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Renewable Energy Auctions and Tenders: How good are they?

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ABSTRACT

This paper analyses the performance of two cases of renewable energy (RE) auction/tender systems in an effort to contribute to the evaluation of and best practice in RE auction/tender systems. This is done by comparing regimes in different settings, one concerned with Danish offshore wind development, the other concerned with renewable energy development in South Africa (SA). It is found that regulatory factors which promote certainty in deployment, including measures to ensure that projects achieve grid connection, are important in assuring delivery of the programmes. However cost reductions that are associated with renewable energy auctions are not caused by the auction systems themselves, but rather are associated with general declines in the costs of renewable energy technologies. Moreover, the effect of renewable energy auctions systems may be more concerned with limiting renewable energy deployment rather than reducing the costs of energy generated by renewable energy projects that are deployed.

Keywords:

renewable energy;
auctions and tenders;
Denmark;
South Africa

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1. Introduction

Competitive procurement of renewable energy through auctions and tenders is a relatively new way of procuring renewable energy (RE). Renewable energy auctions and feed-in tariffs are both associated with the award of long term contracts to renewable energy developers which guarantee payment of specific amounts for energy which is generated. The distinction between an auction and a tender is that in the latter format factors other than pure price are taken into account by the Government in awarding the contract. As will be discussed, both systems studied here (in Denmark and South Africa) have elements of auctions and tenders.

This paper aims to contribute to the evaluation of RE auction/tender systems. This will be done through analysis of the performance of two auction/tenders systems with regard to some key selected criteria. These criteria are grouped around the two crucial concepts of certainty and cost.

In doing so, we can develop theory and practice of the effective use of auctions/tenders. This paper could provide useful information for policymakers when designing future auction/tender systems.

Interest in, and reliance on such competitive procurement methods is expanding. Indeed EU state aid guidelines for renewable energy support now recommend the use of such methods [1]. According to EU Commission advice:

'A well-designed auction can lead to significant competition between bids revealing the real costs of the individual projects, promoters and technologies, thus leading to cost-efficient support levels, and limiting the support needed to the minimum' [2]. On the other hand supporters of setting 'feed-in tariff' prices by administrative means argue that the effect of the EU Commission guidelines *'is to contain renewable power growth to lower levels than so far, and to give big corporate operators a better position to compete in this sector'* [3].

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So far there is a relative scarcity of work analysing the effectiveness of renewable energy auction schemes, mainly owing to the fact that they have not been in operation very much or very long compared to conventional feed-in tariffs or green certificate support mechanisms for renewable energy. However there is an extensive literature on renewable energy policy instruments in general, a few of which can be mentioned on account of their numbers of citations and/or relevance [3], [4], [5], [6], [7], and several others which can be cited as an example of a wider literature [43], [44], [45]. [46], [47], [48], [49], [50], [53].

A review of the existing (limited) literature on renewable energy auctions suggests that among the aspects of design studied, the issue of the nature and type of penalties imposed for non-delivery of projects is important [4]. Anaya and Pollitt [5] comment that the absence of penalties was a factor in the failure of the British renewable energy procurement mechanism to deliver capacity in the 1990s [6]. Moore [6] has compared the UK experience to that of Brazil, which has organised its RE programme through auctions. More broadly, a review of administrative rules underpinning design of RE auctions has been undertaken by IRENA [7].

A discussion of key issues in implementation of renewable energy auctions may be gained from detailed examination of particular cases. In particular we need to examine the extent to which, and the costs at which, the projects are actually being delivered and also the ways in which delivery success is facilitated or challenged through regulatory conditions. Regulatory conditions are studied by reference to the concept of 'certainty'.

In particular there will be:

1. A discussion of the extent to which the delivery of renewable energy projects is associated with the degree of regulatory certainty, this including not just with the auction/tender bidding mechanism, but also with related infrastructural issues. Details of criteria to measure this certainty will be set out in the Methods section. The criteria for certainty includes modes of scrutiny of bids for projects, coordination of delivery of projects, achieving planning consent, site evaluation, ensuring grid connection and ensuring the developers take some financial responsibility for the possibility of failure to deliver the projects.
2. A discussion about the extent to which the introduction of auction systems in renewable energy can be cited as a cause of cost reductions in the delivery of RE projects. The key criterion here is whether the changes in costs can be clearly associated with the auction/tender mechanisms themselves or can be associated with contextual market or technological changes.

The next step in the paper will be to describe the method adopted. This will be followed by an analysis of the Danish programme of offshore windfarms followed by an analysis of the South African renewable energy programme. The results will then be discussed and finally conclusions will be made.

