CLEAN AIR TASK FORCE

Using Reverse Auctions in a Carbon Capture and Sequestration (CCS) Deployment Program

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Founded in 1996, the Clean Air Task Force is a nonprofit organization dedicated to restoring clean air and healthy environments through scientific research, public education, and legal advocacy.

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Introduction

Both the Waxman-Markey, Kerry-Boxer, and Kerry-Lieberman climate bills call for CCS incentives to be allocated in part through the use of a competitive reverse auction mechanism.[1]

This paper reviews the concept of a reverse auction, how reverse auctions are currently used in the public and private sectors, how they can be applied to a CCS deployment program, and the benefits of using them in that manner.

It is worth noting at the beginning that the focus of this paper is on deployment rather than demonstration programs. This distinction is important in a couple of respects. One stems from the view that, while the primary purpose of most demonstration programs is to learn about a new technology, many deployment programs tend to place a higher priority on installing and operating capacity at the lowest reasonable cost. Since competitive procurement processes such as reverse auctions place a premium on cost effective acquisition, they tend to be more appropriate for deployment programs. In addition, since demonstration typically precedes deployment, the reverse auctions discussed in this paper would only begin after some number of CCS projects and capacity from multiple vendors had successfully come into operation. The demonstration experience should provide plant owners and equipment vendors with the knowledge they need to develop bid proposals and compete for incentives in an auction process.

Reverse Auctions: What They Are and How They Are Used

Most auctions involve the sale of a product or service, with multiple buyers competing against one another by raising their bid price until a winner is chosen. The highest priced bid wins the auction. This type of auction is commonly used by sellers in residential and commercial real estate and many other industries.

In contrast, reverse auctions involve a buyer purchasing a product or service, with sellers competing by lowering their bid price to provide the product or service. Here, the low priced bid wins the auction. Because this type of auction is used to purchase rather than sell a product, it is sometimes referred to as a procurement auction.[2]

In the case of a CCS deployment program, the government would in effect procure the sequestration of CO2 captured from the flue gas of fossil-fired generating units. Plant owners and equipment vendors would compete against one another by reducing the price of the incentive they would receive to carry out the project and sequester the CO2. The lowest incentive price bid into the auction, expressed in dollars per ton sequestered, would win the auction. Among other benefits the auction would help ensure that the deployment program deployed as much CCS capacity and sequestered as much CO2 as possible given the available funding, increasing the cost effectiveness of the program.

Reverse auctions are typically carried out in several steps. First, the buyer defines the product or service to be procured with sufficient specificity that sellers can compete to provide it primarily on the basis of price. Second, the qualifications of potential sellers are evaluated and unqualified ones screened out of the auction process. Finally the auction itself is conducted, often over the internet.

Reverse auctions have been conducted for at least 20 years. The practice was pioneered by automotive and aerospace buyers. Today they are used by numerous companies and government entities to procure a wide range of goods (wood, pulp and paper, electronics, plastics, building

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[1] See Section 115 of H.R. 2454 (the American Clean Energy and Security Act of 2009) , Section of 125 of S. 1733 (Clean Energy Jobs and American Power Act.) , and Section 1431 of the American Power Act.

[2] There are many different types of auctions that are used commercially and described in the academic literature. Reverse auctions are typically considered one type of a descending bid, Dutch auction.

materials, metals and chemicals), services (telecom, construction services, travel, packaging, service freight) as well as plant and equipment.

Illustrative examples of entities that use reverse auctions to procure goods or services include the following:

- Federal Government
  - Department of Treasury
  - Department of Housing and Urban Development.
  - Armed Services – Naval Supply Systems Command, Army Tank and Armaments Command (TACOM), Army Communications-Electronics Command (CECOM), Army Space and Missile Defense Command
  - U.S. Postal Service
  - State Department
  - Department of Justice – Bureau of Prisons
- State and Municipal Governments
  - Used to procure electric power supplies - The cities of Waco and Temple Texas, the state of Connecticut, the cities of Worcester and Springfield Massachusetts
  - Used to procure other products – State of Minnesota, Pennsylvania Department of General Services
- States where power providers have used reverse auctions to procure power supplies for standard offer default service
  - New Jersey
  - Pennsylvania
  - Illinois
  - Delaware
  - Connecticut
  - Ohio
  - Maryland
- Private Industry
  - Arch Coal
  - Ericsson
  - Target
  - Dell
  - IBM
  - GE
  - BP
  - United Technologies
  - H.J. Heinz
  - Exxon Mobil
  - Royal Dutch Shell

