

294/09: INVESTIGATIONS INTO NET IMBALANCE VOLUME CHASING ('NIV CHASING') IN GB ELECTRICITY MARKET

MEETING NAME BSC PANEL MEETING 294

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Purpose of paper Information

Classification Public

Summary The BSC Panel Chairman at Panel Action 291/13 directed further investigations to be conducted into concerns raised around 'Net Imbalance Volume (NIV) chasing', in order to better understand these issues and their occurrences in the GB Electricity Market.

1. Summary overview

- 1.1 The Net Imbalance Volume (NIV) is the overall imbalance of all balancing actions taken by National Grid Electricity System Operator (NGESO) in each half-hour.
- 1.2 'Net Imbalance Volume (NIV) chasing' is a practice where market participants try to predict or anticipate system length and adjust their trading positions, either before or after Gate Closure, when they have forecasted the Imbalance Price to be greater than their marginal costs. This can potentially undo the balancing actions taken by NGESO, increasing the total cost of balancing.
- 1.3 This investigation considers the relationships between the imbalance of market participants or BSC Parties and the Net Imbalance Volume (NIV). The factors potentially driving behavioural changes in the market and their effects are assessed over respective periods. These factors were mainly driven by BSC Modification P305, which was first implemented in November 2015.
- 1.4 The market-wide investigation demonstrates the relationship between imbalance of all Parties and the NIV which is expected. There is little change in this relationship after the changes in the market arrangements driven by BSC Modification P305.
- 1.5 The evidence is slightly different for the case of Non-Physical Traders (NPT) and Interconnector (IC) Users who exhibit varying behavioural trend relationships in their imbalance volumes with the NIV. The behavioural trends in their imbalance volumes shows a significant proportion of their volumes or actions in the direction opposite to the NIV. These are contrary to expected market behaviour as observed for the aggregate of all Parties, and shows indications of potential 'NIV chasing' to make profits in the market.
- 1.6 Further evidence in the instance of the potential 'NIV chasing' behaviour was gathered for some Non-Physical Traders (NPT) and Interconnector (IC) parties. Some Parties were used as test cases in relation to the behavioural trend of their Imbalance Volumes to that of the NIV; as well as their traded volumes that are in or opposite the direction of NIV. The evidence points to a potential 'NIV chasing', though some of the NPT/IC demonstrate such behaviour more than others.
- 1.7 The analysis suggests that some of the Non-Physical Traders (NPT) and Interconnector (IC) users may be potentially engaging in 'NIV chasing' in the GB Electricity Wholesale Market. Due to the nature of the data in its aggregation it is difficult to identify the practice across vertically integrated Parties.

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2. Recommendations

2.1 We invite you to:

- a) **NOTE** the information provided in this paper.

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APPENDIX 1: ANALYSIS OF NIV AND PARTY IMBALANCE CORRELATION

1. Background

- 1.1 On 18 September 2018, Settlement Period 9, NGESO took 1,020MWh of buy actions to increase the level of energy on the system, and -931.32MWh of sell actions to decrease the level of energy on the system. After the BSC defined Tagging and Flagging processes had been undertaken, there were no remaining actions to set the System Price. In this circumstance, the Market Index Price (MIP) is used to determine the Market Price for the Settlement Period in question, and sets the System Price at -£6.25/MWh. (Imbalance Pricing guidance: <https://www.elexon.co.uk/documents/training-guidance/bsc-guidance-notes/imbalance-pricing/>)
- 1.2 The Market Index Price (MIP) sometimes does set the System Price but instances where this happens concurrently with a Short system position and negative System Price were likely to be rare, as it has happened only once since the introduction of BSC Modification P305 in November 2015. However, there are concerns from the BSC Panel this unusual occurrence may have been driven by 'Net Imbalance Volume (NIV) Chasing'.
- 1.3 The NIV is the sum of the volume of Bids, Offers and other Balancing Services actions in the Balancing Mechanism (BM) by National Grid Electricity System Operator (NGESO) in each half-hour. The NIV identifies whether the system is Short (i.e. NIV is positive) or Long (i.e. NIV is negative).
- 1.4 According to an Ofgem report (*'Electricity Balancing Significant Code Review: Impact Assessment for Final Policy Decision, 2014' – Section 6*), Parties would not be able to sufficiently forecast the NIV and the Imbalance Prices flowing from it, and therefore trading out the position would remain the dominant strategy in the market.
- 1.5 However, market participants that can anticipate the system length and adjust their positions would have a powerful commercial advantage in respect of trading strategy.

