Berkeley Lab and the Clean Energy Group

CASE STUDIES OF STATE SUPPORT FOR RENEWABLE ENERGY

The U.K. NFFO and Ireland AER Competitive Bidding Systems

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CASE SUMMARY

Case Description

Until recently, the United Kingdom's (UK) principal form of support for renewable energy was delivered through a competitive bidding process known as the Non-Fossil Fuel Obligation (NFFO). Through this process, renewable generators were able to bid for above-market power purchase agreements (PPA) in five NFFO auctions. The UK's electric companies were required to purchase the output of projects awarded NFFO contracts. Instead of the government paying production incentives to renewable energy generators, however, the utility purchasers were reimbursed for any above-market costs that were incurred. A similar mechanism, called the Alternative Energy Requirement (AER), has been operating since 1995 in Ireland. Because these systems eliminate "power purchase agreement uncertainty," a major concern in the U.S., they are described in this case study.

Innovative Features

- Experience with the NFFO and the AER shows how clean energy funds can work directly with the ultimate purchasers of renewable electricity to offer full revenue certainty, including long-term PPAs, to the lowest-cost renewable projects.
- This approach (or variants of it) deserves consideration as a way of maximizing the chances of project success. Of course, unlike the NFFO and AER, state funds will not be able to *require* utility or competitive electricity supplier participation; instead, incentives will need to be offered to *encourage* such participation.
- Such approaches have not yet been applied extensively by state renewable energy funds, in part because such an approach is challenging to develop once retail competition is introduced and the traditional roles of the utility providers change. States like Wisconsin and Oregon, however, which have not comprehensively restructured their electricity industry, may be particularly well positioned to broker such a deal. In fact, in July 2002, Oregon issued a wind power solicitation structured along these lines;

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California is planning to implement a related strategy.

- NFFO and AER experience also shows that long-term PPAs, regular competitive solicitations, technology bands, and penalties for non-performance can all play a role in clean energy fund efforts to support large-scale renewable projects.

Results

- The NFFO and the AER have created strong competitive pressures to lower the price of renewable electricity.
- Both sets of programs have also brought new renewable generation on line (approximately 1000 MW in total) and have solved the "PPA dilemma" faced by some U.S. funds.
- The NFFO and AER processes do not merit direct emulation, however. In both cases, incentives for speculative bidding and permitting hurdles have resulted in a large number of failed projects.

CASE STUDY DETAILS

The Need for a Long-Term PPA

Fund administrators in the U.S. often face a "chicken and egg" problem when it comes to providing incentives to utility-scale renewable energy projects. On the one hand, these projects typically require not only state financial assistance but also a long-term power purchase agreement (PPA). On the other hand, clean energy funds are responsible for only one of the two requirements – state financial assistance.

The limited success of the production incentive auctions in California (described in a separate case study on production incentive auctions) therefore comes as little surprise. With the onset of the energy crisis, the winning bidders in the CEC auctions searched in vain for PPAs with credit-worthy buyers that would, when combined with the CEC incentive, provide enough revenue certainty to get their projects built.

Clearly, a proper linkage between fund solicitations and long-term PPAs is crucial to success (Bolinger and Wiser 2002). As detailed in other cases, Pennsylvania and Minnesota have taken limited steps to break this chicken-and-egg problem – in both states the fund administrator selected projects that appeared most likely to garner a PPA. The Energy Trust of Oregon has gone one step further by proactively working with the state's two investor-owned utilities to ensure a PPA for the wind projects it plans to support; California is planning to implement a related strategy. Finally, as discussed in this case, the U.K. Non-Fossil Fuel Obligation (NFFO) and Ireland Alternative Energy Requirement (AER) provide examples of perhaps the most direct way of achieving a PPA and revenue certainty.

The NFFO and AER Structure "Solves" the PPA Conundrum

Until recently, the UK's principal form of support for renewable energy was delivered through a competitive bidding process known as the NFFO (similar mechanisms, not described here, are used in Scotland and Northern Ireland). Through this process, between 1990 and 1998, renewable generators were able to bid for above-market PPAs in five NFFO auctions intended to result in 1500 MW of declared net capacity (DNC) by 2000 (Mitchell 2000).[1] The UK's 12 regional electric companies were required to purchase the output of any project in their region awarded an NFFO contract, and were refunded the difference between the monthly NFFO price and the market price of power (the UK power pool price) via a surcharge on electricity consumption (similar to a system-benefits charge). A similar mechanism has been operating since 1995 in Ireland and continues to this day, with 5 competitive bidding rounds held so far (Gallachoir 2000).

[1] DNC is the amount of baseload capacity required to produce an equivalent amount of energy over a year – 4 MW of wind at a 25% capacity factor equates to 1 MW DNC.

These solicitations were "full cost" auctions that asked renewable developers to bid the PPA price that they would require to come on line. Instead of the state paying this price directly to the developers, however, the utilities were required to enter into these PPAs but were subsequently reimbursed for any above-market costs that were incurred. Clean energy fund support was therefore directed to the purchaser of the electricity – the utilities – rather than to the project developer. Unlike a production incentive, a full cost auction eliminates the risk of not finding a long-term PPA with a credit worthy buyer.

NFFO1 and NFFO2 offered PPAs that expired at the end of 1998, while NFFO3, 4, and 5 offered 15-year contract terms, as has the AER in Ireland. Within each auction there have been separate "bands" for different renewable technologies, and in some rounds there have been sub-bands for small wind projects, therefore ensuring a more diverse set of winning bidders. Winning bidders are those that have the lowest PPA bid prices in their specific band, and winners are offered PPAs at their bid price.