2. Method

Certainty is measured by examining the following issues:

a) Planning consent for the projects. The degree to which planning consent is guaranteed for the projects or at least that the developers have secured planning consent as a condition for being awarded a contract.
b) The extent to which grid connection is assured
c) The extent to which the government helps the projects to determine project viability at the sites chosen (e.g. assessing windspeeds)
d) The degree of coordination between agencies to ensure delivery of the projects given contracts
e) The extent to which developers have to pay significant financial penalties if they fail to deliver the project on time
f) Scrutinisation and evaluation of financial viability of bids for contracts

Cost is examined by studying changes in prices awarded to renewable energy developers in successive rounds of contract awards. Contextual issues are also examined, especially wider changes in technology costs that are independent of types of policy instrument used to promote renewable energy projects.

The technique employed here is to analyse country case studies of renewable energy auction regimes. We select two of them as apparently successful (so far) exercises in renewable energy auctions. These are Denmark offshore wind power auctions/tenders and South Africa's Renewable Energy Independent Power Producers Programme (REIPPP). These two cases are selected because their renewable energy policy instruments involve RE auctions/tenders in different conditions. One is what is known as a developed industrial economy, another in an emerging economy. It may be the case that if there are common lessons to be learned from these cases in different economic conditions, then such common lessons may be plausibly used as guides to form hypotheses with which to study other cases of RE auctions. This study is compiled mainly by reference to other studies, official reports and reports by NGOs and also a small number of interviews that have been organised in order to shed light on issues that were not so otherwise clear in the documents studied.

3. Danish Offshore Wind Auctions/Tenders

We shall structure this section by examining some relevant history and background of the Danish renewable energy and particularly offshore wind sector before describing the evolution of the tender/auction system. Then we shall look at the extent to which the regulatory conditions for offshore wind contribute to 'certainty' factors that help deployment, and then there will be an examination of the impact of auctions on costs of offshore wind. This section on Denmark will be rounded off by a discussion of how outcomes have been affected by the certainty in the regulatory arrangements and how costs have been affected by the auction system.

3.1. History and background of Danish offshore wind

Denmark's offshore wind capacity is mainly bound up in five farms constructed since 2001, with a contract for another windfarm (Horns Rev 3)having been awarded in March 2015. Wind Power generated around 40 per cent of the level of Danish electricity demand in 2014, and this proportion continues to increase [8]. Calculations made on the basis of data available from the Danish Energy Agency suggests that offshore wind now makes up around half of the production from Danish wind power. Denmark plans to continue expanding offshore wind as a major component of its target to generate 50 per cent of electricity from renewable by 2020 [9].

Denmark was a pioneer in wind turbine development in the 1970s to 1990s[10]. It also developed a system of funding RE that became known as 'feed-in tariff', that of setting prices that electricity utilities would have to pay to producers of wind power and other RE sources. During the 1990s Denmark also acted as a pioneer by extending its wind power programme into offshore projects. However, a new more right wing Government took office at the end of 2001 and they introduced policies which led to a slowdown in the rate of onshore wind power development. The focus for RE development was largely shifted thereafter onto offshore wind projects. A consensus has developed about this programme, with legislation agreed in 2012 that saw further emphasis on the offshore wind programme, with some continued development of onshore windfarms. The onshore programme has continued to be funded through a traditional 'feed-in' tariff style of approach, whilst the offshore programme has been funded through a renewable energy auction scheme since 2005.

Initially Denmark used a form of 'feed-in tariff' method to fund its first offshore windfarms, involving paying a 'minimum price' for a limited period. In this case the payments were set to be buttressed by extra payments if the wholesale market price rose fell below a set amount, although in 2001 when this arrangement was established power prices were very low and did not begin to rise until 2004. Horns Rev 1 and Rødsand 1 windfarms were constructed on this basis. However, after 2002 the Government changed the procurement policy to adopt an auction system for offshore windfarms [11]. This system has been used since then, albeit with some fine-tuning as is discussed in the next sections.

At the time of writing this paper, a tender was being organised for a 'nearshore' 350 MW windfarm. Five companies applied for the project, and three of them have been invited to negotiate with the DEA to be given the tender [15]. 20 per cent of the equity in this windfarm will be offered to local people.

3.2. Evolution of the auction system

The system has gone through some changes since the start of the auction programme in order to improve project delivery. In particular penalties have been introduced.

The launch of the auction programme preceded an increase in energy prices, which became marked from 2005 onwards. This coincided with an increase in commodity prices of resources such as steel and copper that are used in construction of offshore windfarms. Hence offshore windfarm costs also increased. Although one offshore windfarm (Horns Rev 2) was completed under the original tender price that emerged from the auction, the original developers of the other windfarm given a contract at the auction round (Rødsand 2) withdrew after it became clear to them that the price agreed was no longer profitable. A new auction was organised and one company bid for the contract at a rather higher price. However, this time the contract stipulated that a failure to complete the contract within a defined time period would entail a penalty being paid. Penalty clauses have been inserted in the contracts since then.

