



ROMANIAN DEMO PROJECT

GETICA CCS

Why CCS in Romania?

Inter alia

Because

- ✓ To reach 2020 EU targets of making CCS commercial we need to promote **both onshore and offshore projects**
- ✓ **Romania** has preliminary identified around **23 Gt onshore CO2 storage geocapacities** (17Gt in saline aquifers and 4Gt in depleted oil&gas reservoirs)
- ✓ **Romania** has more than **150 years** of history in the **oil and gas** industry, and currently operating natural gas reservoirs
- ✓ **Maintaining operational the PPs** running on fossil fuels (41% indigene coal and 12% hydrocarbons) and the **mining sites exploitations** has a **positive economic & social impact** for Romania
- ✓ It will **contribute** by the power of example to the **CCS deployment in the South-East** European region

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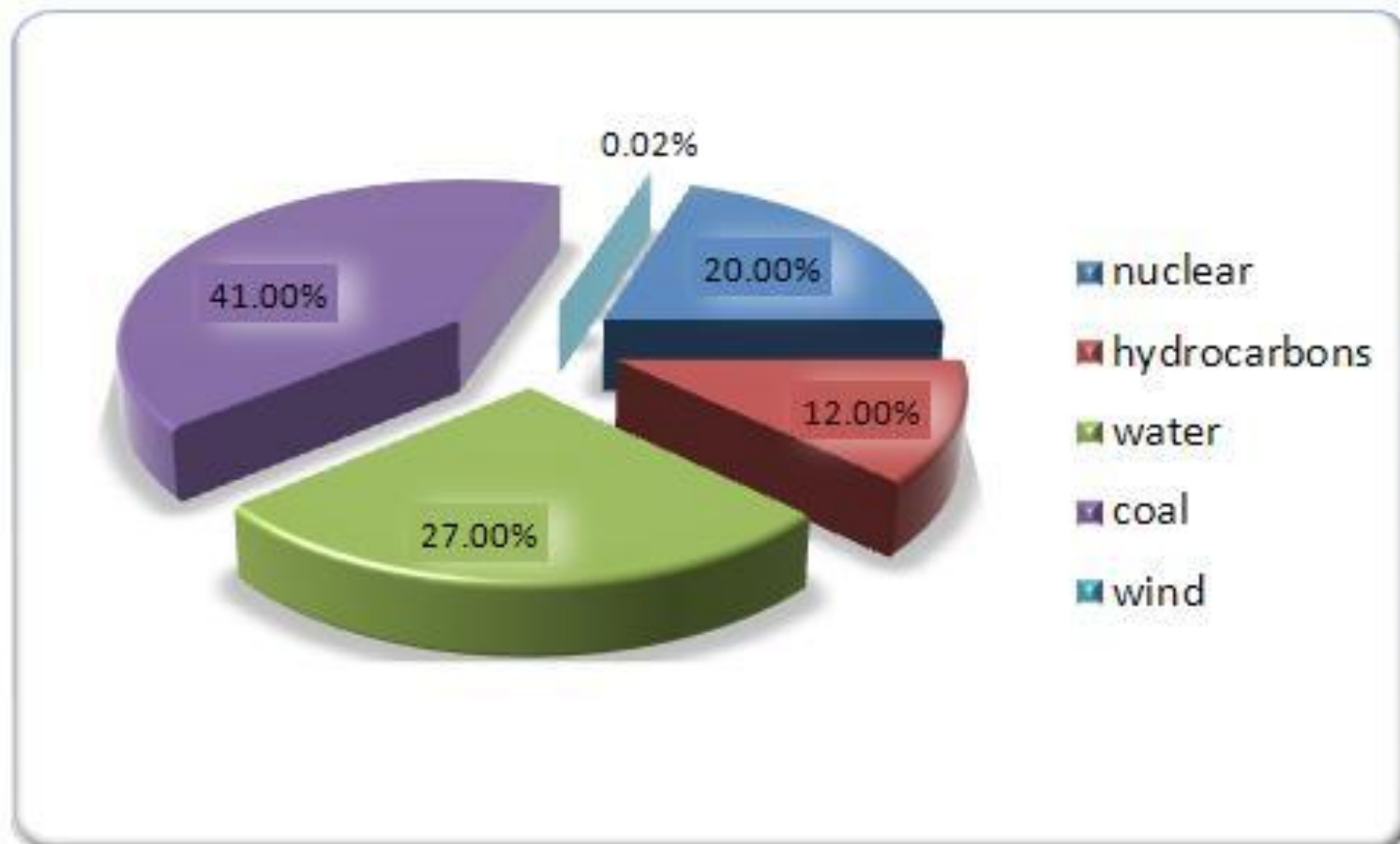
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Electricity Generation by Primary Energy Sources



