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Developing Carbon Capture Use and Storage in the Paris basin:
the STRATEGY CCUS scenario

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Abstract

Carbon capture, use and storage (CCUS) has a crucial role to play in the fight against climate change. Implementing CCUS at a regional scale, based on local GHG reduction needs and opportunities and engaging the discussion with different local stakeholders, can be a way to successfully develop this technology. In this approach, the STRATEGY CCUS project studies 8 regions in the Southern and Eastern Europe with the objective to formulate plans for CCUS development in each of them. This paper describes the CCUS scenario formulated for the Paris basin region and its corresponding business model.

Located in the centre-northern part of France, the Paris basin region, as studied in the STRATEGY CCUS project, broadly corresponds to the administrative region of Ile-de-France, which is the most populated region of France with 12 million people. However, the population is concentrated in the Paris agglomeration (88% of the population in 24% of the region surface, with an average of 3,790 inhabitants per km²) and a large part of the region remains rural.

The carbon emissions considered in the STRATEGY CCUS project for the Paris basin region amount to 6 Mt in 2019, with the particularity that half of the CO₂ emitted comes from the waste sector. This total amount is rather low compared to other French regions with heavy industries as iron-steel plants, refineries and cement production.

However, the region has great geological storage potential. The Paris basin - which is the largest onshore French sedimentary basin - has been identified by previous research projects (e.g. the EU GeoCapacity project) as a major basin to store CO₂ in deep saline aquifers (capacity ranging from 800 Mt up to 27 Gt) and presents several options for storage in depleted hydrocarbon fields. Thus, possibility of storing CO₂ from other French regions could be considered.

The scenario for CCUS deployment in the Paris basin was based on the database developed in the STRATEGY CCUS project, gathering existing data on CO₂ emission sources, transport options, valorization options and geological storage capacities for each of the studied regions. The scenario elaboration includes feedback of the Paris basin Regional Stakeholders Committee, set up in the framework of the STRATEGY CCUS project.

The STRATEGY CCUS scenario for the Paris basin considers, on the period 2027-2035, capturing CO₂ from the 3 major carbon emitters in South of Paris: 2 waste incineration plants and a chemical plant; transporting CO₂ by new

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pipelines and building two CO₂ collection hubs; and storing it in a deep saline aquifer (Keuper Fm) in the southern part of the region. A cumulated amount of approximately 6 Mt of captured CO₂ by 2035 is planned.

On the long term (2035-2050), in addition to the previous plants, 4 emitters located on the route between Paris and the storage place would be connected to the CO₂ transport pipeline: a natural gas-fired cogeneration plant and 3 waste valorisation plants. A second storage infrastructure would be built to store the surplus of CO₂ in the same geological formation but reaching other sedimentary member. By 2050, a total of approximately 36 Mt CO₂ would be captured and stored. This would represent 18% of the French national objectives for CCUS.

The Paris basin scenario has been evaluated using the techno-economic model developed in the project to provide a business model and associated associated Key Performance Indicators (KPIs) including negatives emissions from bio-CO₂ captured and stored from incinerators. The availability, at the chemical plant, of over 300 kt/y of CO₂ already captured for the plant process enables a drastic reduction of the capture costs of the scenario.

Keywords: CCUS, Paris basin, Ile de France, geological storage, cluster, hub, business model, techno-economic evaluation, decarbonation