Although the general principles have remained the same the system was fine-tuned between the last two auctions. Only one bid was made for Anholt windfarm in 2010, and so the system was reformed. The details of the delivery schedule and penalty mechanism were left up to negotiations between the Danish Energy Agency (Energistyrelsen) and the developers who had been approved as bidders in the pre-qualification stage. Four bids were made for the following Horns Rev 3 windfarm in 2015. In effect the process became a little more like a tender rather than an auction.

The premium price is payable for 20 TWh of production, which is likely to correspond to around 12 years of operation, after which market rates for electricity prices will be paid to the operators [14]. All of Danish offshore contracts have been won by large multinational companies such as DONG, Vattenfall and E.ON.

A penalty, rising up to 300 million DKK, was set to be paid by the developer if the winning company (in this case Vattenfall) failed to complete the 400 MW Horns Rev 3 project by a timetable set out in the agreement [13]. No accounts of the capital cost of Horns Rev 3 are currently available, but if we assume a capital cost for the project of 30 million DKK per MW then this maximum penalty is equivalent to a penalty of around 2.5 per cent of the capital costs of the project.

3.3. Factors contributing to certainty in Danish offshore wind

Using the set of criteria set out in the methods, we can summarise the Danish offshore wind tender system the following way. The system adopted is highly regulated and focussed containing the following elements which promote greater certainty [9, 12]:

a) Planning consent is guaranteed for the project to be procured based on a planning consensus among stakeholders
b) Grid connection costs up to the windfarm, including the necessary transformer, are born by the electricity system rather than the windfarm developer
c) Initial surveys of windspeeds and wave patterns and also geotechnical and environmental studies of the seabed are carried out under the auspices of the Government
d) In general the project is closely coordinated between the Danish Energy Agency (representing the Danish Government) and the developers
e) Developers have to pay significant financial penalties if they fail to deliver the project on time
f) There is scrutiny and evaluation of financial viability of bids for contracts. The Danish Energy Agency operates a ‘pre-qualification’ process to ensure that the companies making bids will have project proposals that are economically viable

3.4. The issue of technology costs under the auction system

The paper now turns to look at the issue of what changes in technology costs there have been under the auction programme, as measured in power prices awarded to the developers with successful bids. Figure 1 shows the prices awarded for power purchase agreements for offshore windfarms expressed in 2015 Danish prices. Note that this refers only to projects that have been completed and the most recent project, Horns Rev 3, which is expected to be completed.

As can be seen from Figure 1 the bid prices for projects increased from 2001 onwards, and only the latest project settled this year has shown that prices have fallen again. The operators of Horns Rev 3 will be paid 770 DKK per MWh, which converts to $116 (USD) per MWh, 100 euros per MWh or £70 (GBP) per MWh. However, it needs to be borne in mind that this price excludes grid connection, which could add around 20 per cent to the price if the developer had to pay.

Nevertheless, this cost compares favourably with the cost of offshore windfarm contracts awarded by the UK (also through an auction system) at £120 per MWh. The fact that the UK schemes tend to be in deeper waters compared to Horns Rev 3 might also account for some of the difference in cost. The UK system of auctions for ‘contracts for difference’, which announced its first contract awards in 2015, is perhaps too new to be the subject of analysis of outcomes.

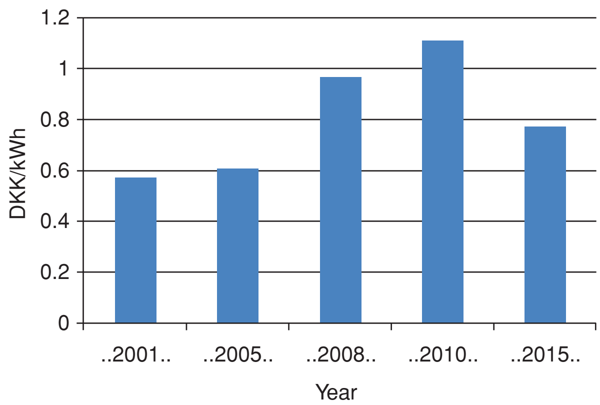

Figure 1: Prices set for offshore windfarms in Denmark Source: [17], [18], [19], [20]. All prices converted to 2015 Danish prices using [52].

copper and other energy and commodities prices. By the same token it should not be automatically assumed that the more recent decline in offshore wind costs is solely attributable to the tender system for awarding offshore wind contracts.

