Mexico’s power auction: A second bite at the cherry
The second long term auction

INTRODUCTION

As part of its energy reform, Mexico introduced long term auctions to procure long term contracts for capacity; clean energy; and clean energy certificates (CEL). The auction aims to provide an efficient mechanism for electricity suppliers to cover their requirements for the three products whilst providing developers with financial stability and reducing their risk exposure from market volatility. The main characteristics of the auction are:

- it is pay-as-bid, meaning winners get what they offer instead of a single clearing price;
- it is multi-product and based on packages;
- the auction is technology neutral;
- pre-qualification is required, but winning projects have no guarantee of securing interconnection agreements to meet commissioning deadlines;
- 15 year contract duration for capacity and clean energy, and 20 years for CELs. The contracts define a fixed price plus inflation, similar to a two way Contract for Difference (CfD); and
- bidders can construct complex bidding strategies using conditionality and mutual exclusiveness between different bids.

SUMMARY

On the 22nd September 2016, Mexico held a long term power auction to procure capacity, clean energy and clean energy certificates (CELs) for delivery (commissioning) by May 2019. This was the second auction of this type that had been run by the CENACE (the system operator). The auction had Comision Federal de Electricidad (CFE), as the single buyer for the second time. A previous auction had taken place six months earlier, but the quantities procured through the second auction were much higher. CFE's volume requirements for clean energy and CELs increased by 67% and capacity by 230%. Key aspects of the auction are:

- the auction was oversubscribed, with participant offers at least more than twice the required volume, only around a third of participants were awarded contracts for some or all of the products;
- only around 80% of stated procurement requirements were met, a similar proportion to the earlier auction;
- the balance of successful technologies was very different to the first auction – with much more wind capacity successful and geothermal and hydro projects successful for the first time;
- the range of clearing prices for all products were lower than the first auction;
- the success of solar projects in the capacity auction may increase the risk exposure given Pöyry’s assessment of shift in critical hours; and
- CENACE, the independent system operator, estimates investment of over 4 billion US dollars from all the projects.
REQUIREMENT VOLUMES

This auction saw CFE as the only potential buyer and also saw them as more confident players, learning from the previous auction, and increasing their requirements for all products – this is shown in Table 1. CFE’s required volumes are logical on economical grounds after the low prices of the first auction, however if this rate of build continues, the 2021 clean energy targets of 30% might be achieved as early as 2020.

<table>
<thead>
<tr>
<th>Product</th>
<th>First Auction</th>
<th>Second Auction</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity (MW)</td>
<td>450</td>
<td>1,483</td>
<td>229%</td>
</tr>
<tr>
<td>Clean Energy (GWh)</td>
<td>6,361</td>
<td>10,629</td>
<td>67%</td>
</tr>
<tr>
<td>CELs (thousands)</td>
<td>6,361</td>
<td>10,629</td>
<td>67%</td>
</tr>
</tbody>
</table>

Source: CENACE and Pöyry Management Consulting

Figure 1 below shows each of the 30 procurement offers presented by CFE for each of the three products and each column shows the price offered for each tranche and product in US dollars in their different units. There has been a material increase in capacity prices² from 0.51 USD/kw to 87.5 USD/kw (7.29 USD/kw/month). This is a very competitive price compared to the prices observed in other capacity auctions in Europe and the US. Coupled with the higher volumes this has been much more attractive to projects.

Figure 1 – Maximum prices offered by CFE for each product

Source: CENACE and Pöyry Management Consulting
The auction was deemed highly competitive by CENACE offering at least twice the volume required. While there were an initial 84 participants the final number of bids was lower, reflecting the removal of some bidders due to ineligibility under the pre-qualification process (16 bidders) and the withdrawal of some technical bids (11 bidders) where a project had multiple bids submitted as part of its bidding strategy.

### Table 2 – Participation in the second and first long term auctions

<table>
<thead>
<tr>
<th></th>
<th>Second auction</th>
<th>First auction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bidders</td>
<td>Offers</td>
</tr>
<tr>
<td>Registration</td>
<td>84</td>
<td>579</td>
</tr>
<tr>
<td>Pre-qualified</td>
<td>68</td>
<td>545</td>
</tr>
<tr>
<td>Participated</td>
<td>57</td>
<td>331</td>
</tr>
<tr>
<td>Winners</td>
<td>23</td>
<td>56</td>
</tr>
</tbody>
</table>

Source: CENACE and Pöyry Management Consulting

The average number of offers per bidder saw an increase compared to the first auction, increasing from 3.3 bids per bidder in the first auction to 5.8 on the second one. This is a reflection of the experience gathered during the first auction, better understanding of the auction design and an increase in the amount of time given to participants to prepare. The removal of some bids at a later stage demonstrates the value to players of a more complex bidding strategy, enabling them to adjust bids once particular data is made available.

