CREG

Commission de Régulation
de l'Électricité et du Gaz

Note

(Z)1633
24 may 2017

Review of day-ahead prices for delivery at hour 12 on April 6 and hour 10 on April 10

Carried out in application of Article 23, §2, second paragraph, of the Law of 29 April 1999 concerning the organisation of the electricity market

Not confidential

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EXECUTIVE SUMMARY

The CREG received by e-mail two informal enquiries on the results of the day-ahead electricity market for the delivery of wholesale energy products in Belgium as organized by EPEX SPOT Belgium. The first enquiry was received on the 5th of April 2017 regarding the market result for delivery on April 6 2017. The second enquiry was received on April 10 2017 concerning the market result for delivery on April 11 2017. The review of the CREG following both enquiries is presented in this document.

The two observed price peaks on the day-ahead market primarily indicate a need for commercial flexibility. Commercial flexibility is low if the algorithm experiences difficulties to find a feasible market clearing price that provides adequate financial incentives to accept or reject a full or partial volume of limit orders and the full volume of block orders, while maintaining the supply-demand balance in terms of accepted volumes. If one of both conditions cannot be met, the algorithm resorts to reject block orders that might be in-the-money to obtain a feasible market result.

The CREG welcomes informal enquiries on events that have occurred and encourages market participants to continue this active engagement. The CREG highly appreciates feedback and comments on the document and encourages stakeholders to communicate other interesting or remarkable events. The CREG aims to timely review enquiries it receives and, if deemed relevant, will publish its review in English.

1. INTRODUCTION

The CREG received by e-mail two informal enquiries on the results of the day-ahead electricity market for the delivery of wholesale energy products in Belgium as organized by EPEX SPOT Belgium. The first enquiry was received on the 5th of April 2017 regarding the market result for delivery on April 6 2017. The second enquiry was received on April 10 2017 concerning the market result for delivery on April 11 2017. The review of the CREG following both enquiries is presented in this document.

The goal of this document is to provide feedback to all market participants and any other stakeholder on the process of price formation. The CREG highly appreciates feedback and comments on the document and encourages stakeholders to communicate other interesting or remarkable events[1].

The CREG aims to timely review communicated events. If said review results in a useful insight the CREG will publish a summary of the results in English to inform all relevant stakeholders, thereby guaranteeing a level playing field and an equal understanding among market participants. Additionally, by publishing its reviews, the CREG invites market participants to provide feedback.

2. REVIEW

2.1. CONTEXT OF THE ENQUIRIES

The following figure illustrates the market result on the EPEX SPOT Belgium day-ahead market for the delivery of electricity on April 6 2017. The stakeholder who sent the communication to the CREG expressed its surprise concerning the cleared price of €82/MWh during hour 12 at a traded volume of 3822,8 MWh/h. Given the similar traded volumes during the hours immediately prior and after hour 12, understanding the reasons for the increase of €30/MWh at hour 12 is not straightforwardly derived from these results.

A week later a stakeholder informally requested an explanation concerning the emergence of the cleared price of €62,52/MWh during hour 10 at a traded volume of 3366,6 MWh/h on the EPEX SPOT Belgium day-ahead market for the delivery of electricity on April 11 2017. The market results for the full day are illustrated below. Given the similar traded volumes during the hours immediately prior and after hour 10, it cannot be readily explained why the price increased with €10/MWh at hour 10.

[1] Any event of interest is encouraged to be communicated, including those that seem not motivated by a reasonable doubt of market manipulation or inside information.