We can help explain price fluctuations by comparing the price changes with studies of contracts that have not been awarded using auction methods. Such a comparison may be used as a proxy for a comparison of wind power technology costs. It may be plausible to look at studies of how wind turbine prices have fluctuated elsewhere on the global market, as reflected through prices that have to be paid to developers for electricity that is generated. One time-series study related to the US market for wind power can be seen in

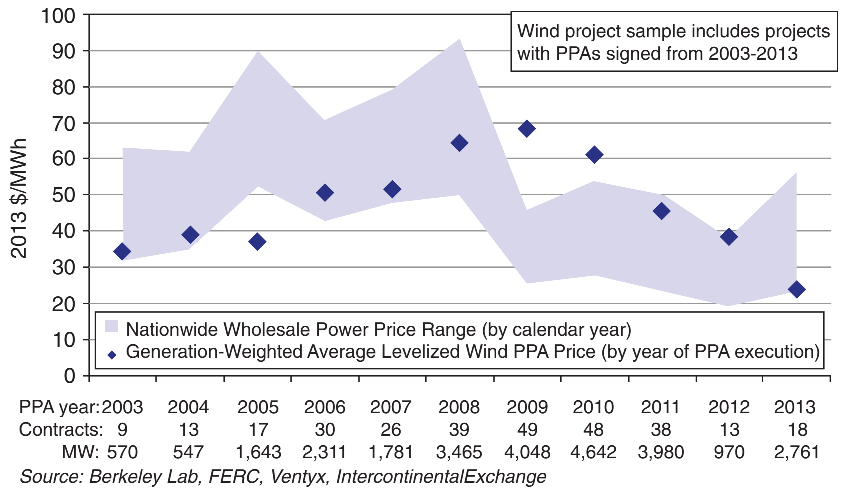

Figure 2: Onshore wind power contract prices in the USA - Reprinted with permission of the authors. Source [21, p 60]

Note: The US wind prices seem very low because the wind power contract prices are also, in effect, topped up by $23 per MWh (2013 prices) from the Federal Production Tax Credit.

It is interesting that the prices payable under the old feed-in tariff regime (Denmark 2005) are significantly lower than any awarded under the auction regime. These are not exactly comparable given that under the feed-in tariff regime developers had the possibilities of making more money over the minimum price if market electricity prices rose. However, at the time that the projects were developed energy prices were still low and developers would have had to finance the project at the minimum price. However, it should not be concluded from this that feed-in tariffs are necessarily more cost-effective compared to auctions. Rather we could examine contextual factors for explanations of cost changes, in particular changing levels of energy, steel, Figure 2. The ‘PPAs’ that are studied are ‘power purchase agreements’, which are payments per MWh to the developers, and as such are analogous to the payments made per MWh to Danish offshore windfarm developers under contracts issued under the auction programme. Although this study refers to onshore wind turbines, offshore wind turbines were still largely based on onshore technology during this period, and would certainly have been sensitive to similar changes in global wind turbine manufacturing costs.

From this it can be seen that there were big increases in wind power prices from 2004 to 2009 followed by decline in the most recent years. This is in parallel to the increases in prices of Danish offshore wind power contracts seen in Figure 1. Hence it can be plausibly argued that technological factors would seem, from this comparison, to be the main driver of fluctuations in wind power costs rather than the procurement procedure that is used by governments. It should be noted that in the USA renewable portfolio standards which encourage suppliers to offer contracts to renewable energy operators are the standard means of allocating contracts to wind developers [16]. This is as opposed to auctions.

3.5. Discussion

What does seem plausible is that the success of the Danish offshore wind programme in delivering several offshore windfarms through its auction/tender process is much concerned with the degree of regulatory certainty given to the developers and the degree of coordination (organised through the Danish Energy Agency) that is deployed to achieve this. This includes certainty about grid connection, planning consent, technical site investigations as well as payment of premium electricity prices. The fact that the Danish Government switched from having no penalties for non-implementation of tenders towards having financial penalties for non-delivery, after the Rodstand 2 project was not implemented by its original contractors, suggests that a penalty system for non-implementation may be useful, in encouraging project delivery.

As a general evaluation it can be said that the Danish offshore wind programme seems to be successful in that large volumes (relative to the size of Danish electricity market) have been delivered. This can be ascribed largely to the great degree of regulatory certainty and coordination exercised by the Danish Energy Agency. The prices are low relative to offshore wind power, although the recent decline in contract prices should be seen as redeeming sharp increases in price from 2005 to 2010. The rise and fall of these prices run in parallel to changes recorded in windfarm prices in the USA.

4. South Africa (SA) and Renewables

We shall order the section on South Africa in a way that is broadly similar to that which has been done in the case of Danish offshore wind. We shall examine some relevant history and background of the South African renewable energy programme, then we shall look at the evolution of the South African tender/auction system for renewable energy. We shall summarise the ways in which certainty for the programme is to be achieved, and then there will be an examination of the impact of auctions on costs of renewable energy. This section on South Africa will be rounded off by a discussion of how outcomes have been affected by the certainty in the regulatory arrangements and how costs have been affected by the auction system.