Using Reverse Auctions to Allocate Incentives and Deploy CCS Projects

The manner in which reverse auctions would be used to deploy CCS technology will depend to some extent on the regulatory framework for the deployment program. For instance, the deployment program could operate within a carbon cap and trade program, as proposed in Waxman-Markey or Kerry-Boxer, where the incentive would be in the form of bonus allowances. Alternately, it could operate without a cap and trade program, where the incentive could be in the form of a sequestration tax credit or direct financial payment for sequestration.

Under either framework, one or more reverse auctions should be held each year. To promote development of a CCS industry in regions of the country without access to revenues from enhanced oil recovery (EOR) projects, separate auctions should be held for CCS projects that sell CO2 for EOR purposes and others, such as in the Midwest, that are more likely to incur transport and sequestration costs. Any CO2 capture technology eligible for incentives could compete in one or the other of these auctions. So for instance, if the program covered CCS retrofit projects on existing coal units, CCS projects on new coal plants and also CCS on natural gas units, all three types of technologies would be eligible to compete in either the EOR or non-EOR auction depending on how they sequester the captured CO2. This would encourage competition in the auctions and allow incentives to flow to the lowest cost CCS technologies and projects.

In order to help reduce the uncertainty of investing in early development project costs (such as engineering, permit, contracting and similar costs) a grant loan program should be established to support the development of auction bids during the first years of the deployment program. Under this aspect of the program, a limited number of cost-sharing loans would be made to qualifying plant owners and vendors. If the resulting bids were selected in the auction, the loan would be paid off as part of the award calculation. If the bid was not selected, the loan would be converted to a grant. In any event, a losing bidder would be able to revise its bid and compete in the following year's auction.

As with any auction process, the design of the reverse auction process is important to ensure that it functions properly.

Auction participants should submit bids in the form of a nominal level dollar per ton of CO2 sequestered by the proposed project over the first 10 years of operation along with an estimate of the amount of CO2 to be sequestered during this period. The entity administering the auction should make provisional awards to the lowest priced qualifying bid or bids no later than 30 days after the auction is conducted. If appropriate, a predetermined cap on the auction price may be established to help ensure that the auction functions properly. The number of projects awarded provisional incentives in a given auction should be based on the proposed number of tons estimated to be sequestered by the winning projects and the value of the incentives expected to be available over the 10 year award period.

The provisional awards would be a binding commitment on behalf of the government, but contingent on the bidder meeting the milestones in the project development proposal and sequestering carbon from the project. The incentive awards themselves would not be made until CO2 from the project was in fact sequestered and should be made on the basis of the actual amount of CO2 sequestered rather than the amount estimated in bid. The auction administrator may also develop rules to verify that adequate development progress is made toward the in-service date and penalize failure to make adequate progress including possible loss of any award commitments resulting from the auction. These requirements place the uncertainty associated with project completion and performance on the bidder, where it most appropriately belongs.

The agency administering the auction should also be required to consult with the National Academy of Sciences or similar independent body of experts on the design, execution and results of the auction process. As part of this, the independent body should submit a joint report to Congress and the President within six months of the completion of each year's auctions assessing the performance of the auction and recommending any necessary changes for future auctions.

Addressing Adverse Selection in a Reverse Auction

For the deployment program to function properly, it is important that incentives are awarded to viable projects that have a high likelihood of being completed in a timely manner rather than others with a greater likelihood of cancelation or postponement. This is an important issue whether the incentive is structured around a reverse auction or other types of incentives, such as a fixed-level incentive. The design of the reverse auction process can address this concern through provisions related to bidder eligibility, bid requirements and the award process.

