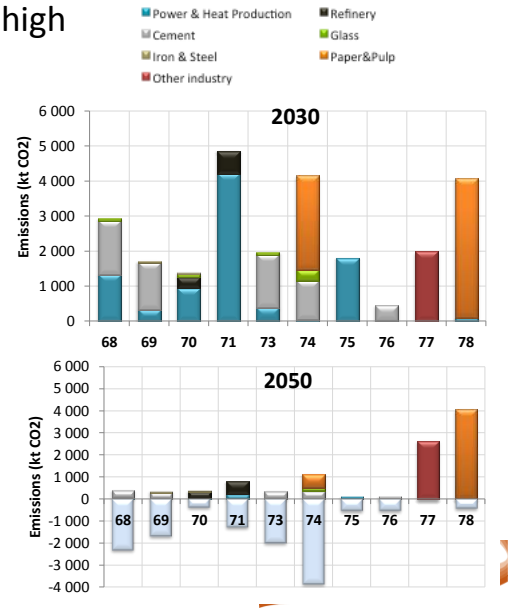




Opportunity for CCS

CO_2 emissions clusters: -40% high





- 2030: no role for CCS;
- 2050: 2 major emitters clusters (77 other industry and 78 pulp & paper); refinery with no CCS. 13Mt CO2 captured, corresponding to 56% of emissions clusters.

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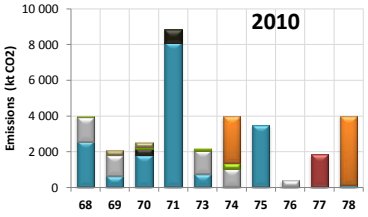
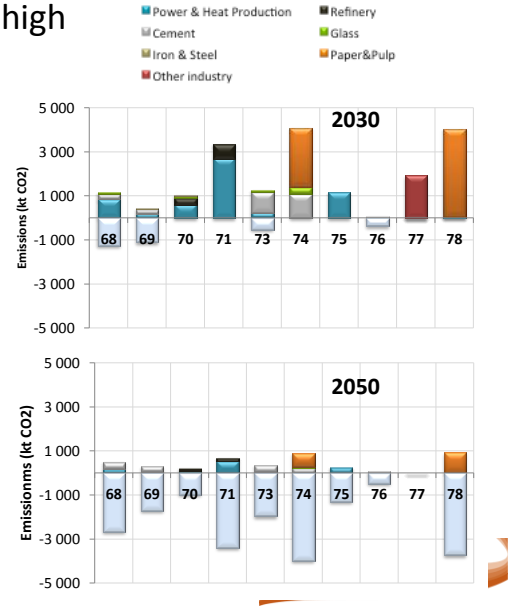
Opportunity for CCS

CO_2 emissions clusters: -80% high





- 2030: modest role for CCS; 3 Mt CO2 captured
- 2050: 20 Mt CO2 captured (more than 80% CO2 emissions clusters).

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Key findings

- CCS is not an option for Portugal for a low mitigation target (-20%).
- CCS is not cost-effective for coal power plants, even under a very stringent CO2 target.
- CCS appears interesting to industry sectors (cement in particular) than to power sector, where RES-E appears more cost-effective.
- When no CCS is available, low carbon pathways still achieved with renewables (solar techs and wind offshore).
- Low demand scenario delays a decade the adoption of CCS (from 2030 to 2040)
- CCS is an option for high demand and aggressive CO2 target (-80%), capturing 45% of expected national CO2 emissions by 2050, and 80% of elected sectors for CCS.

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Thank you

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