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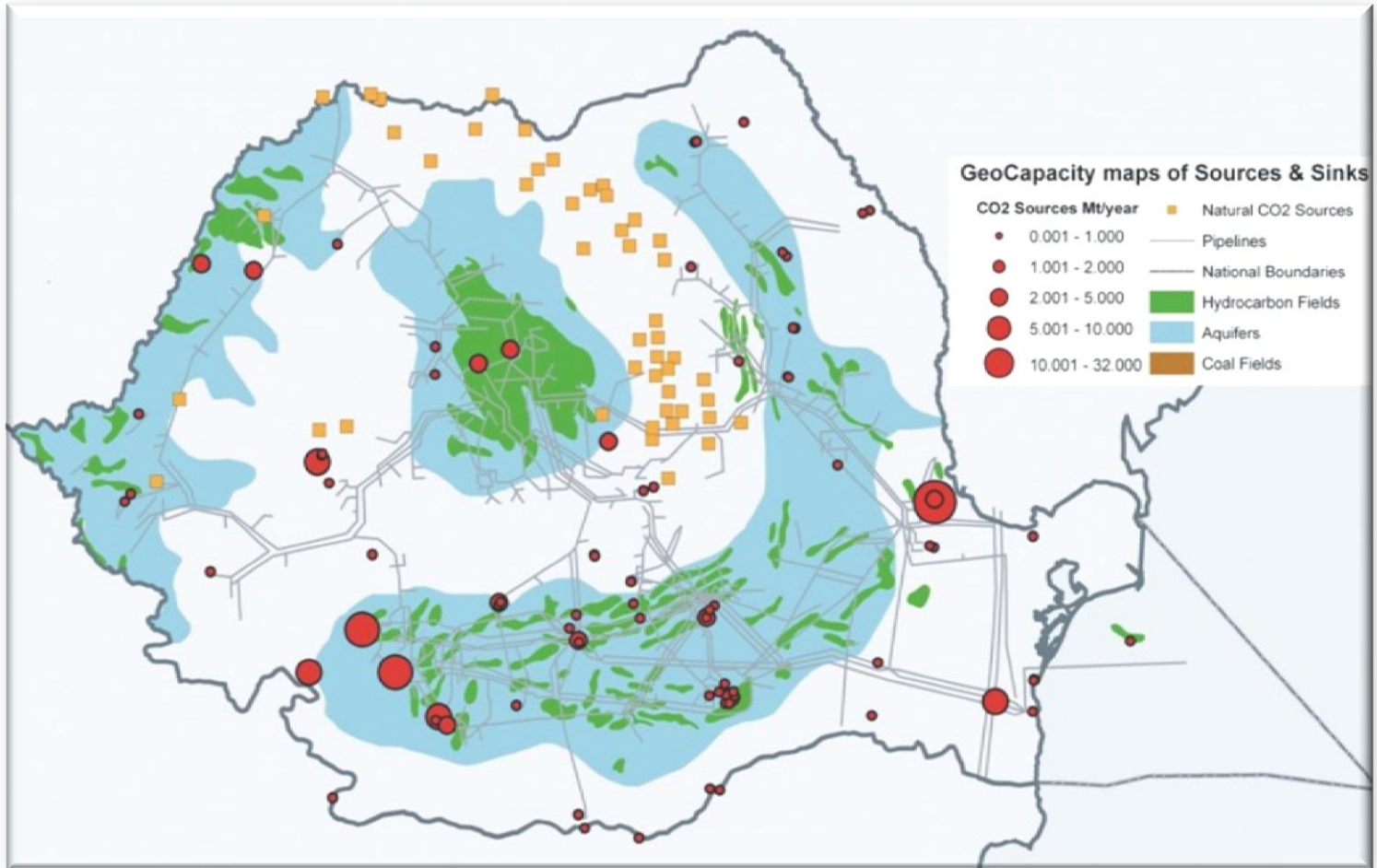
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Learning Process in Romania