The links between offers (conditionality and mutual exclusiveness) are not known. However, we suspect that not many players are taking a full advantage of the auction design, e.g. incorporating conditional and mutually exclusive bids to adapt their strategy towards their own possible financial structures. This is something Pöyry has analysed extensively with a number of market participants.

23 bidders were successful with a total of 56 bids selected in the auction; this covered 83% of CFE’s procurement volume, with the remaining 17% left unallocated. The 17% was left because there was no other project in the auction that could be allocated without breaching the product limits (at their different price levels) and without breaching the capabilities of each substation.

This is in line with Pöyry’s expectations, considering that the last 1 TWh and 1 mCELs in the volume requirements are priced at 50% of the maximum price of each product, this can be seen in Figure 1. In this way CFE is essentially reducing the opportunities of the auction algorithm selecting a small but expensive project to fill in the un-allocated amounts.
**TECHNOLOGY MIX**

As in the previous auction, solar was the most successful technology, with 54.4% of the clean energy awarded to solar projects. However wind gained share by increasing from 25% in the first auction to 43% in the second auction. The participation of wind has increased as a result of a number of factors including:

- smaller expected price differentials between nodes, benefiting nodes with more wind potential unlike the first auction which heavily benefited the Yucatan peninsula;
- more time to prepare for the auction and to progress the project to an auction-ready stage;
- more energy being required by CFE, allowing projects further up the supply stack to be selected;
- the possibility to sell their available capacity; and
- more clarity over the auction/financing and risk of not obtaining a contract.

The successful onshore wind projects were those with higher load factors. The average load factor of the five awarded projects is 44%, with the highest two projects stating a 51% and 47% load factor. Figure 2 highlights the allocations per technology as installed capacity (left) and clean energy (right).

![Figure 2 – Summary of auction allocation](image)

<table>
<thead>
<tr>
<th>Capacity (MW)</th>
<th>Clean Energy (TWh)</th>
<th>CEL (million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buy Offer</td>
<td>1,483</td>
<td>10.62</td>
</tr>
<tr>
<td>Assigned</td>
<td>1,187</td>
<td>8.90</td>
</tr>
<tr>
<td>Solar</td>
<td>184</td>
<td>4.83</td>
</tr>
<tr>
<td>(15.5%)</td>
<td>(83.8%)</td>
<td>(87.3%)</td>
</tr>
<tr>
<td>Wind</td>
<td>128</td>
<td>3.87</td>
</tr>
<tr>
<td>(10.8%)</td>
<td>(43.5%)</td>
<td>(41.3%)</td>
</tr>
<tr>
<td>Hydro</td>
<td>25</td>
<td>0.31</td>
</tr>
<tr>
<td>(2.1%)</td>
<td>(3.4%)</td>
<td></td>
</tr>
<tr>
<td>Geo</td>
<td>25</td>
<td>0.19</td>
</tr>
<tr>
<td>(2.1%)</td>
<td>(2.2%)</td>
<td>(2.1%)</td>
</tr>
<tr>
<td>CCGT</td>
<td>850</td>
<td></td>
</tr>
<tr>
<td>(71.6%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: CENACE and Pöyry Management Consulting

CFE Generation was awarded a contract for the geothermal project Azufres III. The bid produced surprise, not only because of the price level at 42.46 USD/MWh, but also because of the amount of energy and capacity offered as part of the package. The project is offering 100% of its capacity, meaning that they expect to be 100% available during the top 100 critical hours of each of the 15 years of the contract. Whilst Geothermal power is a firm generation technology this commitment has a high delivery risk. Energy wise, the committed load factor is of 90.8%; this is within the achieved load factors of some geothermal projects, but it does not account for the decrease in steam that has been observed on other CFE projects during their lifetime. This bid may reflect CFE’s ability to mitigate the risk by using the rest of the Los Azufres geothermal site.
The results of the capacity prices show an increase in interest from intermittent generators in selling their capacity, with 312 MW awarded to wind and solar projects. Solar projects on average offered 21% of their capacity. However as solar generation increases, the top 100 critical hours are expected to shift to periods of no-sunlight hours. This raises questions as to whether solar projects will be able to offer the contracted capacity.

Pöyry has undertaken detailed analysis on the contribution of intermittent generators during the critical hours which questions the strategy followed by these solar projects. History is no guide to the future as Pöyry’s analysis shows that critical hours shift with the increase in solar penetration.

Wind projects offered on average 35% of their capacity compared to their average load factor during hours of high demand. Whilst more conservative than solar, the real outcome will depend on the projects correlation to national wind output and demand. Figure 3 shows the average contribution of the different projects (right side) and the calculated value of capacity based on the winning bids that offered capacity only (left side). This does not indicate the average value of capacity per kW of all participants, but only of those that had separate bids for their capacity.