4.1. History and background

South Africa's RE programme is, as in most emerging economies, a new one, but it is fast developing. Total electricity generation capacity is around 45.7 GWe and electricity consumption is around 234 TWh [40]. Hitherto most electricity (over 90 per cent) has come from coal-fired power stations run by the state owned electricity utility, Eskom. An Integrated Resource Plan (IRP) which was adopted in 2011 anticipates a rapid deployment of RE, visualised as growing to over 20 GWe by 2030 [22].

South Africa's electricity system has succeeded in connecting up most of the country's residents, and it has done so whilst attempting to keep consumer prices as low as possible. However, perhaps because of efforts by the Government to restrict price rises, Eskom did not build sufficient power station capacity to meet demand for electricity. Since 2008 South Africa has suffered a series of debilitating grid failures. Parallel to this there has been increasing pressure for renewable energy sources to be developed.

An Integrated Resource Plan (IRP)which was adopted in 2011 anticipated a rapid deployment of RE, visualised as growing to over 20 GWe by 2030 [22, p 14–16]. The granting of over a 1000 MWe of contracts a year since 2011 through a renewable energy tender systems implies that, up to date, this ambition is on track. By Round 4 in April 2015, 5037MWe of renewable energy contracts had been issued [23]. Of this capacity just over half has gone to onshore wind and nearly 40 per cent to solar photo voltaics (PV), other contracts also going to concentrated solar power, biomass, small hydro and biogas.

4.2. Evolution of the auction/tender system

The South African Government's Renewable Energy Independent Power Producer Procurement Programme was launched in 2011 in order to provide the main means of meeting the IRP target for renewable energy deployment.

Initial suggestions were made in favour of a feed-in tariff made before 2011 [24] [25]. However in the end no feed-in tariff offer was made. Pressure from energy-intensive industry and government departments such as the Treasury for prices to be kept as low as possible was associated with the adoption of a tender system.

The biggest contribution that will come from introducing independent power producers (IPP's) is that it will create a more efficient industry because at the moment with Eskom's monopoly there is virtually no incentive for them to be efficient. Also efficiency requires transparency which competition naturally introduces. [26].

The Department of Energy DOE receives tenders for contracts to fill up annual tranches of renewable energy procurement. Successful proposals not only have to bid low prices, but they also have to fulfil criteria for local economic development as part of the country's black economic empowerment (BEE) programme. The BEE criteria constitute 30 per cent of the criteria for awarding the contracts.

Contribution to local economic development and black economic empowerment are key criteria in the selection of winning bids, involving criteria such as the need to achieve at least 2.5 per cent of equity ownership by local people and 'Between 12% and 20% of the people employed on each project have to be residents of local communities located within 50km of the project site' [42]. The local and black economic empowerment criteria make up 25 per cent of the scoring in evaluation of the bids [33]. It may be that such requirements have, paradoxically, favoured non-South African developers associated with large multinational companies secure large proportions of the project given contracts. ENEL, for example, the former Italian state electricity company has picked up a considerable portion of the contracted capacity [40].

The equity and bank loans necessary to expedite the projects can be sourced at much lower rates of interest by multinational companies (who can issue guarantees based on their balance sheets) compared to most domestic (South African) developers [28], [51]. This has contributed both to low bid prices for the RE projects but also a trend towards ownership of the projects given contracts by non-South African interests.

It is necessary to explain how the coordination of the renewable energy programme is to be achieved. This also involves explanation of the grid connection arrangements and the penalty system. Hence we have three elements of the coordination system that provides to the 'certainty'.

First, there is a penalty system to ensure that those who win and then accept contracts are committed to project delivery. Prospective developers have to lodge a bid bond with the authorities organising the tender system (the Department of Energy) of 100,000 ZAR per MW. Which is roughly 1 per cent of capital costs of the project. Bonds are returned if the companies making tenders are unsuccessful. If the developers win a contract and then sign with the Government they must then deposit a further 100,00 ZAR per MW.

Second, there is a coordinating group of agencies to steer the REIPPP. This involves the Department of Energy, Eskom, which has a near-monopoly of the electricity industry, the National Energy Regulator of South Africa, and the Treasury.

Third, there has been a commitment within the programme that Eskom will ensure cheap connection of the renewable energy projects into the electricity grid. This is very important to the programme, especially as the prices for the projects have fallen in successive rounds.

In practice Eskom has had difficulty in redeeming its commitment to connect to the grid all of the RE projects winning bids. In some cases grid connection proved to be rather more expensive for the projects than originally envisaged by the RE developers. Initially the early projects (Rounds 1 and 2), seemed able to absorb higher than anticipated grid connection costs into their cost structure [29]. However in the case of Round 3 problems emerged which led to the postponement of the financial closure of the round from autumn of 2014 to Spring of 2015. These delays were put down to the financial problems suffered by Eskom in offering affordable grid connection to the RE projects [34, 35]. This problem was only overcome when the coordinating group of agencies procured more finance for Eskom based on a loan from a German bank [37].