| | |
|------|---|
| 2001 | GeoEcoMar affiliation to ENeRG |
| 2006 | GeoEcoMar affiliation to CO ₂ Net |
| 2007 | <ul style="list-style-type: none"> ▪ “CO2 Club” Association was founded ▪ GeoEcoMar representation in ZEP - GG |
| 2008 | <ul style="list-style-type: none"> ▪ ISPE representation in ZEP - AC ▪ First International Workshop “Promoting CCS in Romania” – Bucharest |
| 2009 | <ul style="list-style-type: none"> ▪ CIEM - International Conference on Energy and Environment “CCS Round Table” – Bucharest ▪ FENCO ERA NET – CCS impact on communication |
| 2010 | <ul style="list-style-type: none"> ▪ Second International Workshop “Promoting CCS in Romania” – Bucharest ▪ FOREN – Regional Energy Forum “CCS International Workshop” – Neptun ▪ GeoEcoMar participating in CGS Europe / FP7 ▪ Romanian CCS Demo Project accepted as observer in CCS - EU Project Network ▪ First Knowledge Sharing Event on “CCS National R&D Program” – Târgu Jiu ▪ Official announcement of Romania candidacy to NER300 competition |
| 2011 | <ul style="list-style-type: none"> ▪ Events already contracted: <ul style="list-style-type: none"> ✓ 2 national CCS knowledge sharing events within the METBE’s CCS National R&D Program (April, together with WEC-RNC and November 2011) ✓ 1 Open Door event (TURCENI April 2011) ✓ 2 international CCS conferences (Co2 Club – September 2011, CIEM – November 2011) ▪ Intention to develop a CCS Knowledge Sharing Strategy Platform at regional level – South-East Europe, Black Sea and Balkan countries |

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Romanian Governmental Actions

| | |
|-----------------------|--|
| July, 2009 | <p>Action Plan to prepare Romania for the “Energy-Climate Change” EU legislative package implementation (co-initiated by METBE, MEF, MPF, MERYS and signed by the Prime Minister)</p> |
| February, 2010 | <p>Action Plan for implementing a Demo Project regarding the Carbon Capture and Storage in Romania (initiated by METBE and signed by the Prime Minister)</p> |
| April, 2010 | <p>METBE launched the call for proposals to industries for the national ranking</p> |
| May, 2010 | <p>The Romanian CCS Demo Project was selected from the energy industry</p> |
| August, 2010 | <ul style="list-style-type: none"> ▪ METBE contracted the National CCS R&D Program ▪ METBE established the CCS Demo Project Inter-Ministerial Steering Committee through the Order no. 1508 |
| 2011 | <ul style="list-style-type: none"> ▪ Transposing the EU Directive related to CCS ▪ Founding the future CCS Project Company as the Romanian CCS Demo Project sponsor ▪ GETICA CCS Demo Project financing |



EC/31/2009 CCS Directive transposition

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- ✓ In Romania the CE/31/2009 CCS Directive is promoted under the Ministry of Environment and Forestry and Ministry of Economy, Trade and the Business Environment co-initiative

- ✓ It was decided to be transposed first through an Emergency Order

- ✓ The Competent Authority will be the existing National Mineral Resources Agency - NAMR

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Project Location



South-West Oltenia Development Region

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GETICA CCS Demo Project – in brief

GETICA CCS is a governmental demo project, officially sustained by the Prim Minister and coordinated by the Ministry of Economy, Trade and the Business Environment – METBE and supported by Global CCS Institute.

