PLATON

How have institutions, interests and ideas aligned to enable CCS developments in different Northern European national contexts?

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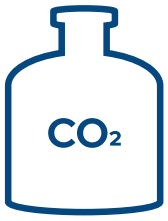

This paper considers the question of whether the challenge of rolling out large-scale and costly CCS solutions for deep decarbonisation is in fact one of public policy and political decision-making more than technical feasibility. While research has tended to focus on technology and project cost concerns, we conclude that the slow pace of rollout in Norway, the Netherlands and the UK links to political economy concerns. A key issue therein is the Increasing need for grounded narratives to justify and enable political and public policy decisions.

Introduction[2]

Projections by the Intergovernmental Panel on Climate Change (IPCC, 2018) have shown that CCS is likely to be required to meet the ambitions of the 2015 Paris Agreement (UNFCC, 2015). Government departments responsible for energy and climate policy around the world do tend to acknowledge the potentially crucial role of carbon capture and storage (CCS) technologies and systems. Nonetheless, the global roll-out and deployment of CCS projects has been slow. The first CCS project in a Northern European context was realised in Norway in 1996 and a second one in 2008, both involving production of natural gas, where separated CO_2 is stored in geological formations under the North Sea. A few CCS facilities exist in the United States and Canada, but these have a clear commercial driver, with CO_2 captured from coal-fired power stations being

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transported and injected into oil reservoirs to enable more efficient and economically viable oil extraction in the latter stages of production.

In Northern Europe, most CCS research and much of the policy debate has focussed on resolving technological issues and reducing costs. Less attention has been devoted to developing understanding of the public policy and political decision-making context. This is an important gap, particularly given the extent of public funding support commonly required to enable the development and/or deployment of CCS systems. In this brief we consider how in practice CCS developments in the three Northern European countries (Norway, the Netherlands and the UK) are in fact largely dependent on key political economy factors in terms of how ideas, interests and institutional support and developments align (or not). Summing up the experience from these initiatives provides an important knowledge platform for new CCS research in the Platon project, which will ultimately address the role of Norwegian public and private actors and activity efforts in advancing the technological and economic case for CCS.

CCS in action: the Norwegian example

CCS developments in Norway are set in the context of that nation's history in offshore oil and gas extraction combined with efforts to be a leader on tackling climate change. Although there was an earlier project launched in 1996, a key development in the Norwegian case was the 2007 initiation of a project to build a full-scale CCS plant at Mongstad, where CO_2 was to be captured on-shore from the existing oil refinery and a new gas-fired power station. However, in 2013 the main project was cancelled, with the subsequent scope adjustment justified in terms of allowing a test centre for CO_2 capture technologies to be established. Discussion in the public domain reflects concern that Government decision-making added to uncertainty around CCS projects.[3]

On the other hand, Norway is the only European nation with operational CCS activity. Two gas field CCS projects - Sleipner in the North Sea and Snøhvit in the Barents Sea – are now utilising some of the 70 giga tonnes of Norwegian storage capacity (Norwegian Petroleum Directorate, 2019). About two thirds of the storage capacity is in aquifers

[3] For example, see http://www.zeroco2.no/projects/mongstad, https://www.bloomberg.com/news/articles/2013-09-20/norway-drops-moon-landing-as-mongstad-carbon-capture-scrapped

(porous sandstone filled with brine) and the last third is in emptied oil and gas reservoirs. Both projects are industry-led, responding to the introduction of Norway's tax on CO_2 emissions on petroleum industry emissions in 1991 and currently operational in capturing emissions from gas processing activities.[4] A crucial institutional driver has been set by the Norwegian Government in the form of a hybrid CO_2 emissions tax and an emission allowance obligation, which is thus subject to the price of carbon determined by the EU ETS.

Crucially, the presence of, and learning from this operational CCS activity sets important foundations in building knowledge and experience that can help enable the roll-out of earlier stage Norwegian CCS projects. There are commonalities between this model and that proposed for the UK in what has come to be known as 'the Oxburgh Report' (PAGCCS, 2016). That is, the aim is for CCS to be an enabler in an energy supply context, thus laying crucial Infrastructure and capacity to enable industrial carbon capture, which in itself can be costly and prohibitive if a reliable and cost efficient transport and storage network is not available to 'plug into'. On the other hand, the industrial decarbonisation base and need is limited in the Norwegian context.