Regarding eligibility, rules should be established specifying the qualifications needed by bidders to participate in the auction. In addition to minimum project size and the percent of CO2 captured, bidders may be required to submit a project development plan that demonstrates its ability to meet certain development milestones in a timely manner. For instance, the plan could demonstrate that the bidder is able, within 12 months of the bid being accepted, to finalize EOR or transport sequestration agreements, obtain final air permits, secure final financial commitments, and break ground on the project. The development plan could also demonstrate the ability of the bidder to achieve commercial operation within four years of the bid being accepted. These requirements will help ensure that auction participants are serious bidders capable of building and operating the proposed projects in a timely and effective manner.

A similar approach to this process was included in the proposed Clean Energy Jobs and American Power Act (S. 1733). That bill includes certification and bonus allowance reservation processes for both the fixed-level incentive and reverse auction phases of the program as a means to provide assurance to promising project developers that they will receive incentive bonus allowances provided they continue to meet the requirements of the program. Certification requirements included a financial commitment as well as construction and operational milestones. The bill does not explicitly require a development plan in order to participate in the auction, only to reserve bonus allowances.

Benefits of a Reverse Auction Mechanism

The U.S. coal fleet is quite diverse, with a range of coal types, conventional pollutant controls, unit sizes, heat rates, access to EOR and sequestration sites. Considering the potential for new coal plants as well, including IGCC or underground coal gasification, the diversity of unit characteristics is even greater. Because of this, the economics of CCS varies widely from unit to unit. Larger units with lower heat rates, conventional pollutant controls, access to EOR revenues and relatively low replacement power costs[3] generally have the most favorable economics. As shown in ***figure 1*** below, this variation in unit characteristics and market conditions can result in the cost of the incentives required for deployment without a carbon market to vary between $40/tonne and over $100/tonne.

The variation in the level of required incentive is compounded by the uncertainty in capital costs and pace of technological learning as well as the commodity cost of oil, coal, natural gas and electricity. The price of oil is important because it will influence the price of CO2 sold to EOR projects. The price of natural gas and electricity are important because they will influence the cost of satisfying the parasitic load requirements of CCS systems.

[3] This is an important economic factor given the parasitic load requirements of CCS projects.

10 Year $/Tonne Incentive Required to Deploy CCS
(2014 In-Service date for Nth Unit, $25/Tonne Carbon Allowance Price)

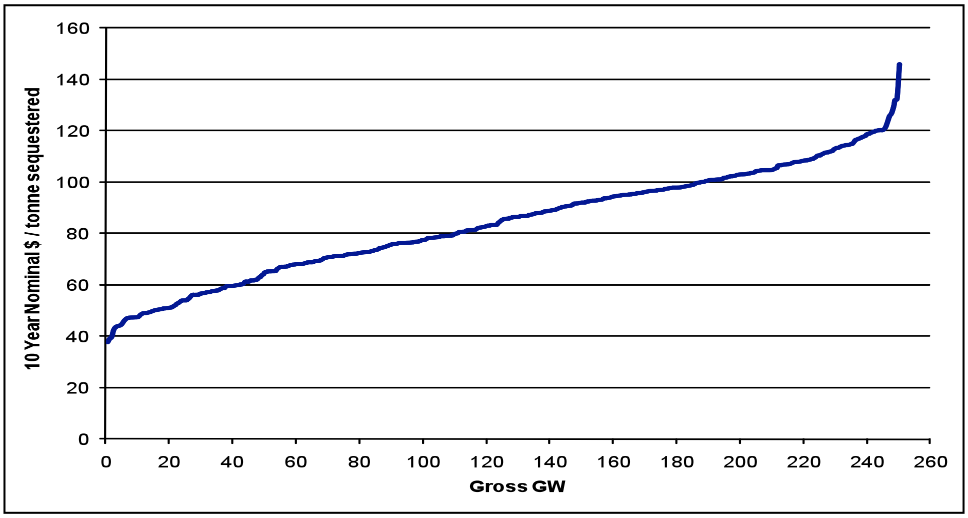

Figure 1

All this suggests a deployment program based on a fixed incentive price will be either inefficient (because the incentive is higher than needed to deploy the least costly CCS projects) or ineffective (because it is too low to deploy any CCS).

