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ACT!ON CCUS Economic-Regulatory Business Model: to improve economics of CCUS projects bridging the gap with Emissions trading Schemes, regulatory policies and public finances

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## Abstract

The Intergovernmental Panel on Climate Change (IPCC) published its “Climate Change 2023: Synthesis Report” (IPCC AR6 Synthesis Report) on March 2023 and once again highlights the importance of carbon capture and storage (CCS) in addressing climate change. CCS technology is presented as a critical CO<sub>2</sub> mitigation option for the power sector, along with cement and chemical production.

However, compared to IPCC modelling, relatively few CCUS projects have been launched. In general, the total cost to deploy CCUS entire chain is above direct financial benefits industry may receive. Business model of such CCUS projects can be completed both with public fundings, national regulatory policies and possible recognition of CCUS carbon credits on voluntary carbon markets (and in future on the mandatory carbon markets). These three pillars can help to get CCUS projects off the ground, but they are largely unknown and specific to Europe and North America. A **CCUS Economic-Regulatory Business Model is then needed to fill the gap of regional CCUS business models.**

ACT!ON project (*Advanced multitemporal modelling and optimisation of CO<sub>2</sub> Transport, stOrage and utilisation Networks*) aims to research and develop a multitemporal integrated assessment model that will support stakeholders in the planning and design of large-scale, flexible CO<sub>2</sub> transport, utilisation and storage networks. One of the tasks of ACT!ON project is the development of a

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**CCUS Economic-Regulatory Business Model** which permits to assess CCUS financial and regulatory regional environments including Mandatory and Voluntary Carbon Market (VCM).

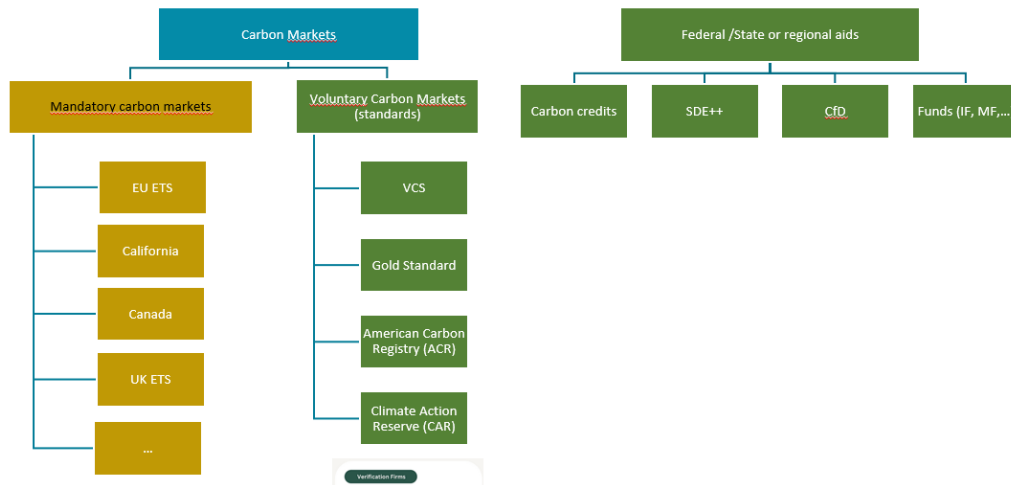


Figure 1: different carbon markets and possible CCUS public fundings

ACT!ON CCUS Economic-Regulatory Business Model includes different Emission Trading rules like EU-ETS, UK-ETS, California and Canada ETS, and different Voluntary Carbon Market standards like VCS, Gold Standard, American Carbon Registry (ACR) and Climate Action Reserve (CAR) (cf. Fig 1). CCUS public funding rules and data are detailed at federal, state, or regional level (like carbon credits, SDE++, Contracts for Difference (CfD), Innovation Funds, Inflation Reduction Act, etc.) and are relevant for CCUS regional deployment projects. A focus is done on Monitoring, Reporting and Verification methodologies.

After asking a few upfront questions to define the CCUS project, like: “Where is the CO<sub>2</sub> captured (in Europe, USA, Canada or UK?)”, “is any biological CO<sub>2</sub> captured?”, and “Is the CO<sub>2</sub> stored in the same regional jurisdiction as the CO<sub>2</sub> captured?”, ACT!ON CCUS Economic-Regulatory Business Model provides Emission Trading Scheme regulatory framework and economic regional financial aid eligible for the CCUS project. Applied to a specific CCUS project the Economic-Regulatory Business Model provides the regulatory obligations, the possible carbon credits generation and possible public fundings.

In Europe, the model refers for example to EU-Emission Trading Scheme (EU-ETS) but few European countries (e.g., UK, Norway) also apply an additional CO<sub>2</sub> tax. The aids related to the Innovation Fund, Modernisation Fund, Carbon removal certification framework, EU monitoring Reporting Guidelines, Sustainable Energy Transition Subsidy Scheme SDE++ , Carbon contracts for difference are implemented in the CCUS business model.

In Canada, the tax credit for CCS projects including direct air capture equipment is modelled. The Alberta Emission Offset Scheme (AEOS) and its CCS methodologies “CO<sub>2</sub> Capture and Permanent Storage in Deep Saline Aquifers” under which Quest Carbon Capture and Storage Project has an offset project is considered. Carbon Sequestration Tenure Regulation, Technology Innovation and Emissions Reduction Implementation Act (TIER), which is Alberta’s carbon pricing system is noticed.

In USA, US federal government and states CCUS financial incentives and regulatory frameworks are implemented. For example, the Inflation Reduction Act providing 45Q Tax credit is modelled, the American Carbon Registry’s CCS methodology (on public consultation) is included.

CCUS Economic-Regulatory Business Model is applied on different projects and regions: United Kingdom (Net Zero Teesside and Northern Endurance, South Wales Industry cluster); The Netherlands (Porthos, Aramis and the Netherlands-North Sea CCS cluster); France (Dunkirk-North Sea CCS cluster); Romania (Romanian cluster), USA (CCU at Intermountain West region) and Western Canada (Alberta Carbon Trunk Line and Weyburn Midale CO<sub>2</sub> Monitoring & Storage Project, Saskatchewan).

Then, ACT!ON Economic-Regulatory Business Model implemented in CCUS cases studies provides very original economic assessment of CCUS projects as no single CCUS - MRV projects is recognized nowadays. Different carbon markets are looking to integrated CCUS in their scope but none of the existing regulatory carbon market is dealing with the entire CCUS chain. The aim

of ACT!ON Economic-Regulatory Business Model is to improve economic assessments of CCUS projects bridging the gap with Emissions trading Schemes, regulatory policies and public finances.

*Keywords:*

"EU ETS, UK ETS, ACR, carbon markets; MRV; mandatory carbon markets; voluntary carbon markets, CCS; CCUS; carbon credit management"

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