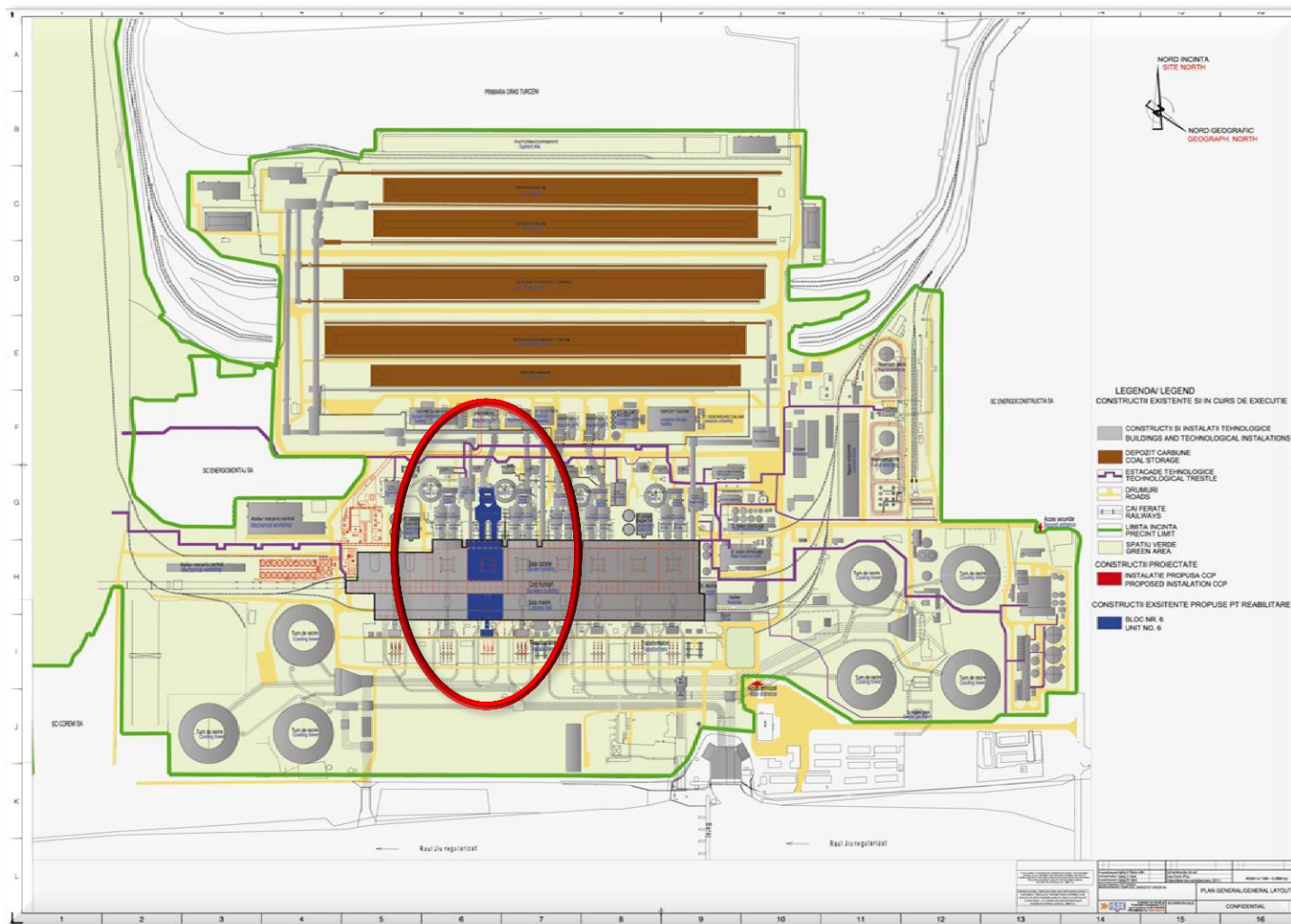
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|  <p>Location</p> | <ul style="list-style-type: none"> ▪ Oltenia region – the most energy intensive ▪ Turceni PP – Unit no.6 (330MW) |
|   <p>Full Chain</p> | <ul style="list-style-type: none"> ▪ CO₂ Capture Plant & Compression (1.5Mtpa) ▪ CO₂ Transport – onshore pipeline ▪ CO₂ Storage – onshore deep saline aquifers |
|    <p>Sponsor</p> | <p>GETICA CCS Project Company (PC), including:</p> <ul style="list-style-type: none"> ▪ TURCENI Energy Complex – future CO₂ Capture Plant operator and PC Leader ▪ TRANSGAZ, National Company for Natural Gas Transport – future CO₂ Transport Infrastructure operator and PC Member ▪ ROMGAZ, National Company for Natural Gas Exploitation – future CO₂ Storage Facility operator and PC Member |
|   <p>Current Status</p> | <ul style="list-style-type: none"> ▪ On-going Feasibility Study ▪ NER300 Application Forms was submitted on 9th of February to the Romanian Government - METBE |

