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Is Negative Emissions technologies a more socially acceptable form of CCS?

A general analysis of expert's debates

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Abstract

In the 1970s, Carbon Capture and Storage technology (CCS) was exclusively used in oil exploitation for Enhanced Oil Recovery (EOR). At the dawn of the 3rd millennium, the fight against global warming and in particular greenhouse gas emissions turns it into a solution to remove CO₂ from the atmosphere (O'Neill and Nadai, 2012). The idea of storing CO₂ first appeared in Marchetti's scientific paper in 1977. The concept then struggled to break out of these confined niches of scientific research (Gilbert and Henry, 2012) but gradually evolved from an oceanic dissolution to a geological storage solution. A few demonstrators were implemented with success such as Sleipner in 1996 and others failed like Barendrecht in 2009. However, the deployment of this technology, although promising, has remained marginal.

Unlike in the USA, CCS was born firstly in the EU as a solution to global warming (O'Neill and Nadal, 2012). Then, a first phase of integration into the existing socio-technical regime took place between 2000 and 2010 by coupling geological storage to coal-fired power plants to produce a "greener" energy. However, this adaptation was rejected by industrial and political actors who prefer to decarbonize power generation instead of greening coal or oil power generation (Hammond and Spargo, 2014). In the following decade (2010-2020), heavy emitting industries become the heart of the fight against global warming (Rissman 2014, IEA 2014). CCS technology will approach again the regime and propose a solution to decarbonize not power generation anymore but goods production (Rissman 2020). This evolution in CCS use overcame two previous challenges. First, those carbon emissions are now difficult to avoid, as it was the case in energy production where alternative sources were available. This sector of the economy is even grouped under the term *Hard-To-Abate* emissions (Paltsev, 2021) in order to show that storage appears to be the only decarbonizing solution for this type of industry. Secondly, CCS applied to the goods-producing industry could concern directly and benefit to a larger number of actors, making it more likely acceptable. Indeed, plant owners can avoid pollution penalties and save profitability, employees keep their jobs and local elected officials support economic development of their regions. (Figure 1)

However, this more "social" definition didn't lead to a wide-spread deployment due to technical (very energy-intensive capture process), economic (cost of storage still prohibitive) and societal (fear of leak's risks) hurdles. That's why, nowadays CCS enlarges its scope of application by integrating not only carbon emissions reduction capabilities but also atmospheric CO₂ removing capacities. Becoming Negative Emission Technologies (NET), CCS could

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probably meet its final and finally wide-spreading opportunity. Nevertheless, CCS has not yet been adopted by the socio-technical system, as no large-scale debate has taken place (Arnauld de Sartre, Chailleux, 2021). Using the multi-level perspective (MLP), this paper aims to describe the discursive evolution of CCS from its invention to the innovation of negative emissions technologies. The present analysis follows the changes through IEA publications, Club CO2 reports, a French association of industrial and governmental actors for CCUS initiatives and ADEME papers, the governmental institution for environmental transition, and experts' seminars. Those exchanges show that social acceptance has yet to be obtained between technical experts before being a problem for population.

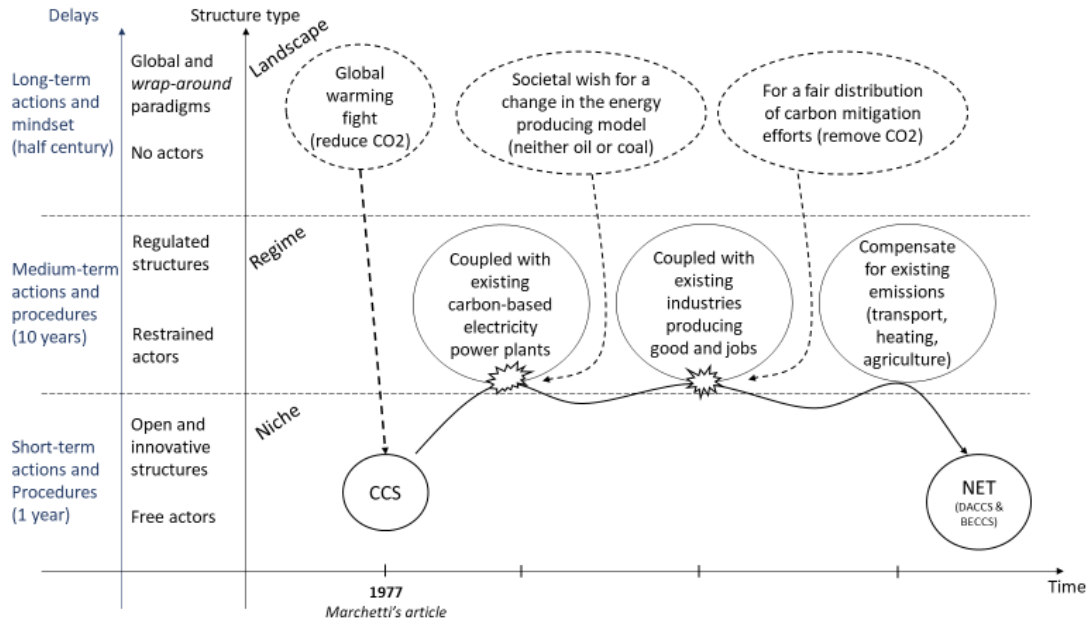


Figure 1

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