2. 'Net Imbalance Volume (NIV) chasing' in perspective

- 2.1 On the backdrop of this, 'NIV chasing' may be a preferred trading strategy by some of the market participants. This is because being in imbalance in the opposite direction to the system means the Party is either paid more or pays less than they would have otherwise paid or been paid if they traded their position in the wholesale market.
- 2.2 In such scenarios, a BSC Party may deliberately incur an Energy Imbalance Volume in order to receive, or pay the Imbalance Price rather than the wholesale market price for that energy. This trading practice is allowed in the BSC rules.
- 2.3 According to a Cornwall Insight article (*'Energy Spectrum 633'*), non-licensed generators also have a significant advantage in the 'NIV chasing' space, as they do not have to fix their output with contract notifications (at Gate Closure – they could intentionally spill into the market when they forecast the Imbalance Price to be above their marginal cost). This practice means there are generators waiting to see which actions the system operator instructs under the BM and running in response to these signals.
- 2.4 A recent report by ELEXON (*'ELEXON Insights: What is driving increases in Electricity Imbalance Volumes?'*), also sheds some light on how Non-Physical Traders and Interconnector Users may be adopting this 'NIV chasing' strategy. The report indicates Non-Physical Traders cannot be the lead Party on any registered generation or demand Balancing Mechanism Units (BMUs). Hence, they can incur an Imbalance

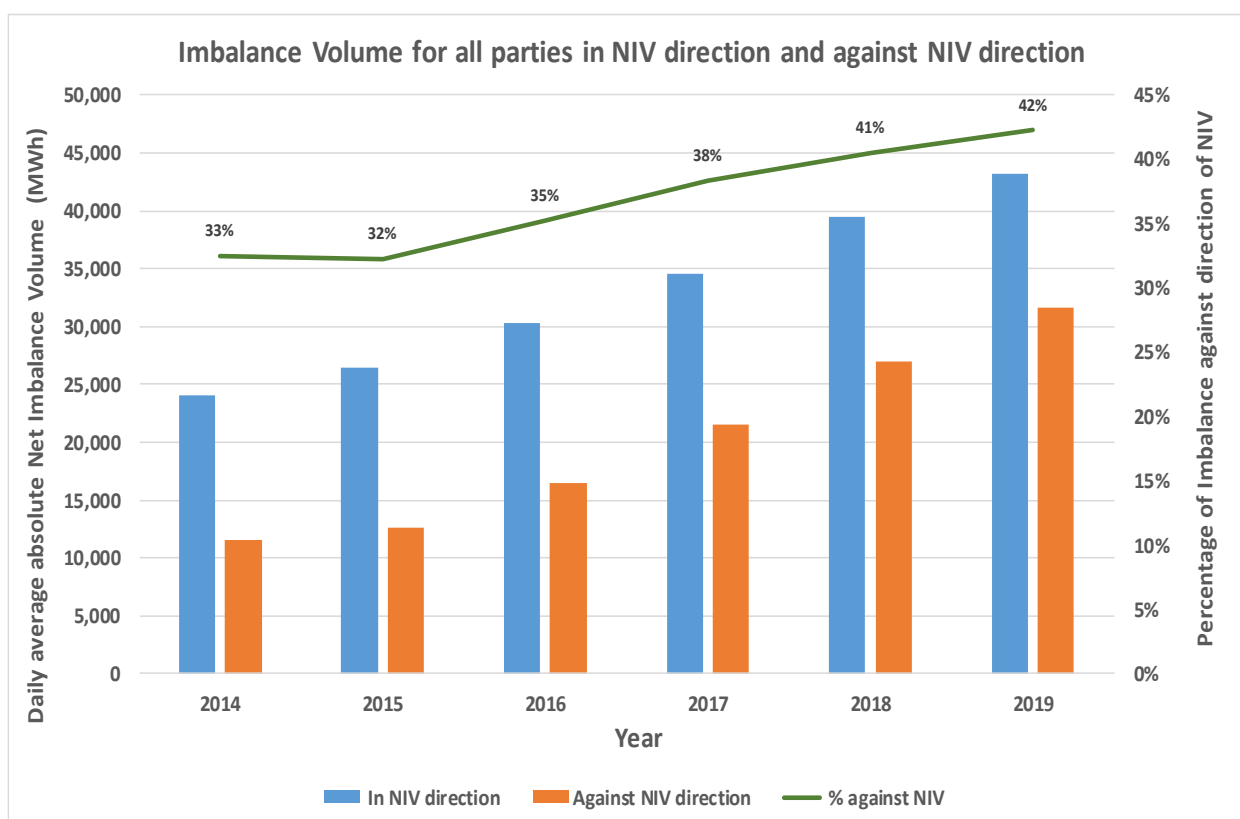
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Volume by buying energy from another trading party and not selling all of that energy on, or by selling energy to another a trading party and not buying enough energy to cover what they sold.