Turceni PP Layout

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Turceni PP – Unit no. 6 (330MW)

- under going **retrofitting process** – deadline 2013
- **FGD** system – deadline 2012
- **ash and slag “dense slurry”** system – deadline 2012

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Main technical features after retrofitting

Steam Turbine + Electric generator

| | |
|---|-------|
| Rated gross power | 330MW |
| Maximum long term available gross power | 310MW |
| Annual average gross power | 280MW |

Steam Boiler

| | |
|---|--------------------|
| Steam flow | 1035t/h |
| Steam parameters (pressure / temperature) | 192 / 540 bar / °C |
| Efficiency | 88% |

CO₂ Capture

- post-combustion system
- 85% minimum efficiency
- chilled ammonia
- future operator: **Turceni Energy Complex**

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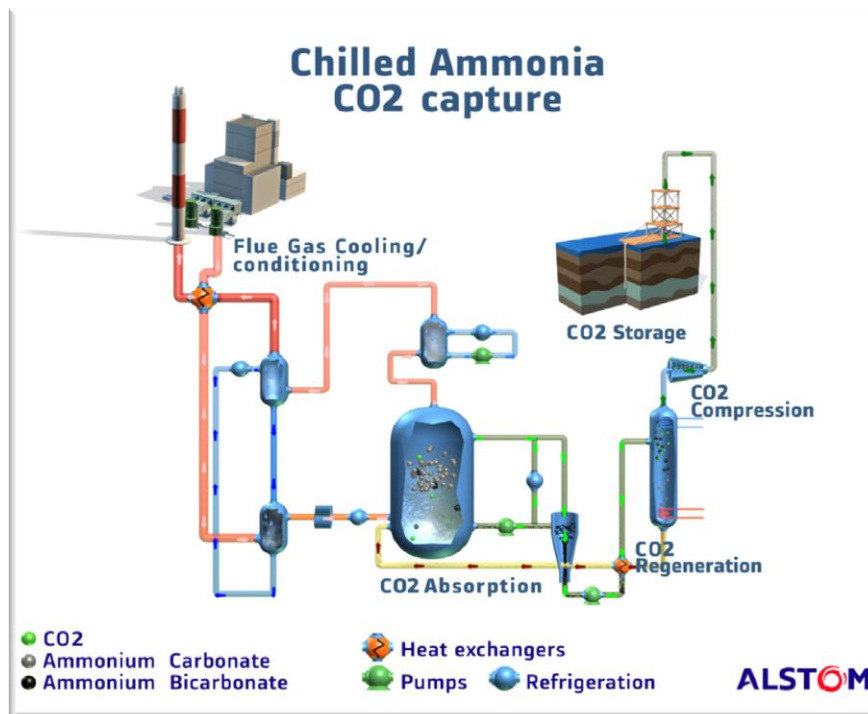
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CO₂ Transport