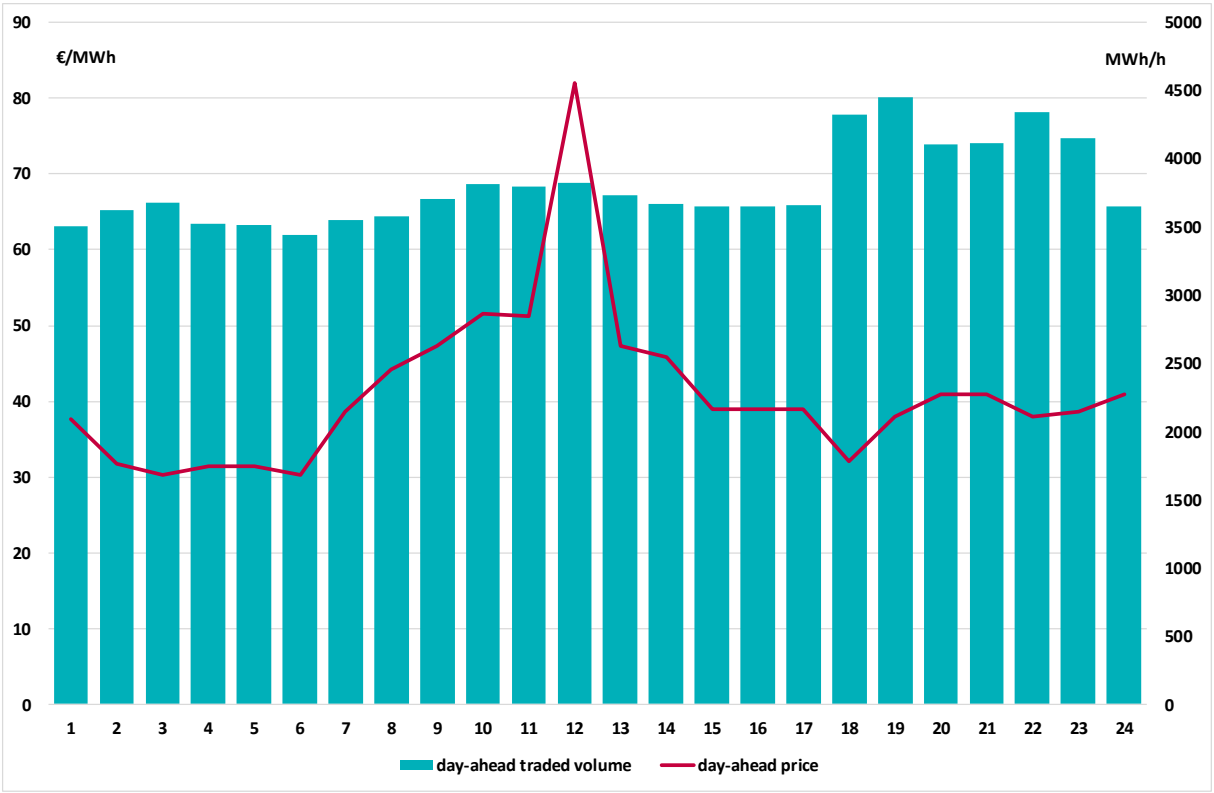

Figure 1 – Hourly prices and volumes for the delivery of day-ahead wholesale energy products in Belgium on April 6 2017, as cleared by EPEX SPOT Belgium
Source: EPEX SPOT Belgium