Despite the hiccup with the postponement of financial closure for Round 4 projects there is confidence that all but 2 of the 64 successful bids made in Rounds 1–3 are going ahead. Two of the 17 projects given contracts in Round 3 did not go through to financial closure, implying that the developers would forfeit their bid bonds. However there are still question marks about the delivery of Round 4 projects. There are continuing doubts about whether all of the projects will achieve grid connection and there is uncertainty over the effects of a rule-change which no longer requires debts to be underwritten by banks in advance of bid acceptance [38] [45].

4.3. Factors contributing to certainty in the South African renewable energy programme

We can summarise how South Africa's renewable energy tender regime can be analysed in terms of our previously mentioned five 'certainty' criteria.

a) RE projects must have been granted planning consent in order to be awarded contracts for premium prices. However, there are few records of controversies surrounding large scale RE projects in South Africa. The degree to which planning consent is guaranteed for the projects or at least that the developers have secured planning consent is a condition for being awarded a contract.
b) In theory responsibility for provision of grid connection rests with Eskom, although in practice this responsibility has not been fully carried in practice leading to some delays.
c) Site selection and evaluation is a matter for the developers.
d) There is a policy of coordinating the programme between the Department of Energy, Treasury, the National Energy Regulator of South Africa and Eskom. The financial closure of projects in each bidding round is coordinated and synchronised to promote implementation.
e) The Department of Energy (DOE) has required that there must be an agreement by bank(s) to underwrite any debt as a condition for a bid to be accepted. The DOE evaluates each bid for its financial plausibility.
f) Developers must post significant guarantee bonds prior to bidding for contracts and also after signing contracts, as discussed later.

Sources: [32, 33]

4.4. The issue of technology costs under the auction system

So far there have been four rounds of bidding for the renewable energy contracts, with awards being made for contracts in 2011 (Round1), 2012 (Round 2), 2013 (Round 3) and then Round 4 in 2015. The final round was delayed following problems with assuring grid connection of projects given contracts in Round 3. Below are graphs for the bid prices for onshore wind and solar PV (which together secured over 90 per cent of the contracted capacity) in different rounds of bidding. These are shown in Figures 3 and 4 in Rand (ZAR) per MWh in 2015 South African prices. The data is derived from the Department of Energy (2015). These figures are based on data released by the South African Government which were based on 2014 prices, so inflation is added onto them to generate figures for 2015.

The proportion of contracts won by domestic (South African) developers fell from 59 per cent in the first round to 22 per cent in the third round (own research). The ratio of unsuccessful to successful bids has also consistently risen through the bidding rounds. Davin Chown commented that 'the lack of projects going to SA based developers has led to deep concerns'. Chown also commented that a lot of developers would prefer a feed-in tariff system that could achieve a higher volume of renewable energy deployment and form the basis for a long term sustainable energy sector where Governments developmental policy objectives are also met, [29].

As can be seen in Figures 3 and 4, both wind power and solar prices have fallen. Indeed, the Round 3 and Round 4 prices are at least competitive, arguably rather lower than, the cost of power from new coal fired power plant in South Africa. The Department of Energy gave a (2014) price of wind power of 619 ZAR which equates to 676 ZAR in 2015. This converts to around $56 per MWh in US currency (June 2015 prices), certainly less than fossil fuel power prices in the EU. For South Africa, the prices for wind power are considerably lower than 970 ZAR price said, according to NERSA, to be the levellised cost of power from new coal fired power plant being built by Eskom [30].

However, before accrediting this fall in prices (solely) to competitive bidding in the renewable energy auctions, it has to be borne in mind that wind power and solar PV prices were falling in other countries. As can be seen in Figure 2, wind power prices also fell in the USA after 2009. Indeed, the wind power contracts in 2013 pay wind operators less than the South Africa average bid prices, even after the Production Tax credit (and inflation since 2013) is added to the contract prices. As can be seen in 2013, wind power contracts were being awarded for no more than $20 per MWh, which equates to around $45 per MWh (June 2015 prices) being paid to the operators when the Production Tax Credit and inflation since 2013 is taken into account. This is still less that in the case of the average price for the South African wind power contracts.

In the case of solar PV it is not possible to maintain a case that solar PV prices have fallen due to renewable energy auctions themselves simply on the basis that SA auction prices have fallen. This is because there has been a global decline in solar PV auctions during this period which runs in parallel with declines in the South African auctions for solar PV. Prices of solar panels declined by 65 per cent in the 5 years up to 2014 [31]. Certainly the South African market is only a very small part of the solar PV market, and most of the build-up in solar PV capacity has come from countries such as China, the EU, the USA and Japan who have (up until 2015) not usually employed renewable energy auctions to promote solar PV installation. Hence SA prices are likely to be influenced by global trends rather than vice versa.