In Norway there are currently two on-shore capture projects, in pilot phase, at two industrial sites: a cement works (HeidelbergCement Norway) and a waste-to-energy plant (Fortum Oslo Varme). The plan is for the 'Northern Lights' consortium (Equinor, Shell and Total) to provide transport (shipping) and storage services, eventually linking this CCS infrastructure to CO_2 sources in Continental Europe and the UK (CCS Norway, 2020a). The Ministry of Petroleum and Energy is responsible for the policy framework, with public support fed through the state-owned Gassnova in the sponsorship of Front End Engineering Design (FEED) studies (Gassnova, 2020). The aim is for industrial partners to take investment decisions autumn 2020, moving to the stage of parliamentary approval later in 2020/2021, and aiming for at least one full-scale project to be operational within the mid 2020s (CCS Norway, 2020b).

Thus, in the case of Norway, on the one hand there would seem to be clear progress on

[4] Where not otherwise referenced, information on the Norwegian case is drawn from Norwegian Government web-pages on CCS at https://www.regjeringen.no/en/topics/energy/carbon-capture-and-storage/the-governments-carbon-capture-and-storage-strategy/id2353948/ and https://www.regjeringen.no/no/tema/energi/co2-handtering/id86982/

CCS with apparent alignment of government and industry interests. Crucially, the Norwegian Government has supplied substantial financial support and established a clearly directed and supporting institutional framework.

On the other hand, that the challenge of building consensus around CCS as a large-scale decarbonisation solution extends beyond meeting climate targets in a cost-effective way also seems to be reflected in ongoing attempts to shape a broader political economy narrative. The ideas underpinning such a narrative – and linking to potential large scale production of hydrogen - are set out in the high profile report on 'Industrial opportunities and employment prospects in large scale CO_2 management in Norway' produced by the Norwegian research organisation SINTEF in the summer of 2018. This report focuses very clearly on jobs and economic value associated with the CCS supply chain and hydrogen production activity. Interestingly, it does not headline with the technical name of 'CCS' and develops a narrative that relates clearly to sustaining and evolving existing activity in Norwegian on and offshore industry. While the methods underpinning the report's results on substantial levels of supported (direct and indirect jobs) are arguably simplistic, the message and narrative developed are more sophisticated and clearly intended to signal a strong 'first mover' advantage in establishing a new industry in the decarbonisation space. In doing so, it clearly aims to speak to a wider range of policy, industry and citizen interests regarding the potential importance of CCS and hydrogen production for the Norwegian economy in moving towards Mid-Century goals.

Of course, the extent to which the Norwegian narrative is, or has to be, as dependent on the off-shore oil and gas industry/energy supply context as comes across in the sources reviewed here, is perhaps debatable. On the other hand, this provides an interesting basis for comparison with the Netherlands and the UK, both of which are, or have shifted towards, more of an on-shore industrial decarbonisation driver and narrative.

Strategic development in the Netherlands

CO_2 storage capacity for CCS is much more limited in the case of the Netherlands, at just 2.7 to 3.2 giga tonnes (Ministry of Infrastructure and the Environment, 2015) and the focus of policy attention is the decarbonisation of onshore industry. The responsible national Government Ministry is that of Economic Affairs and Climate Policy, an important linking of policy responsibilities, reflecting an institutional focus on economy-energy-

environment interdependencies, and one that has also emerged in the UK (with the 2016 establishment of the Department for Business, Energy and Industrial Strategy). Perhaps the most high profile (but not the only[5]) CCS project in the Netherlands is Porthos at the Port of Rotterdam, run by the Port Authority, under joint government ownership of the municipality of Rotterdam and the Ministry of Finance at national level (Porthos, 2019). As in the Norwegian case, state ownership of key industrial actors, through Gasunie and Energie Beheer Nederland (EBN) undoubtedly plays a key role in linking public and private interests.