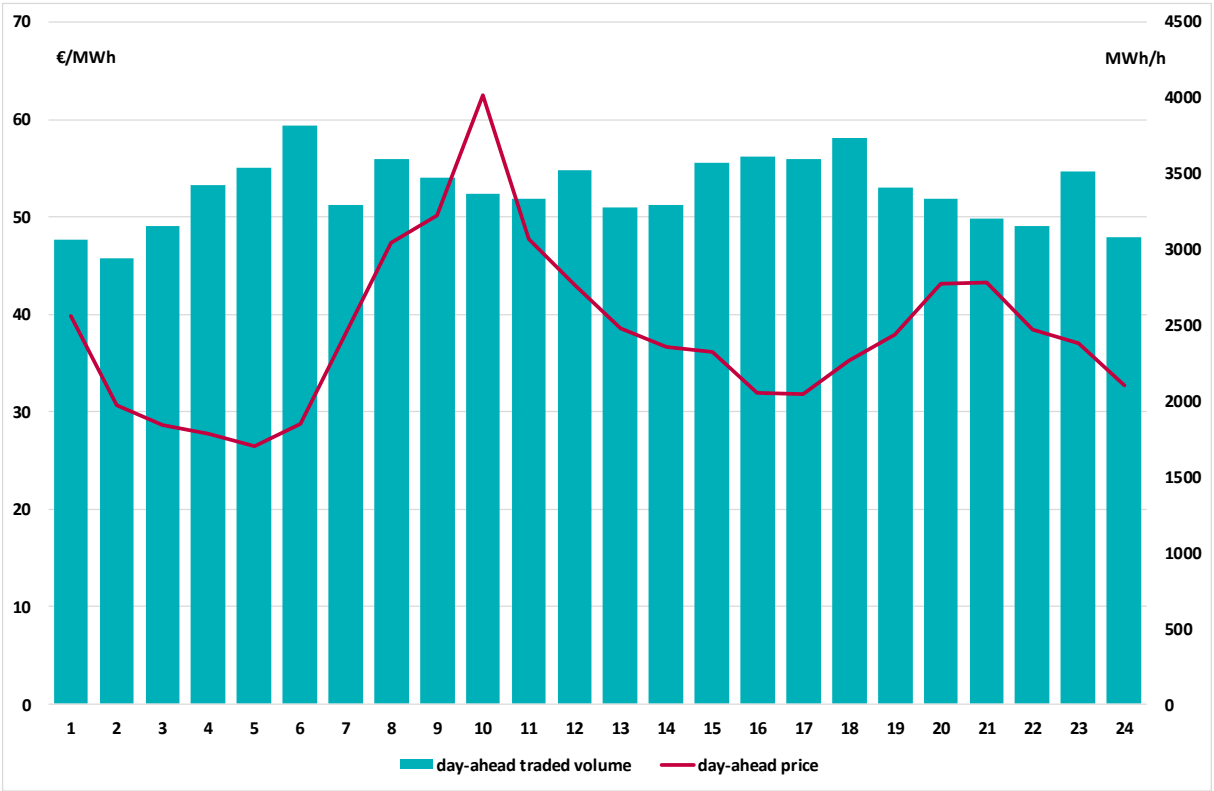

Figure 2 – Hourly prices and volumes for the delivery of day-ahead wholesale energy products in Belgium on April 11 2017, as cleared by EPEX SPOT Belgium
Source: EPEX SPOT Belgium

2.2. ANALYSIS OF THE ORDERBOOK

2.2.1. April 6 2017 – hour 12

The price at **hour 12** on the EPEX SPOT Belgium day-ahead market for the delivery of electricity **on April 6 2017** has been determined by trading between 28 market participants active on EPEX Spot Belgium[2]. 20 participants have bought 3822,8 MWh/h in total using 22 buy orders and 12 participants have in total sold 1551,7 MWh/h using 17 sell orders. The HHI on the sell side is 1357 and on the buy side 1681. Both indices indicate a low market concentration[3]. A buy limit order in the Belgian orderbook was partially accepted[4], consequently determining the market price at hour 12.

Importantly, at hour 12, a sell block order was not accepted while being significantly in-the-money (>€10/MWh). The sell block order covered three hours (including hour 12) and represented a low volume (<50 MWh/h on average) with the clear majority[5] of volume being concentrated in hour 12.

A rejected block order while being in-the-money is referred to as a paradoxically rejected block order (abbreviated as "PRB"). The cause of the paradoxically rejected sell block order observed at hour 12 on April 6 2017 can be intuitively explained. Assuming the additional supply after accepting said paradoxically rejected block order would make the price peak at hour 12 disappear from the day-ahead market price curve, the resulting averaged day-ahead market price would be insufficient to cover the indicated willingness to sell of said sell block order. The current algorithm is programmed to not allow for a solution that forces a market participant to trade at a loss, hence its decision to reject the sell block order. The consequence is that the market clears at higher prices creating the false impression that the paradoxically rejected sell block order could have been profitably traded if accepted.

The previous reasoning only materializes if the supply and demand curve is inelastic. The following graph presents a portion of the aggregated supply-demand curve for the considered hour. Clearly, the supply curve is highly inelastic[6] around the market clearing price: an increase of supply of around 10 MWh/h would result in a price decrease of €30/MWh-€40/MWh.

[2] Since markets are coupled, market participants from other bidding zones are involved as well but not represented by this or following numbers.

[3] A low HHI during higher prices does not necessarily indicate that there is no (or low) market power or decisive power.

[4] The market clearing price generally equals the willingness to sell (or buy) of a limit order that is partially accepted.

[5] Even though the volume of a block order is represented by the sum of hourly volumes offered during the day, the hourly volume of said block orders can alter from one hour to the other. If this is the case, a profile block order has been submitted. In the specific case treated in this document, a smart profiled block order was submitted to the orderbook.