3. Trends in Parties Imbalance Volumes in relation to Net Imbalance Volume (NIV)

- 3.1 The absolute volume of daily imbalance in the opposite direction to the daily NIV has increased by 174% (20,244MWh) between 2014 and 2019. Over the same period, the absolute volume of imbalance in the same direction of the NIV has increased by 81% (19,554MWh).
- 3.2 Non-Physical Traders and Interconnector Users have the highest percentage of Energy Imbalance Volume in the opposite direction of the NIV between 2014 and 2019. This could partly be due to some BSC Parties choosing to 'NIV chase' as a trading strategy.
- 3.3 Graph 1 below indicates that overall, the percentage of imbalance volumes in the direction opposite the NIV has increased from about 33% in 2014 to about 42% in June 2019. The green line demonstrates this.

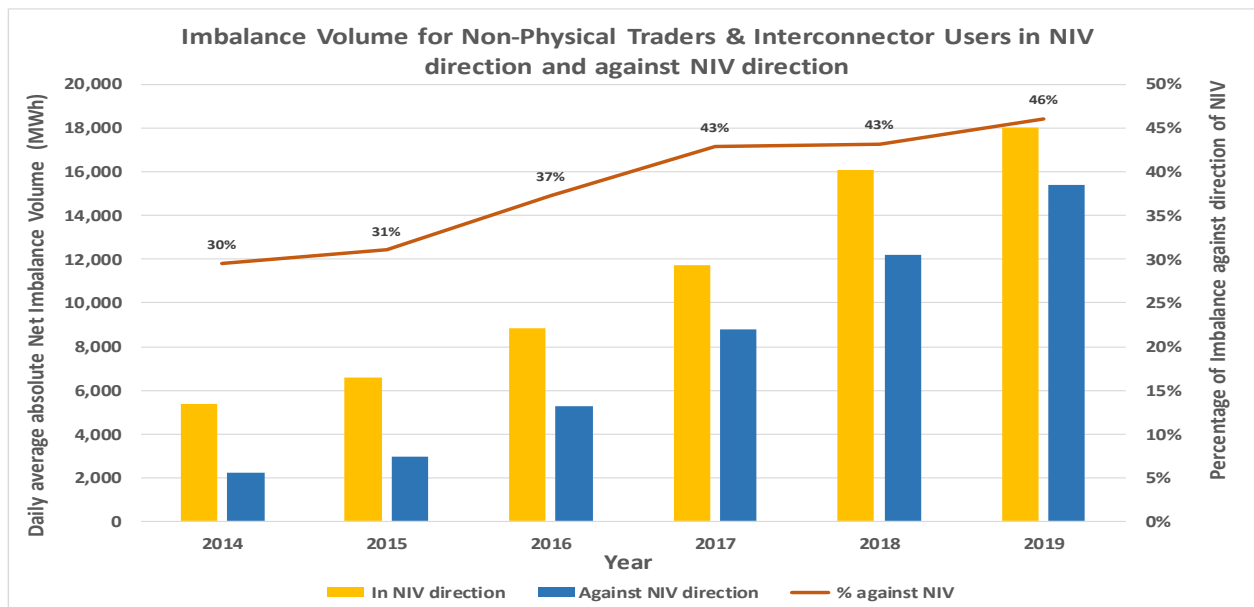
Graph 1: Imbalance Volumes for all Parties in NIV direction and against NIV direction