In contrast, setting the incentive price using a flexible, market-based mechanism such as a reverse auction allows the level of incentive to reflect the lowest cost CCS projects first and then adapt to changing technology and market conditions over time. The incentive will be high enough to deploy CCS and assure the program is effective, while not paying more than necessary. The result is an efficient and effective incentive deployment program.

CCS Capacity Deployed under a Reverse Auction Process
and the Mechanisms Provided under the Kerry-Boxer Bill

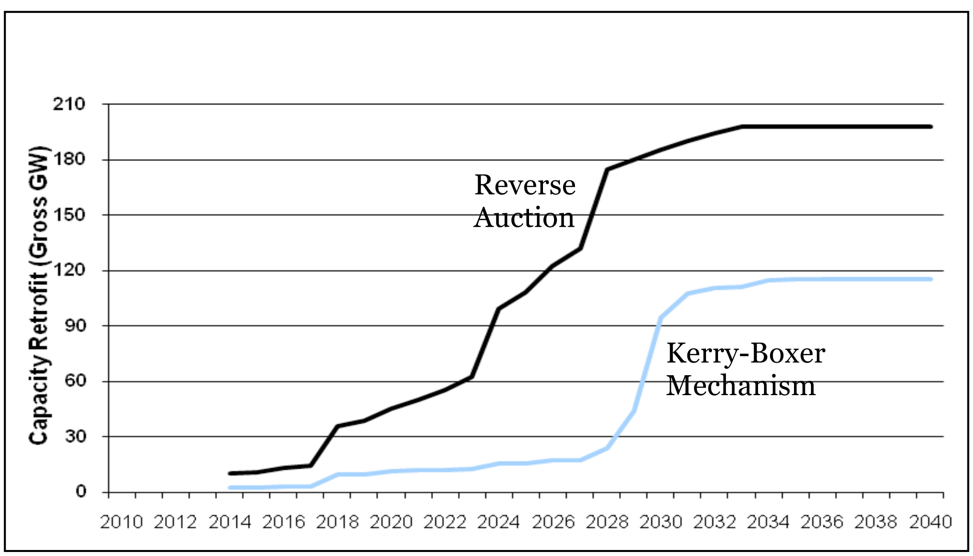

Figure 2

The amount of additional CCS capacity deployed and CO2 sequestered as a result of using a reverse auction process, and therefore the benefits to coal plant owners, vendors, environmental interests and taxpayers, are potentially quite large. ***Figure 2*** above illustrates that a deployment program relying exclusively on a reverse auction can accelerate and roughly double the capacity deployed under the incentive pricing mechanisms proposed in the Kerry-Boxer bill (which calls for the first 20 GW of CCS capacity to be deployed under a fixed incentive price before being replaced with a reverse auction mechanism).

Finally, while a reverse auction requires plant owners and equipment vendors to compete for incentives, it also would benefit them in important ways[4]. Perhaps most significantly, as suggested by the figure shown above, it can accelerate and substantially increase the portion of a coal owner's fleet that might be retrofit under a deployment program, thereby increasing the size of the market for equipment vendors, especially those with innovative and low cost technologies. The larger market created by the more efficient reverse auction process gives both groups greater certainty they will be able to achieve their respective business objectives. In addition, holding separate auctions for EOR and non-EOR CCS projects would ensure early CCS development in regions of the country, such as the Midwest, without easy access to EOR, while a grant loan program to support early project development costs would reduce the investor development risks in the first years of the deployment program.

[4] Many of the public policy and private sector advantages of using a reverse auction process to deploy CCS capacity are also described in the testimony of Frank Alix, CEO of Powerspan,Corp. a clean energy and carbon capture technology company, in his March 10, 2009 testimony before the House Subcommittee on Energy and Environment.