[6] Note that (profile) block and smart orders that were not accepted might not be shown in the graph. Since block orders are heavily used on the supply side, the graph gives the impression that the supply curve is more inelastic than it actually is. Block orders however, do not determine prices, only the partially accepted limit orders does. The graph hence does illustrate the limited number of feasible results available for the market clearing algorithm thereby increasing the likelihood of paradoxically rejected block orders.

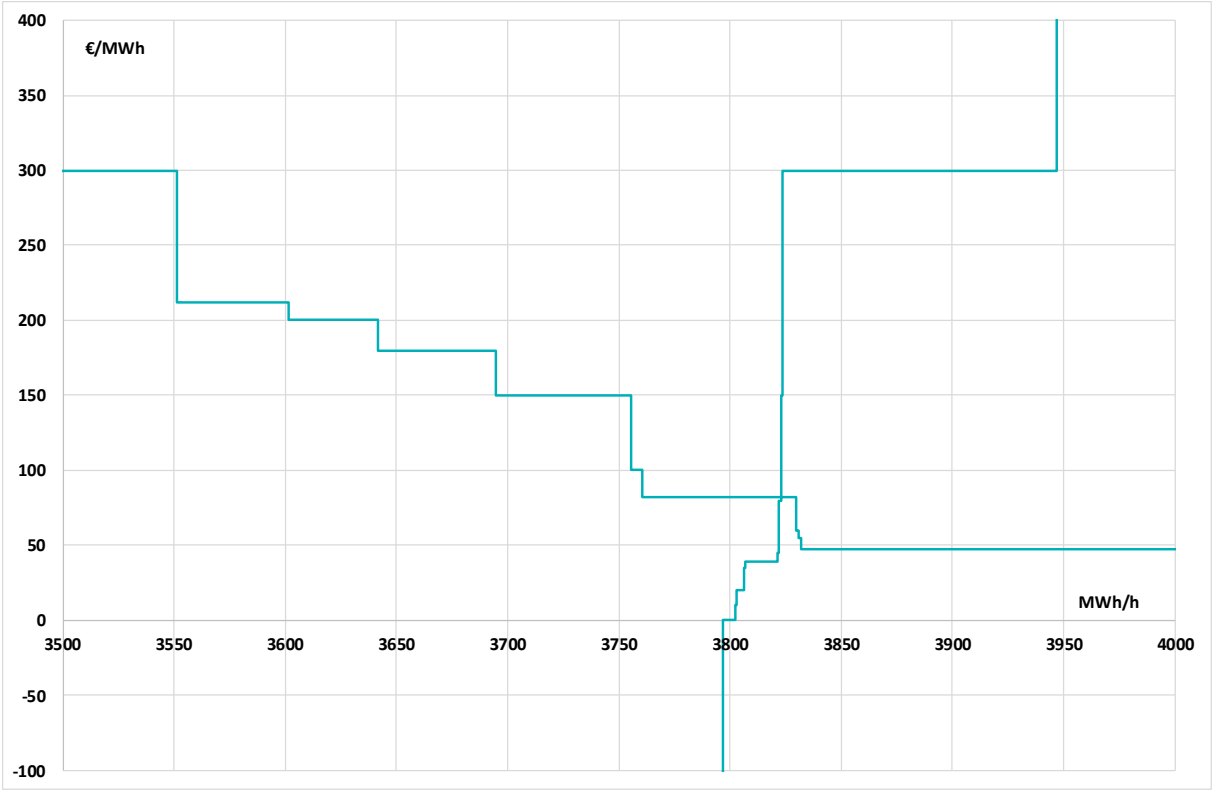

Figure 3 – Aggregated supply and demand curve for the delivery of day-ahead wholesale energy products in Belgium at hour 12 on April 6 2017, as cleared by EPEX SPOT Belgium (detail)
Source: EPEX SPOT Belgium, available at https://www.belpex.be/market-results/historical-data/

2.2.2. April 11 2017 – hour 10

The price at **hour 10** on the EPEX SPOT Belgium day-ahead market for the delivery of electricity **on April 11 2017** has been determined by trading between 27 market participants. 21 participants have bought 3366,6 MWh/h in total using 26 orders and 13 participants have in total sold 1762,4 MWh/h using 22 orders. The HHI on the sell side is 3888 – indicating a concentrated supply side – and 1225 on the buy side. No limit order in the Belgian orderbook was partially accepted at the market clearing price, indicating that the market price at hour 10 in Belgium was determined by an order in the order book of a coupled bidding zone. Only the price spread with the Dutch bidding zone is €0/MWh at hour 10, leading to the conclusion that the day-ahead price in Belgium during hour 10 was determined by a partially imported order from the Netherlands. Given the Belgian bidding zone imported 1,6 GWh/h at hour 10 one can conclude that a sell order was imported.

