



Programme Area: Carbon Capture and Storage

Project: Scoping New Thermal CCS Power Station

Title: Incentivisation of Thermal Power with CCS

Abstract:

The ETI Executive approved a Stage Gate Zero paper for a potential project entitled 'Early Facilitation for the Development of a New Large Thermal Power Station with CCS', with the request that initial work should be carried out to further develop the idea. Following this the ETI has considered the 'shape' of a potential project further and identified some initial (confidential) work to provide further shaping. The proposed way forward in this paper represents the ETI's preliminary thoughts, which may be modified following further inputs and discussions. The overall aim of the 'ETI project' is to establish an investment proposal for a new, carbon abated GW scale thermal power station. Key drivers will be (a) the investability of the 'power station project' and (b) the extent to which it will act as an exemplar for future power/CCS projects.

Context:

The aim of this project was to scope out a potential ETI Project which would establish an investment proposal for a new, GW scale, carbon-abated, thermal power station, which minimised risk and built on infrastructure which was at the time being proposed in response to the DECC CCS Commercialisation Competition. This scoping exercise had two major components: a review of potential sites where such a station might be built, taking into account existing infrastructure and planned CO₂ transport and storage infrastructure; and the development of an investment model to identify the key features of an investable CCS power project. The ETI's ultimate objective was to establish a new investment consortium ready to undertake 'front-end engineering design' (FEED) on a major thermal power station development incorporating CCS (£2bn+ capex). This initial scoping project sought to create a clear view of the structure of that future FEED study, the likely shape of the power project and to identify potential partners.

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Incentivisation of Thermal Power with CCS

Background and Desired Outcome

The ETI Executive approved a Stage Gate Zero paper for a potential project entitled 'Early Facilitation for the Development of a New Large Thermal Power Station with CCS', with the request that initial work should be carried out to further develop the idea.

Following this the ETI has considered the 'shape' of a potential project further and identified some initial (confidential) work to provide further shaping. The proposed way forward in this paper represents the ETI's preliminary thoughts, which may be modified following further inputs and discussions.

The overall aim of the 'ETI project' is to establish an investment proposal for a new, carbon abated GW scale thermal power station. Key drivers will be (a) the investability of the 'power station project' and (b) the extent to which it will act as an exemplar for future power/CCS projects. This leads to the following key features:

- Brings new players into the CCS arena (project developers, generators, site owners etc)
- Expected to be new generation capacity – rather than retrofit
- Fossil fuel – at the moment both gas and coal (with or without biomass) are potentially in scope (but potentially the initial analysis may point in one or other direction)
- Brownfield site (may already have consent for a power station and/or be an 'add on' to or replacement of an existing station)
- Economic, low risk access to fuel supply and grid connection
- Low technical risk generation and capture technologies ('best proven')
- Focus on power generation with CCS, financially enabled through a CFD/FIT (i.e. the focus is not deflected by EOR, co-generation, district heating etc)
- Piggy back on transport and storage infrastructure and capacity being developed for the current DECC Commercialisation competition, to reduce effective T&S costs and risks – in practice this really means the White Rose pipeline and store

At the conclusion of the 'ETI Project', it is expected that there will be an established consortium of partners ready to take a decision to enter FEED for a 1 GWe scale power station with CCS. The activities which will need to have been completed are expected to be:

- Site selected, with Heads of Terms (HoT) signed for land use and utility supply
- Generation and capture technologies selected (technology licence agreements, supply HoT)
- Pre-FEED completed
- Environmental Impact Assessment completed
- Power Station Capacity Rights secured (or option?); outline agreement for CFD/FIT?

- Transport and Storage Capacity Rights secured (or option?)
- Fuel supply contract HoT signed
- Consortium (including funding) established (signed enduring HoT) to execute the next Phase to prepare for FID (FEED, consenting etc)
- Consortium FEED execution and funding agreement; Consortium enduring HoT

Phase 1 - Initial ETI Shaping Work (~2 – 3 months)

This phase of the work will be carried out internally and through targeted consultancy contracts.

WP1.1 Site & Key Options Shortlisting (Contractor 1)

This will be a targeted study of existing industrial/generation sites within a specified distance of potential access points to the proposed National Grid 'feeder pipeline' for the White Rose project (e.g. within 40 miles of Drax or Barmston). Each potential site (maximum 10 – 15 in total) will be reviewed in terms of:

- Size and suitability for construction & operation of a gas and/or coal and/or biomass plant at 1000MWe scale with amine capture (identify any constraint on higher capacities). Issues to consider include land area, utilities, skyline (for amine columns), emissions etc
- Ease of access to fuel supplies (gas and/or coal and/or biomass)
- Ease of access to grid connection
- Ease of access to the CO2 pipeline
- Current status of consenting and likelihood/complexity of additional consents
- Current ownership/control and forward plans (if any)

Based on an initial high level review, three sites will be selected (in consultation with the ETI) for further analysis. For each of these sites, estimates will be made for the costs and timescales for work required to take FID, construction and commissioning of a 'standard' power station/capture plant (ETI can provide information on the design/estimated costs of nominal 800MWe USCPC and CCGT plant). Likely fuel supply, grid connection and CO2 transport issues (e.g. routes, key crossings) will be identified in outline, with a view given on their significance. Key risks (to timescale and cost) associated with each will be identified.