The initial focus of the Porthos project is on capturing CO_2 emissions within the industrial complex at the Port of Rotterdam, in which more than forty-five chemicals companies (dominated by petrochemicals but with growing biochemistry presence) and five refineries are based. Ultimately, the ambition is to develop a CCS network that could incorporate capture and transportation of wider Dutch and possibly Belgian and German (North-Rhine Westfalia) emissions over time. Thus, the idea and developing narrative concentrates very much on developing economies of scale to enable deep decarbonisation in a manner that focuses on sustaining industry competitiveness, and setting this in a cross-border EU context (the EU has identified the Porthos project as a 'project of common interest'). Roll-out is expected to be begin in the early 2020s, becoming operational at the Port of Rotterdam by 2026, with a next stage of network development by 2030 (Porthos, 2019). In late 2019, the Port Authority announced that four companies had signed an agreement with the Porthos project to engage in capture activity.[6] A key point to note is that these four companies - ExxonMobil, Shell, Air Liquide and Air Products – are all refinery operators and hydrogen producers. This does bring commonality with the Norwegian case in terms of the fossil fuel/replacement low carbon fuel focus of CCS activity. However, that the dominant presence at the Port is in petrochemicals and other chemicals industries, that are not yet 'signed up' to capture activity, invites comparison with the UK case (below). There, a crucial feature in how the policy landscape has shifted is movement away from the Oxburgh model of enabling CCS through energy supply, and towards sustaining high value manufacturing activity as the

[5] There are two other CCS projects In the Netherlands: Athos, an Industrial capture project linked to steel production; Magnun, a natural gas to hydrogen linked to power generation.

[6] See https://www.portofrotterdam.com/en/news-and-press-releases/ccs-project-porthos-a-step-closer

potential motivation for political and societal support of CCS as a deep decarbonisation solution. This seems to be a common narrative developing in both the Dutch and UK contexts.

In summary, on the one hand, it may be argued that the state of CCS in the Netherlands lags behind Norway in fully institutionalising - and broadening the audience targeted with - ideas and narratives around the role of CCS in the political economy of the low carbon transition. On the other hand, certainly in the context of the large-scale/multi-industry Porthos project, it could be argued that attention - and political economy narrative development - in the Netherlands has focused directly on the need to set CCS less as an energy policy issue and more in terms of the need to sustain high-value manufacturing Industry in a low carbon future. In this regard, there is clear strategic development with clear institutional support (reflected in financial support, formal accreditation and partnership activity) at local, national and EU governmental levels in developing CCS projects that align with industry interests.

A political economy challenge: CCS in the UK

With similar offshore CO_2 storage capacity to Norway (around 80 giga tonnes, mainly in the North Sea, but with limited capacity in the Irish Sea also), the UK – and the devolved nation of Scotland therein - could be considered as having similar interests in large scale CCS as Norway. However, the history of CCS in the UK is a complex and challenging one. It has been characterised by several failed public-private partnerships on FEED and demonstrator projects and competitions since 2006, all linked to power generation. The first three were in Scotland linking to North Sea storage: BP's Peterhead (gas-fired) power station pre-combustion CCS-hydrogen project in 2006-7; a National Grid/Shell post-combustion project at the Longannet (coal-fired) power in 2010-11; Shell/SSE's Peterhead post-combustion project in 2013-15. The latter was the competitor to the only English project, the White Rose oxyfuel project (coal fired with the option to co-fire biomass) linking to the southern North Sea, also in 2013-15. The 2013-15 projects were the subject of the November 2015 cancellation of the UK Government's commitment to a large scale CCS Commercialisation Programme, announced in the regular autumn budget

statement of the Chancellor of the Exchequer (see National Audit Office, 2016). [7]

The main, or at least the highest profile, 'post mortem' of this decision is provided by the Oxburgh Report (PAGCCS, 2016), which argued an urgent need to reconsider the approach to CCS development and deployment in the UK. However, the recommendations made continued to flow from a foundation of CCS being enabled through the energy supply system, specifically with power generation being the 'first mover' required to open up the UK's CO_2 storage capacity.

A series of key developments that subsequently unfolded in the UK implicitly moved away from this model for CCS. Crucially, 2016 saw major institutional changes in the structure of UK Government. These included the Department of Energy and Climate Change, which had been the responsible ministry for all previous CCS activity, merging into a new Department of Business, Energy and Industrial Strategy (BEIS). This aligned policy interest in industrial, energy and climate issues and resulted in a new CCS strategy being set in the context of the UK Industrial Strategy (BEIS, 2017), with dedicated focus in the form of a 'CCUS Action Plan' published in the autumn of 2018 (BEIS, 2018) [8]. The key outcome in terms of the policy and approach and narrative was to put the need to decarbonise high value industry clusters at the heart of the CCS challenge.