- onshore pipeline of 40km maximum length
- future tie-ins to be considered: Rovinari PP (1300MWe), Craiova II CHPP (300MWe), Işalnița CHPP (600MWe), Petro-chemical and Metallurgical industries
- future operator: **Transgaz** - National Company for Natural Gas Transportation

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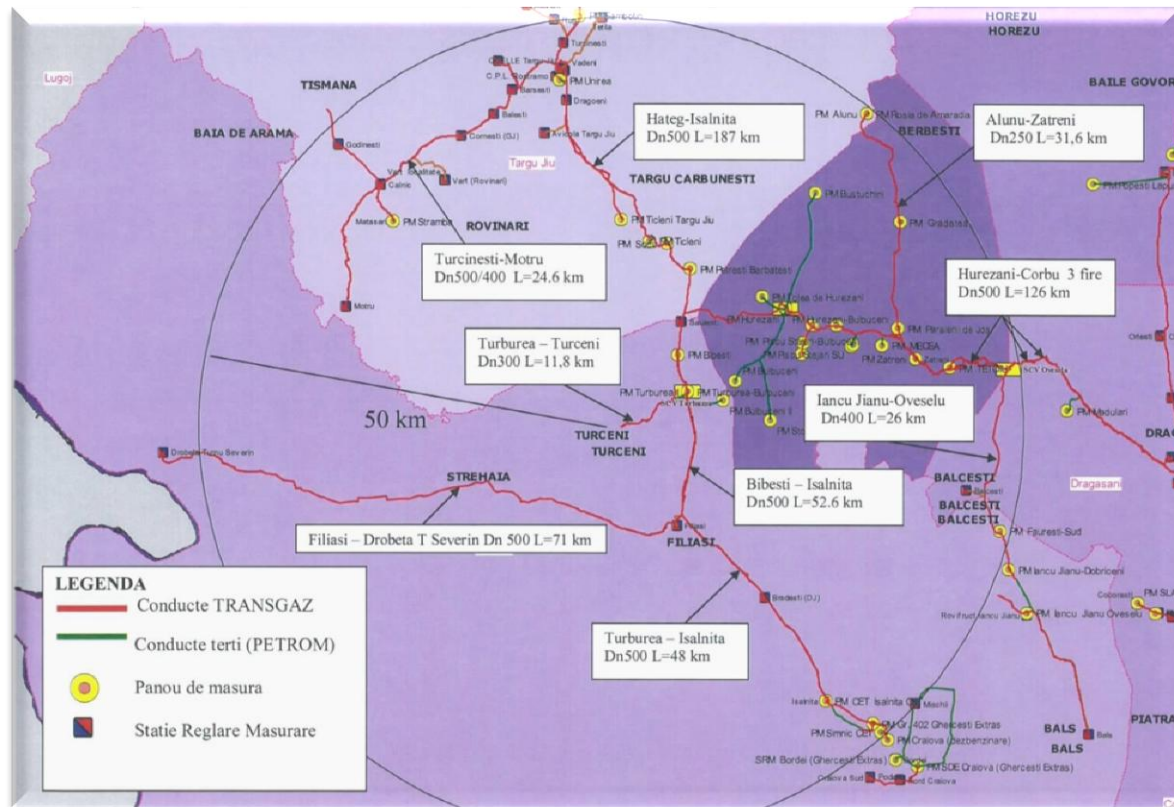
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CO₂ Storage