4.5. Discussion

In sum, then, it can be seen that while there has undoubtedly been success (so far) in implementing the SA renewable programme with declining costs, it is not evident that the cost reductions can be substantially ascribed to the auction process itself. However, the auction/tender system does control costs in that the Government can control the number of projects that can develop projects for a given set of bid prices.

Past and continued progress in the renewable energy programme is dependent on certainty being achieved for projects to be able to secure grid connection that is affordable to the developers. This has only been achieved so far because of the coordination of the programme. Hence this coordination led by the South African Government is important, and it has succeeded so far in overcoming some serious financial problems being faced by Eskom. However, there is uncertainty about delivery of new projects. So it is clear that continued regulatory leadership and certainty is a vital part of delivery of the SA renewable programme.

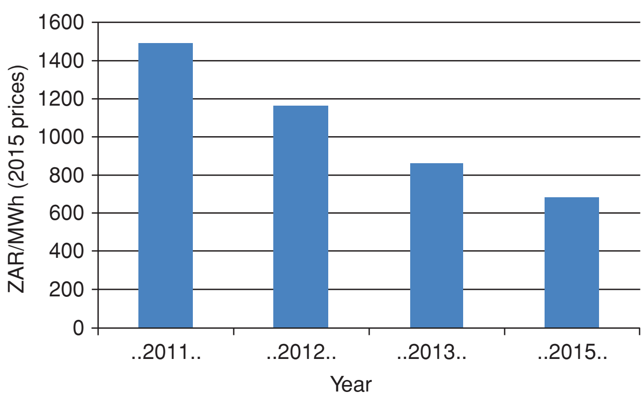

Figure 3: Average bid prices for successful wind power tenders under REIPPP. Source; DOE 2015 [23]
All prices converted to 2015 South African prices using [52]

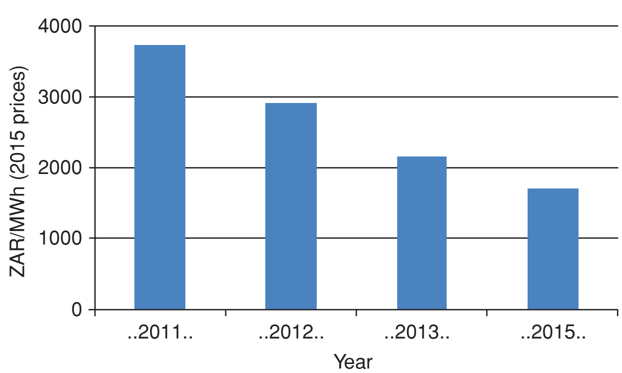

Figure 4: Average bid prices for successful solar PV tenders under REIPPP Source: DOE 2015 [23]
All prices converted to 2015 South African prices using [52]

5. Overall discussion of two cases

In the introduction key objectives were set out to analyse the performance of two auction/tenders systems, first in order to ascertain the degree and type of regulatory certainty that generated effective delivery of renewable energy, and second to examine the extent to which auction systems can be said to reduce the costs of renewable energy. In practice we can see in both cases (SA and Denmark) that a high degree of regulatory certainty is important. First, it is important to guarantee that schemes awarded contracts are able to achieve grid connection that is affordable within the terms of their original tenders. In Denmark this is achieved simply through the agency of the state taking on the costs of the grid connection and provision of transformer. In the case of South Africa it is achieved through a guarantee that the utility Eskom would cover grid connection costs. However, in practice this has become merely an objective of achieving affordable grid connection for the developers. There have been initial problems with implementing this for the third round projects. Such problems have been overcome following intervention by the SA Government. However, question marks remain over how well grid connection will be achieved for the projects given contracts in the fourth and successive rounds of the South African RE programme.

It needs to be noted that grid connection should be considered as an integral part of the auction/tender process, and not be looked upon as a separate issue.

The point is that the auction system restricts the number of schemes that can be deployed to those that are awarded the contracts. If there was a 'feed-in tariff' system then developers might find sites where grid connection was cheaper, and these projects would then be deployed instead of projects that win bids but which cannot be set up because grid connection costs turn out to render them uneconomic.

RE auction schemes can only deliver a given quantity of renewable energy at a given price if schemes awarded contracts under the bidding system can achieve affordable grid connection. Much the same can be said about planning consent in that RE auction systems can only work efficiently if the projects can gain planning consent within any timeframe demanded. In the cases studied of Danish offshore wind and South African RE this is not a problem, although this has been a problem in the past in the case of the UK in the 1990s [38].