Importantly, at hour 10, a sell block order in the Belgian order book was paradoxically rejected while being moderately in-the-money (>€5/MWh but <€10/MWh). The sell block order covered two hours (including hour 10) and represented a moderate volume during these hours (>50 MWh/h on average but <250 MWh/h). No majority of the volume has clearly been offered in hour 10. The rejection of said sell block order by the market clearing algorithm indicates that the depth of the market was insufficient to accommodate the offered volume without reducing prices beyond the willingness to sell said block order.

Interesting for this specific case, assuming a day-ahead market price curve without a price peak at hour 10 would emerge in case the sell order was accepted, the resulting averaged day-ahead market price still exceeds the willingness to sell at which the sell block order was offered.

The following figure presents a portion of the aggregated supply-demand curve for the considered hour. Nota that the demand and supply curve are vertically aligned at the 3366,6 MWh/h mark. This hints that the market clearing price is determined by an order from the order book of a coupled bidding zone. Note again the inelastic shape of the supply curve.

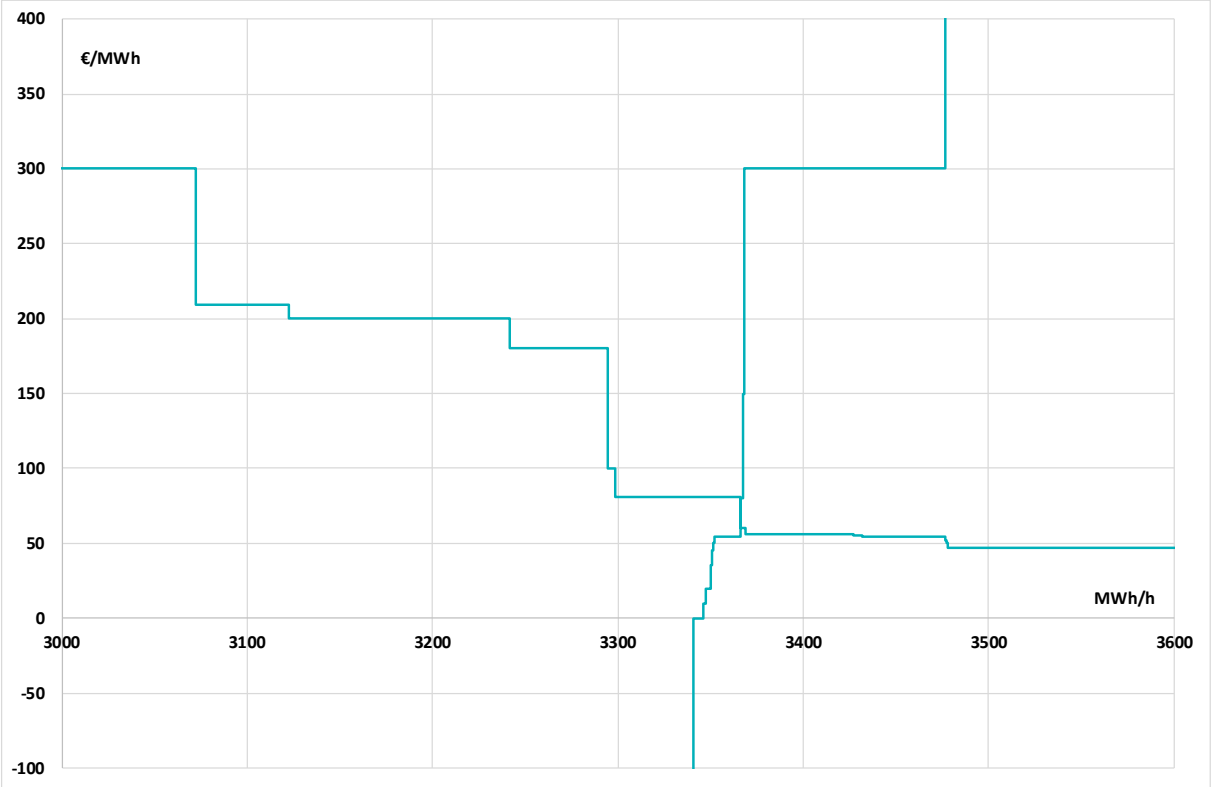

Figure 4 – Aggregated supply and demand curve for the delivery of day-ahead wholesale energy products in Belgium at hour 12 on April 6 2017, as cleared by EPEX SPOT Belgium (detail)
Source: EPEX SPOT Belgium, available at https://www.belpex.be/market-results/historical-data/

The paradoxically rejected sell block order in the Belgian bidding zone however competes with orders that have been accepted in the order book of the Dutch bidding zone. Given an imported sell order from the Dutch bidding zone and given the insufficient depth in the joint Belgian-Dutch order book[7] to accommodate the volume of the paradoxically rejected sell block order, accepting said sell block order in Belgium would imply rejecting other accepted sell orders in the coupled Belgian-Dutch bidding zone. The current algorithm does not allow rejecting limit orders if they are in-the-money. Consequently, the algorithm must find a feasible price level that complies with two conditions. The first condition is that the feasible price level is sufficiently low to reject the required volume of sell limit orders to replace it with the full volume offered by the paradoxically rejected sell block order[8]. The second condition is that the feasible price level is sufficiently high to provide a financial incentive to accept the block order that is now paradoxically rejected. If no such feasible price level exists, the only option available for the algorithm would be to paradoxically reject the block order.

Given the steep supply curve, it seems likely that such feasible price level did not exist. The algorithm is then programmed to reject the block order that generates the lowest welfare in the coupled Belgian-

[7] Full price convergence exists between the Dutch and Belgian bidding zone during hour 10 which indicates that there is no constraint limiting the import from the Dutch to the Belgian bidding zone.