- 3.4 Graph 2 below shows that Non-Physical Traders and Interconnector users contribute more to the absolute volumes of actions taken in the opposite direction to the NIV. That is, the percentage of Imbalance Volumes in the opposite direction to the NIV for Non-Physical Traders and Interconnector users is above that of all market participants shown in Graph 1.
- 3.5 Graph 2 shows an increasing trend from 30% to 46% for Non-Physical Traders & Interconnector user parties.

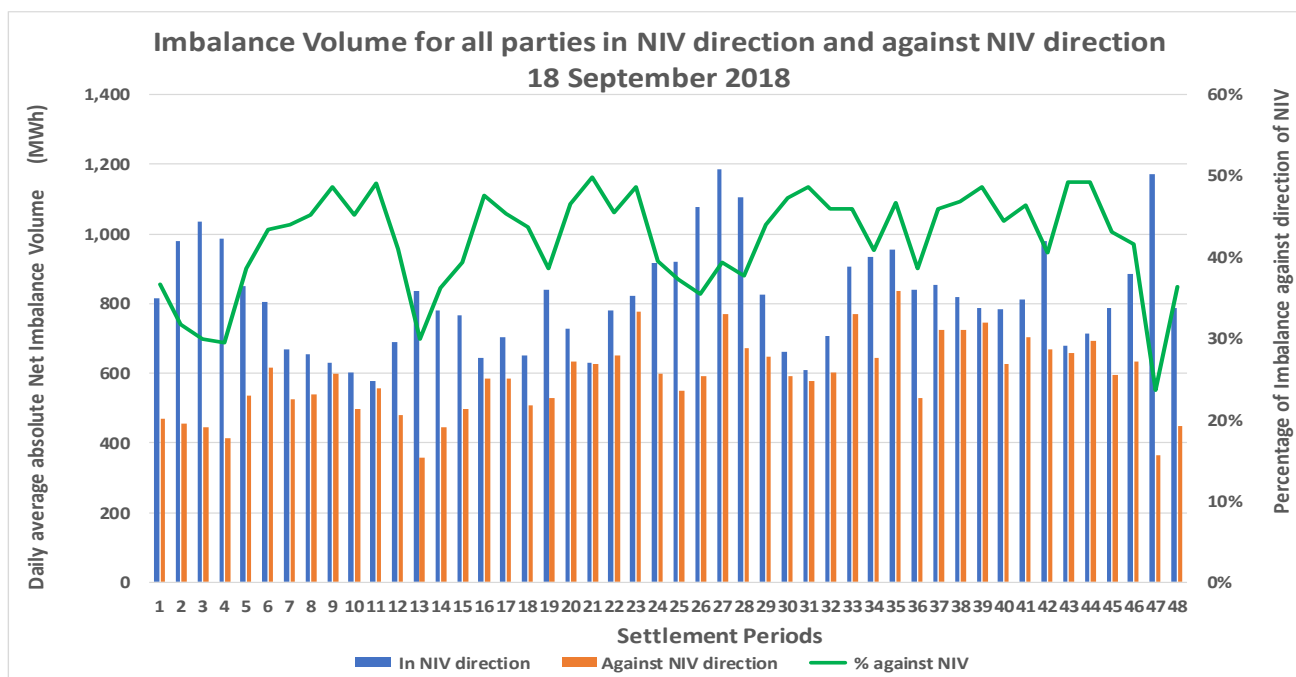
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Graph 2: Imbalance Volumes in NIV direction and against NIV direction for Non-Physical Traders & Interconnector users



- 3.6 Focusing on 18 September 2018 provides more detailed insight into the direction of market participants' imbalance and the respective direction in relation to the Net Imbalance Volume.
- 3.7 Graph 3 below shows the Settlement Periods on 18 September 2018.