There was also a wide range in the value assigned to capacity only bids. Most surprising is the difference in the average price between the two CCGT’s, with Frontera Generacion obtaining less than half the value of Agua Prieta. The capacity of Frontera Generacion (firm reliable capacity) is being valued lower than that of some solar and wind projects (non-firm capacity). Similar results are also observed for wind and solar, with the lowest projects seeing an average price 26% and 29% lower than the highest capacity only bid respectively for each technology.

The results for the second auction suggest that each participant has valued capacity in different ways – since economic theory suggests that all bids should be close to the expected clearing price. This has clearly resulted in some bidders realising much less value than they might have secured with a more refined bidding strategy. The complexity of the auction design and the lack of clarity in the supply curve may have also encouraged participants to bid more in line with their actual costs.
Once again the power auction in Mexico has created headlines for delivering record low prices for clean energy with an average of 34.25 USD/MWh compared to a 42.73 USD/MWh. The average bid for wind projects was 35.7 USD/MWh, the highest accepted bid for wind (non-capacity bids) was more than 10% below the lowest accepted bid of the first auction. This is a substantial decrease reflective of the competitiveness of the participants in the auction.

These outcome prices do not represent the levelised cost of energy (LCOE) because projects are spreading their total cost over capacity, clean energy and CELs in different proportions. It is not possible to discern the value of energy to calculate a LCOE from the packages. The calculations used in this note are the total cost of the project packages divided by the clean energy sold by the projects.

It was a similar outcome for solar developers. The auction cleared six projects below 30 USD/MWh with the lowest bid at 26.77 USD/MWh from Consorcio Fotowatio. On average accepted bids were 33.85 USD/MWh; Alten Energia with projects Alten 1 to 5, was allocated a contract for 373 GWh at 40.5 USD/MWh, the highest for a solar project. However each project comes with the risk of non-availability at the critical hours, as previously discussed.

Los Azufres III Geothermal project was awarded a contract at 42.46 USD/MWh based on the amount of energy allocated. This is significantly lower than the levelised cost of energy\(^2\) (LCOE) estimated by Lazard\(^4\) for Geothermal (which is between 68 and 112 USD/MWh). This may be explained by the fact that Los Azufres III is an expansion to an existing site, which may lead to lower costs. However, the contract price is still seen by Pöyry as very low for a project offering capacity, energy and CELs.

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\(^2\)CLEAN ENERGY PRICES

\(^4\)Source: CENACE and Pöyry Management Consulting
The second auction had smaller expected price differences across the nodes. This has led to a more dispersed geographical distribution of the projects. Clearly projects with the highest load factors have been the winners, as load factor is key to the ability to submit competitive bids. Both the geographical distribution of the 23 projects and the average regional load factors can be seen in Figure 5 below. Another factor to consider is the hurdle rate or required rate of return (IRR) for the winning projects. These figures are not publically known but in our opinion some winning bids will have been based on a project return as low as 6% which is below standard commercial benchmark rates for this type of projects.

Figure 5 – Geographical location of winning projects

Source: CENACE and Pöyry Management Consulting
Mexico has become a very attractive market for renewable and thermal developers alike. Whilst the market offers growth opportunities and attractive investment, there still remain barriers that limit its full potential. The long term auctions are currently the best alternative for developers to progress their projects towards development. However the complex auction design creates various risks for participants, some of the evident risk factors are:

- the risk of failing to obtain a contract in the auction;
- the opportunity costs from not having bid at a higher price, and from not having gone to the wholesale market rather than the auction;
- the risk of under or over-delivery of the committed energy during the contract period; and
- the risk of obtaining a non-bankable contract.

In order to maximise benefits in the long term auction, participants must fully understand the auction design and its implementation, the risks that different bidding strategies and likely levels of competition represent, the effects of combinatorial bidding and how this can better reflect complex costs structures of different projects.

Unlike other auctions where the only risk lies in the allocation process of the auction, this auction also requires a full understanding of the wholesale electricity market, as part of the projects’ generation will be exposed to market volatility either directly as a merchant plant or via PPA’s linked to market prices.

Pöyry has over 20 years’ experience in energy markets, our team has valued ~146 GW of Electricity Generation capacity across Europe, the MENA region and the Americas with a combined value in excess of €150 bn. In addition to transactions we have worked on directly, our independent market reports are relied upon and trusted by utilities, banks and independent players for use in numerous strategic and commercial valuations. Combined with our track record we also have full understanding of electricity markets having designed and worked at various wholesale, capacity and renewables markets in Europe and the world as well as in the first auction in Mexico.

Find out more: www.poyry.com/services/management-consulting

End notes
1 The first auction was held on the 31st March 2016
2 Considering an exchange rate of 19.3 Mexican Pesos (MXN) per US Dollar (USD) throughout the note
3 The contact price is not equivalent to the LCOE of a project, we use this as an initial indicator

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