This workstream will also identify potential cost- and/or time saving options that could be taken to reduce either the pre-FID development cost, time and risk, or those post-FID. This might include options such as "drag and drop" of previous (e.g. Maasvlakte/ROAD) or current full-scale capture schemes.

WP1.2 High Level Investment Model (Contractor 2)

The aim of this work is to produce an initial high level investment model which can be used to identify the key dependencies/risks involved in a project to design, build and operate a coal or gas-fired station, with CCS, in the Humberside region of the UK. The focus of the model should be providing high level representation of all key 'levers' affecting the investability of a generic project (including the CFD/FiT requirement) rather than high fidelity of any one aspect. The key features of the model are expected to include:

- Capital costs based on nominal 800MWe coal and gas stations provided by the ETI, but model should allow scaling to other sizes in ‘natural’ steps (e.g. 500 – 2000 MWe). The contractor should ‘sense check’ these numbers against their own experience;
- ‘Connection’ costs (to fuel supply, grid and CO2 pipeline) to be estimated (e.g. simple formula based on capacity and length);
- Any relevant additional costs/cost risks not covered in the ‘engineering studies’ (e.g. taxation)
- Costs/risks of different fuel supply contract structures;
- Pricing of other key risks, including failures of the downstream transport and storage assets/service contract;
- Availability/load factor as inputs;
- Cost of capital as function of risk profile.

The key output should be the required CFD/FIT to make the project investable. Two options should be included: fixed (or rather index-linked) FIT and fuel-indexed FIT.

All parameters should be adjustable to enable ‘what if’ scenarios to be explored.

The model will be supplied to the ETI and must be transparent in its assumptions and capable of operation by the ETI following initial support/training. The ETI may wish to pass a copy and/or results from the model to its Members and potential project partners such as OEMs, banks, site owners and energy suppliers.

WP1.3 Market Sounding & Consortium Building (ETI)

Phase 1 will be primarily carried out confidentially, rather than through major external engagement. However, ETI should carry out some initial market sounding as a ‘sense check’ whether some key players would be interested in the concepts developed.

WP1.4 Working up the Project Concept and Variants (led by ETI)

This work package will be based around one or more small, confidential meetings and/or workshops (e.g. possibly using ETI staff, SAG members and representatives from the contractors for WP1.1 and 1.2), which will explore the risks and opportunities associated with different approaches, including:

- What would be the options for the ‘consortium’ developing the power project, and where would risks be allocated (e.g. can you get an EPC wrap? Who will take risk on fuel price changes? How will transport and storage risks be allocated?)
- Physical differences in the potential schemes and key choices/decisions required
- Timing risk – what (ideally) would be the FID date with respect to market opportunity and transport/storage risk? How/when to secure pipeline/storage capacity?
- How could FID be brought forward? What are the risks of accelerating FID ahead of the ‘ideal’?
- What alternative project development strategies are there to reduce risk and accelerate implementation (e.g. initially build without CCS?)
- What precisely needs to be achieved within the ‘ETI Project’ (Phase 2)?

The workshop(s) should take place when the initial part of WP1.1 and the draft model from WP1.2 are available. There should be some consultancy allowance post-workshop to work up any options identified.

WP1.5 Approval to proceed

On completion of Phase 1 it will be necessary to revert to the ETI Executive, the Technical Committee and the ETI Board for a mandate to start Commissioning the project.

Phase 2 – Commissioning 9 – 12 months?

This may involve the following:

- Engage with potential players to assess interest;
- Public workshops to develop ideas and enable consortium building (would need to be alongside DECC and NG, as they hold the main keys to success in any future project)
- Draw up RfP for bidding consortia to respond to
- Select and negotiate contract to deliver ‘ETI project’ (i.e. develop investment proposal)
- Potentially put consortia together with complementary strengths and weaknesses.

Any consortium is likely to be led by a development company, experienced in putting together power station or other infrastructure projects. This could either be an ‘independent’ or a major utility player.

We would probably retain some support from contractors for this phase.

The ETI is currently considering alternative structures/funding approaches.

Phase 3 – Delivery (12 – 18 months?)

The ETI would be to oversee and advise the winning consortium, bringing in ETI Member expertise to ensure delivery (firm proposal for FEED with investment secured). ETI could help identify additional players (including any interested ETI members).

The ETI may support more than one consortium through Phase 3. It could act as an ‘independent broker’ to encourage interaction between consortia (including any that are unsuccessful in the RfP).