Solicitation Results

The structure of the NFFO and AER solicitations solved one major problem – that of the PPA – and also resulted in deep price reductions over time. For example, the average 15-year PPA price of winning bidders in NFFO3 was 4.2 pence/kWh, while similar bids in NFFO5 were down to 2.7 pence/kWh.

The table below shows results from the five rounds of the NFFO, which resulted in 880 awarded contracts for 3271 MW of renewables declared net capacity (DNC). Note that prices in NFFO1 and 2 are not directly comparable to NFFO3, 4, and 5 because PPA lengths were raised from 8 to 15 years.

Results of the AER, not presented here, show similar trends, though the AER competitions have been far smaller in size (Gallachoir 2000).

Problems Loom: Permitting and Speculative Bidding

While the basic structure of the NFFO and AER has merit, and the results of the solicitations have been widely lauded as encouraging efficient cost reductions, the NFFO and AER processes have also been strongly criticized. This criticism is based on the observation that the majority of winning bidders have been unable to bring their projects on-line. Out of 3271 MW of awarded contracts, only 821 MW has been installed – a success rate of just 25% so far. AER results are similar.

As described by Mitchell (2000), the government's often-stated desire to reduce the average price per kWh for each successive order created tremendous competitive pressures to lower bid prices. Two specific design features of the NFFO and early rounds of the AER contributed to what many believe to be a high degree of speculative bidding:

- **No Penalties for Non-Performance and Lengthy Development Times**: Bid prices have been the primary metric by which winning projects are selected. With no penalties applied to winning bidders that are unable to develop their projects, and with up to 5 years to bring one's project on line, generators were encouraged to bid speculatively based on assumptions of declining technology costs in the future.
- **Permitting Hurdles**: To further increase their chances of securing a contract, developers naturally looked to the strongest wind sites – which in the UK often coincide with prominent features of the landscape. With no requirements that projects have permits before bidding into the NFFO and

	NFFO1	NFFO2	NFFO3	NFFO4	NFFO5
period of guaranteed contract	1990-1998	1991-1998	1994-2009	1997-2012	1998-2013
capacity of winning bids (MW, DNC)	152	472	627	843	1177
installed capacity (MW, DNC)	145	172	293	156	55
average price (pence/kWh)	6.5	6.6	4.4	3.5	2.7

initial rounds of the AER, numerous projects faced permit denials after winning an NFFO contract.

Though these elements of the NFFO and AER process do not deserve emulation – and in fact the UK NFFO has now been abandoned in favor of a renewables portfolio standard because of the limited success of the NFFO in bringing projects on-line – the concept of working with or through the utility buyer of renewable electricity deserves the attention of U.S. clean energy funds. Such an approach may be especially viable in states that have not opened their electricity market to full retail competition and therefore have not fundamentally altered the role of the utility providers. Of course, unlike the NFFO and AER, state funds will not be able to require utility participation; instead, incentives will need to be offered to encourage such participation.

Several state funds are considering or actually pursuing such a model. In July 2002, the Energy Trust of Oregon (in complicity with the state's two investor-owned utilities) issued a solicitation for wind power whereby the utilities would enter into long-term PPAs for the power at prices reflective of projected market prices, and the Energy Trust would subsidize the project to cover any remaining above-market costs. California is planning to use a similar model as a means of covering the incremental cost of a renewable portfolio standard.

The idea of regular competitive solicitations to allow technologies to mature and technology bands to ensure resource diversity also deserves consideration. It is also useful to note the NFFO's move away from the initial 8-year PPAs to 15-year PPAs in later rounds, and the consequent reduction in bid prices. Learning from the NFFO and AER, it is also apparent that penalties for non-performance and closer consideration of siting and permitting issues should be incorporated in competitive bidding processes. These lessons have apparently been learned in Ireland, where the latest round of the AER required that projects have permits *before* they bid, and that winning bidders maintain a tight schedule for completion (Gallachoir, Chiorean and McKeogh 2002).

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Ireland AER:
http://www.irlgov.ie/tec/energy/renewable/

UK NFFO:
http://www.dti.gov.uk/renewable/nffo.html

About this Case Study Series

A number of U.S. states have recently established clean energy funds to support renewable and clean forms of electricity production. This represents a new trend towards aggressive state support for clean energy, but few efforts have been made to report and share the early experiences of these funds.

This paper is part of a series of clean energy fund case studies prepared by Lawrence Berkeley National Laboratory and the Clean Energy Group, under the auspices of the Clean Energy Funds Network. The primary purpose of this case study series is to report on the innovative programs and administrative practices of state (and some international) clean energy funds, to highlight additional sources of information, and to identify contacts. Our hope is that these brief case studies will be useful for clean energy funds and other stakeholders that are interested in learning about the pioneering renewable energy efforts of newly established clean energy funds.

Twenty-one total case studies have now been completed. Additional case studies will be distributed in the future. For copies of all of the case studies, see:
http://eetd.lbl.gov/ea/ems/cases/ or http://www.cleanenergyfunds.org/

About the Clean Energy Funds Network

The Clean Energy Funds Network (CEFN) is a foundation-funded, non-profit initiative to support the state clean energy funds. CEFN collects and disseminates information and analysis, conducts original research, and helps to coordinate activities of the state funds. The main purpose of CEFN is to help states increase the quality and quantity of clean energy investments and to expand the clean energy market. The Clean Energy Group manages CEFN, while Berkeley Lab provides CEFN analytic support.

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