Second, there needs to be an effective coordinating mechanism. In the case of Denmark this was done through the aegis of the Danish Energy Agency (DEA). In the case of South Africa, a coordinating group headed by the Department of Energy office dealing with the REIPPP occupies this role. The DEA's role is simpler since it has to deal with a smaller number of companies and projects.

Third, a key issue of certainty is that of providing certainty that the developers will carry out their projects if they are awarded contracts. This is being achieved in most cases in South Africa, and the risk of losing their money will certainly motivate developers to press for Eskom to deliver on its commitments to assure affordable grid connection. In the case of Denmark a 'bid bond' system was introduced after developers pulled out of the original contract for the Rodsand 2 Project.

The issue of the impact on reducing costs of renewable energy auction systems needs to be looked at more carefully than simply reading off recent declines in auction prices. In the case of the South African renewable energy programme, costs have been declining and appear to be competitive with, indeed arguably cheaper than, a conventional (coal) alternative. However, in the case of the Danish programme offshore wind prices have only declined since 2010. In South Africa, of course, the RE auction programme has only been operating since 2011. But wind power costs have been declining since 2010, and solar PV costs have been declining for decades. Given the earlier discussion there is no evidence (from these cases) that the auction schemes have reduced renewable energy costs any faster than global technological trends for renewable energy. In the case of wind power these seemed to rise in the 2005–2009 period.

Two further points need to be made here. First, auctions or tenders are useful in those cases where governments want to plan the amount of capacity that is implemented, and if a key risk is that too great a volume of projects may be implemented at too great a cost. However, critics may argue that auctions therefore err on the side of keeping programme costs down rather than delivering large volumes of renewable energy. It can be argued that auction or tender programmes can reduce costs principally by rationing the number of projects. If the emphasis on developing volume is preferred, then it may be that feed-in tariffs could be an effective policy choice.

The second point is that there is no evidence in the two cases studied here that the auction or tender systems have an inherent ability to reduce costs below what is dictated by technological trends. Certainly it is possible to read too much into the declining costs recorded in recent auctions such as in South Africa and Denmark. These are welcome signs for renewable energy of technological cost reductions, but they are not generated by the auction/tender systems per se. These cost trajectories seem to be influenced by changes in technological cost pressures, and recent declines in auction costs are reflections primarily of that. Indeed, in the Danish case the process set under the feed-in tariff are still lower than the prices being given to more recent projects. Likewise, in the case of South Africa, cost reductions have paralleled the trend of cost reductions globally.

It should also be added that the tender/auction systems studied here are dominated by large transnational corporations. It may be that this is inevitable in the case of offshore wind projects, although in Denmark there are efforts to sell shareholdings to local people. It is clear from the South African case that large companies have an advantage in having access to cheaper sources of finance compared to locally based developers.

6. Conclusion

This paper posed two aims. One concerned the degree of regulatory certainty necessary for an effective auctions/tender programme. The other concerned the ability of auction/tender systems to reduce the costs of renewable energy. Two different cases, Danish offshore windfarms and South African renewable energy, were examined to see whether even in such apparently different cases whether common themes emerged. One thing that both cases have in common is that the auction/tender regimes used in these countries appear to be at least relatively successful in delivering renewable energy. Another common factor is that well organised coordination of the programmes is important to guarantee, as far as possible, that the projects who win contracts can achieve grid connection. Also in both cases planning consent is not difficult to obtain, and also, in both cases, there has been serious attempts to evaluate the financial plausibility of the bids that have been made. The existence of penalties on companies winning contracts for non-delivery of projects also appears also to be important. These factors are crucial contributions to the concept of assuring 'certainty'.

On the issue of costs, it seems clear that the main cause of recent cost reductions has little, if anything, to do with the auctions/tender systems themselves, and mostly, if not entirely, to do with declining technological costs of renewable energy in recent years. It is certainly wrong to assume that recent reductions in costs associated with renewable energy auction systems are caused by the auction systems themselves. Rather, the cost reductions coincide with a period of declining costs for renewable energy. This implies that a conventional feed-in tariff system may, in principle at least, be no more expensive for a given level of renewable energy deployment than an auction system.

Certainly the auction systems can help countries plan their renewable energy programmes, and control costs, but this may only be an optimum policy if the intention is to limit renewable energy deployment below a given threshold rather than expand it towards a greater potential. However, it is also the case that the programmes need to be well regulated so as to achieve certainty on issues including grid connection. Nevertheless, sceptics of auction systems (and supporters of conventional feed-in tariff systems) may still maintain that the system is more oriented towards controlling costs rather than developing larger volumes of capacity that may, for example, be relevant to rapid adoption of systems for obtaining 100 per cent of energy from renewable energy [43]. The evidence in this study is that, certainly in the case of South Africa, the auction system is constraining renewable energy development well below that which would be feasible for little additional cost if a conventional (non-auction) feed in tariff system was deployed.

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