- area of investigations within a radius of 50km around Turceni PP
- 7 potential CO₂ storage sites in onshore deep saline aquifers
- multi-user hub development potential
- future operator: **Romgaz** - National Company for Natural Gas Exploitation

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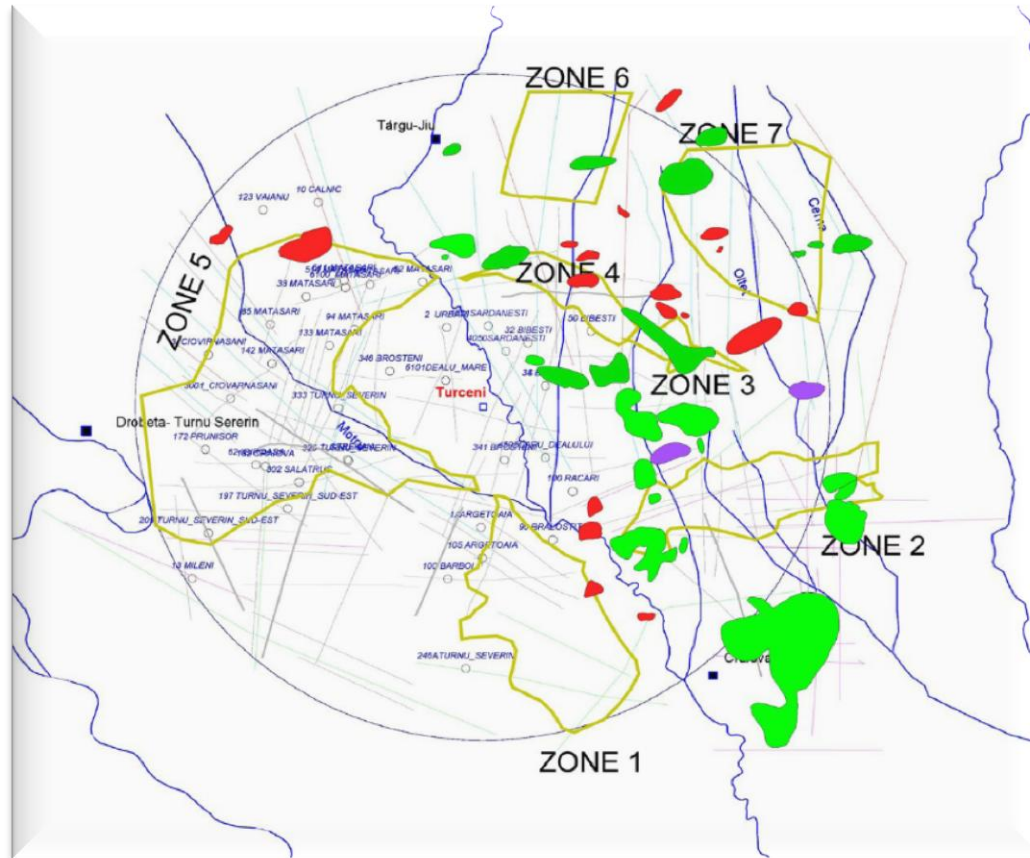
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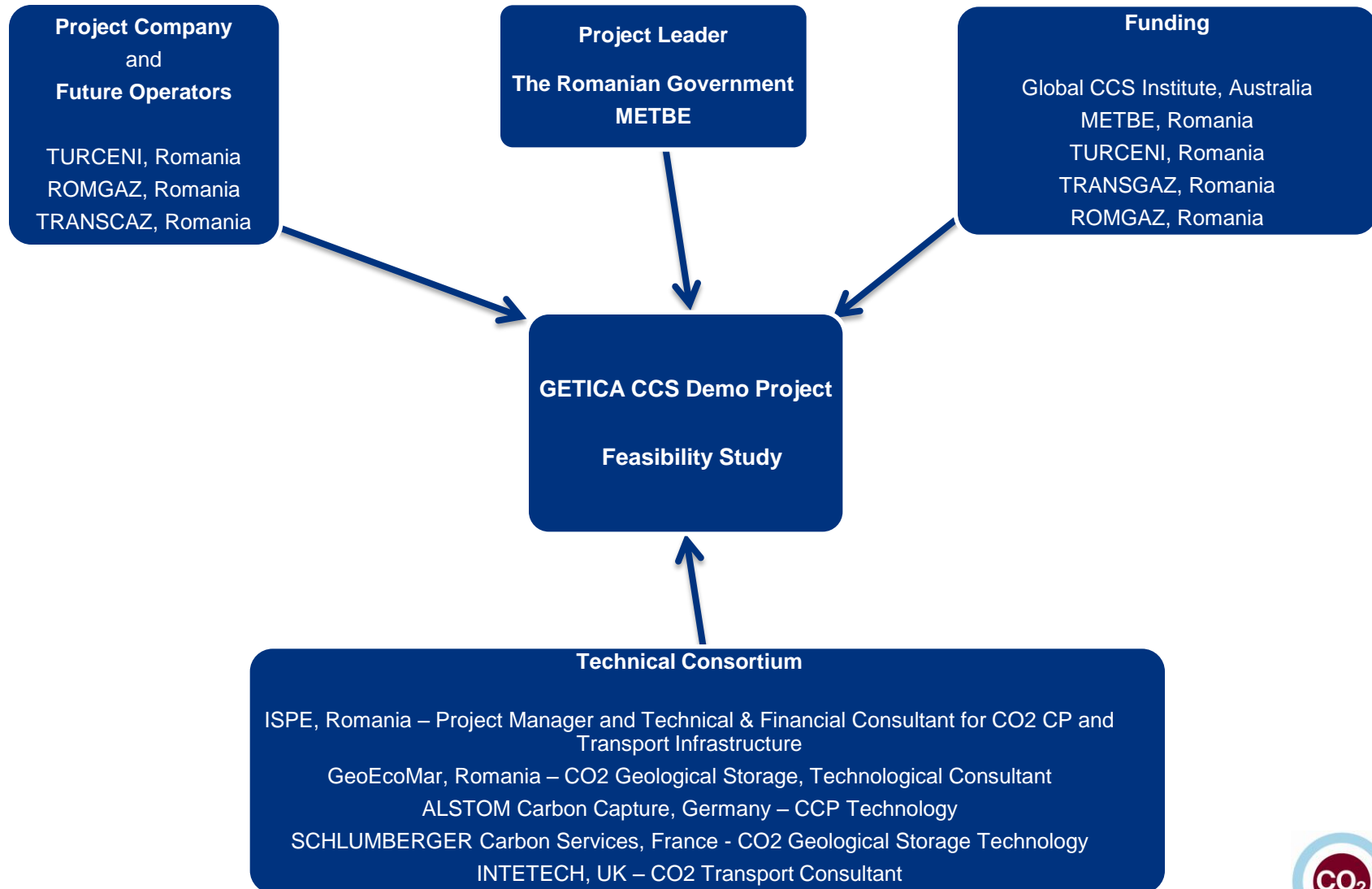
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GETICA CCS - Key Players



Prospected Financing Sources

- ✓ NER 300 Program
- ✓ Norwegian Financial Mechanism
- ✓ EEA Financial Mechanism
- ✓ EU Structural Funds (2013 ÷ 2020)
- ✓ EU-ETS auctioning
- ✓ EIB (Risk – Sharing Financing Facility)
- ✓ USA Government Support
- ✓ Operators (Turceni , Transgaz, Romgaz)
- ✓ National Public Sources (feed-in-tariff)
- ✓ Other sources (commercial loans)

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WE STAND FOR THE DEVELOPMENT OF CCS PROJECTS IN ROMANIA



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