The interesting backstory to this is that, given what was arguably a breakdown of trust and communication through the series of failed CCS programmes in recent years, BEIS – under the leadership of the UK Minister of State for Energy and Clean Growth – launched a process of 'consensus building' as it set out to reset the CCS policy challenge. The main mechanism was a CCUS Cost Challenge Taskforce, composed of industry (largely those involved In previous projects), technology and government stakeholders, alongside selected academics, charged with reporting to the Minister in the summer of 2018 with recommendations for the forthcoming CCUS Action Plan (see CCTF, 2018). Supporting the aim of embedding CCS strategy within the wider industrial strategy, BEIS invited our own contribution in the form of helping develop and building consensus around a

[7] Where not otherwise referenced information in this section is drawn from UK government publications https://publications.parliament.uk/pa/cm201516/cmselect/cmenergy/692/692.pdf and news sources http://www.carboncapturejournal.com/news/bp-scraps-peterhead-carbon-capture-project/2178.aspx

[8] More recent UK publications and activity around CCS tend to refer to a fuller carbon capture, utilisation and storage (CCUS) chain, albeit with limited focus to date on the utilisation element.

particular type of narrative (see Turner et al., 2020). This focused on the idea that the deployment of CCS may help sustain the value and jobs currently supported by energy-intensive industries (including chemicals/petrochemicals, cement, gas processing, refining, paper and power generation) located at key point source geographical clusters across the UK (see Turner et al., 2018). With the CCTF (2018) embedding elements of that narrative within its recommendations to the UK Government, BEIS were arguably empowered to further develop the idea and narrative within the CCUS Action Plan. Subsequently, CCS solutions are clearly embedded within the UK Government's 'Industrial Clusters Mission', which aims to deliver at least one net zero carbon industrial cluster by 2040. [9]

In summary, it could be argued that action on CCS in the UK clearly lags behind that in Norway and the Netherlands. The North Sea Acorn project[10] is perhaps the only major project to have reached even a substantial planning stage in recent years (through a portfolio of project funding that includes CCS activity emerging via the Industrial Strategy Challenge Fund[11]). On the other hand, through the institutional changes that embed CCS within an Industrial Strategy context, and clear attempts to reset the political economy narrative in this context, is clearly consistent with the Dutch approach - and increasingly that of Norway, to shift CCS out of energy policy and into a broader low carbon economic development space. More generally, the UK does perhaps provide the clearest example of why and how CCS constitutes a political economy rather than a purely technical challenge.

Concluding remarks

This paper argues that the challenge of rolling out large-scale and costly CCS solutions for deep decarbonisation is a one of public policy and political decision-making. The history of CCS in all three countries considered here links strongly to political economy concerns, despite the overwhelming research focus on techno-economic and technology

[9] For information on the UK Government 'Industrial Clusters Mission', see https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/803086/industrial-clusters-mission-infographic-2019.pdf.

[10] For information see https://pale-blu.com/acorn/

[11] See https://www.ukri.org/news/uk-plans-to-fund-new-technologies-to-decarbonise-industrial-clusters/.

issues. Even in the case of Norway, where the only operational CCS projects in Europe exist, the history of CCS in that nation reflects the challenges presented as a result of large-scale project cancellation in the past. As can be observed particularly in the current UK landscape, costly participation in large-scale projects that are subsequently cancelled by Governments results in uncertainty and trust challenges among potential participants. In all three national cases considered here, there is also clearly a perceived on-going need to develop political economy 'narratives' based on the potential for CCS to underpin existing and new valuable industry activity (and associated jobs and other benefits) at scale. It could be argued that in all three cases, albeit to different degrees, the ideas reflected in such narratives currently sits more in the realms of aspiration rather a clearly established low carbon economic develop pathway. On the other hand, what is clear is that the strategic actions of policy makers, and the development of policy/political economy narratives, is moving very much in a direction that aligns with a broader set of national economic development, with particular focus on sustaining capacity to deliver prosperity through low/net zero carbon transitions.

Thus, there is clearly still plenty of opportunity for political scientists, political economists and other social scientists to play a key role in research to support CCS and other low carbon policy development. The Platon project constitutes a key initiative in this respect, with its aim to address the role of Norwegian public and private actors and activity efforts in advancing the technological and economic case for CCS. It is an example that must spread across the wider international research community, not least in the UK and Netherlands if CCS is to actually play the essential role set out for it in the international climate change community.

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