[8] Under the condition that replacing the limit orders by the block order increases welfare, which is the utility function the algorithm aims to maximise.

Dutch bidding zone, even if the block order is in-the-money. The CREG did not analyse the order book of the Dutch bidding zone to verify, but assumes this is likely the case.

3. CONCLUSION

The CREG received by e-mail two enquiries following observed price peaks on the day-ahead electricity market for the delivery of wholesale energy products in Belgium as organized by EPEX SPOT Belgium. The first enquiry concerned a price peak for delivery at hour 12 on April 6 2017; the second concerned a price peak for delivery at hour 10 on April 11 2017.

The two observed price peaks on the day-ahead market primarily indicate a need for commercial flexibility. Commercial flexibility is low if the algorithm experiences difficulties to find a feasible market clearing price that provides adequate financial incentives to accept or reject a full or partial volume of limit orders and the full volume of block orders, while maintaining the supply-demand balance in terms of accepted volumes. If one of both conditions cannot be met, the algorithm resorts to reject block orders that are in-the-money to obtain a feasible market result.

Commercial flexibility is increased when the algorithm can find a feasible market clearing price without resorting to paradoxically rejecting block orders. This can be achieved in various ways among which two are identified based on the review above. Firstly, the more limit orders that are offered at different prices - preferably prices close to optimal market clearing price – the higher the likelihood a market clearing price is found that provides adequate incentives to all accepted and rejected orders. In other words, the supply curve would resemble a more elastic shape. Secondly, the more diverse the hourly volume offered by block orders at an hour when flexibility is needed, the higher the likelihood that the algorithm will find a feasible one. Indeed, offering more possibilities offered in terms of volume reduces the risk that the block order is rejected because the indivisibility of its volume is incompatible with the constraint of balancing supply and demand. Large block orders, mainly those with large volumes, are more easily paradoxically rejected than smaller ones. Market participants can divide their block orders by using smart orders such as linked and exclusive block orders. Since also profiles can be indicated using smart orders, they are excellent tools for this purpose.

The CREG welcomes informal enquiries on events that have occurred and encourages market participants to continue this active engagement. The CREG highly appreciates feedback and comments on the document and encourages stakeholders to communicate other interesting or remarkable events.

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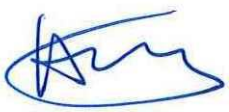

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