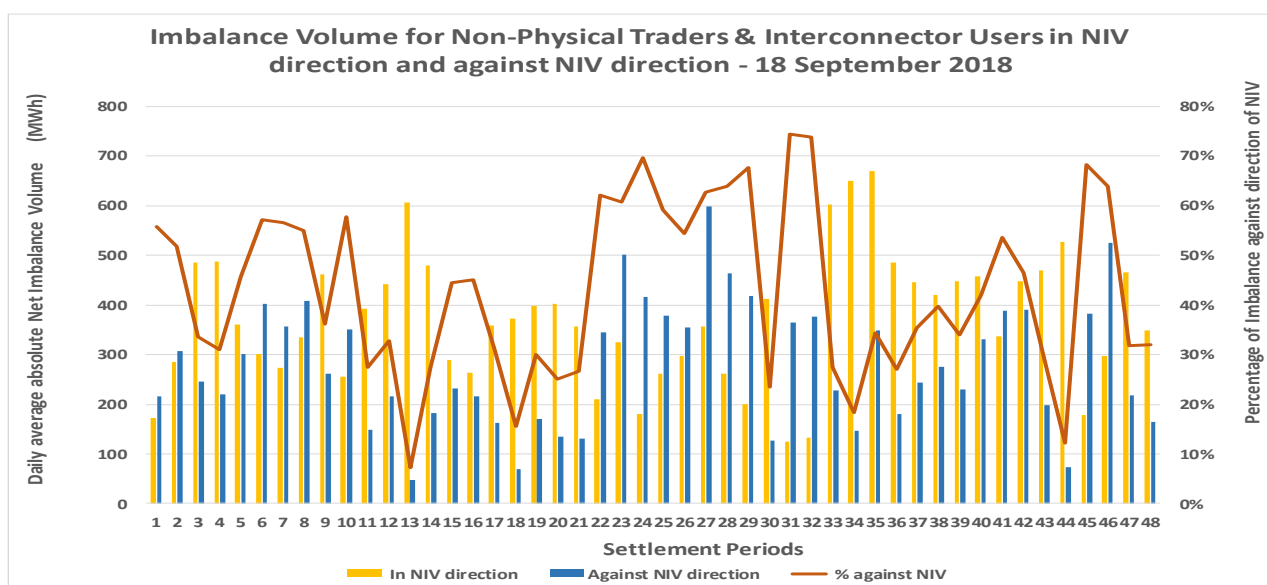
Graph 3: Imbalance Volumes in NIV direction and against NIV direction for all Parties: 18 September 2018



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- 3.8 For Settlement Period 9, 49% of the market imbalance volume was opposite the direction of the NIV. Although, this represents a high proportion of the imbalance volume in the opposite direction to the NIV, it was not the only settlement period, among those that were short that had such a high proportion of imbalance volume opposite the NIV.
- 3.9 Drilling down to the imbalance volumes by the Non-Physical Traders and Interconnector users, it is also evident that for Settlement Period 9, 36% had imbalance volume in the direction opposite the NIV.

Graph 4: Imbalance Volumes direction for Non-Physical Traders & Interconnector users: 18 September 2018



4. Drivers of Net Imbalance Volume (NIV)

- 4.1 Two of the factors that influence NIV are below:
- Demand forecasting errors
 - Market changes (structural changes in market fundamentals)
- 4.2 Demand forecast errors have an impact on the overall level of Net Imbalance Volume (NIV), as the National Grid Electricity System Operator (NGESO) would normally have to take actions in the form of Bids, Offers and Balancing Services Adjustment Actions to reduce demand forecast bias (over or under forecast).
- 4.3 Changes to market arrangements affect how market participants operate. Any such change may have a big or small effect on market participants. The extent of such impacts of market change depends on the level of 'structural changes' that are implemented. Such structural changes would normally trigger changes in the market fundamentals, which would inevitably change or swing the 'behaviour' of market participants in any direction favourable with their business trading strategies.
- 4.4 Between 2014 and 2019, there has been some major changes in the market arrangements that could potentially have influenced 'market behaviour' in relation to market imbalance.
- 4.5 Table 1 indicates some of the significant changes to market imbalance pricing arrangements within the last five years:

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Table 1: Significant changes in market imbalance pricing arrangements since 2014

From November 2015	<ul style="list-style-type: none">• A single imbalance price for each half-hour• A reduction in the Price Average Reference (PAR) value to 50MWh and the Replacement PAR (RPAR) value to 1MWh upon implementation• A price for Short Term Operating Reserve (STOR) actions using a Reserve Scarcity Price (RSP) determined by a 'static' Loss of Load Probability (LoLP) function• A price for Demand Control actions at Value of Lost Load (currently £3,000/MWh)
From November 2018	<ul style="list-style-type: none">• A further reduction to the PAR value to 1MWh on 1 November 2018• Increase the VoLL to £6,000/MWh• A 'dynamic' LoLP function

- 4.6 While all the changes may have had a combined impact, in regards to this analysis, it is considered the market changes in 'single imbalance price for each half-hour' and 'reduction in the Price Average Reference (PAR)' may have had significant impacts due to the sensitivity of market participants to System Prices.
- 4.7 The focus of the behavioural change and correlational analysis will be on recent market changes and their relative impacts.

5. Impact of market structural changes: Net Imbalance Volume (NIV) & Party Imbalance

- 5.1 Structural changes in the market have the tendency to alter behaviour of market participants, in relation to their actions to gain competitive advantage or minimise any impact on their optimal market position.
- 5.2 Some of the significant changes in the market over the last few years could have had an impact of how market participants may have altered their trading strategies.
- 5.3 The significant changes in the market arrangements in the last five years have already been outlined. While all these changes may have a combined effect, it is expected that changes in regards to the 'single imbalance price for each half-hour' and the 'Price Average Reference (PAR)' may have had the most impact.
- 5.4 For the sake of identifying the perceived changes in market behaviour in relation to the 'structural changes' in the market, we categorise the market changes into 3 periods:

Table 4: Significant changes in market arrangements since 2014

Changes in market arrangements	Data Periods
No significant changes	January 2014 to October 2015
BSC Modification P305 : 1 st market changes	November 2015 to October 2018
BSC Modification P305 : 2 nd market changes	November 2018 to June 2019

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- 5.5 The review of the impact of the market changes will cover the respective periods of data for Market Imbalance (i.e. NIV) and Party Imbalance.
- 5.6 The analysis will cover the correlation between the Net Imbalance Volume (NIV) vis-vis Parties imbalance; and a further correlational analysis in regard of Non-Physical Traders (NPT) & Interconnectors (IC) users.
- 5.7 The table below provides a summary of the performance metrics of market imbalance volume in relation to imbalance volume of the Parties.

Table 5: Market Imbalance vs Party Imbalance metrics per market changes periods

Market Imbalance vs Party Imbalance				
	Market Imbalance		Party Imbalance	
	Standard Deviation (SD)	Mean Absolute Error (MAE)	Standard Deviation (SD)	Mean Absolute Error (MAE)
2014 to Nov 2015	349	275	346	274
Nov 2015 to Oct 2018	356	286	338	279
Nov 2018 to Jun 2019	337	263	324	254
18 Sept 2018	291	228	288	227

- 5.8 The level of variation in the metrics is minimal for the three categorised periods for consideration under the market changes. The standard deviation for overall market imbalance does not vary much from the standard deviation of the imbalance of all the parties. The same is observed for the mean absolute error for each year. This indicates the range of values for market imbalance in absolute terms are consistent with the range of values in absolute terms for the parties' imbalance. A high level of variation between the standard deviation of the market imbalance and parties' imbalance would have indicated some level of volatility or a higher level of dispersion in absolute terms for either the market imbalance or parties' imbalance.
- 5.9 The metric values for the 18 September 2018, when market was Short and System Price negative for Settlement Period 9 had a rather lower level of standard deviation compared to that for the other three periods. However, mean absolute error for the 18 September 2018 was within close range of the mean absolute error of the other three periods under observation. In effect, the error level followed the same trend, but there was a lower level of dispersion as far as the imbalance positions were concerned for 18 September 2018.
- 5.10 The correlation coefficients for the periods under consideration between market imbalance and party imbalance is below:

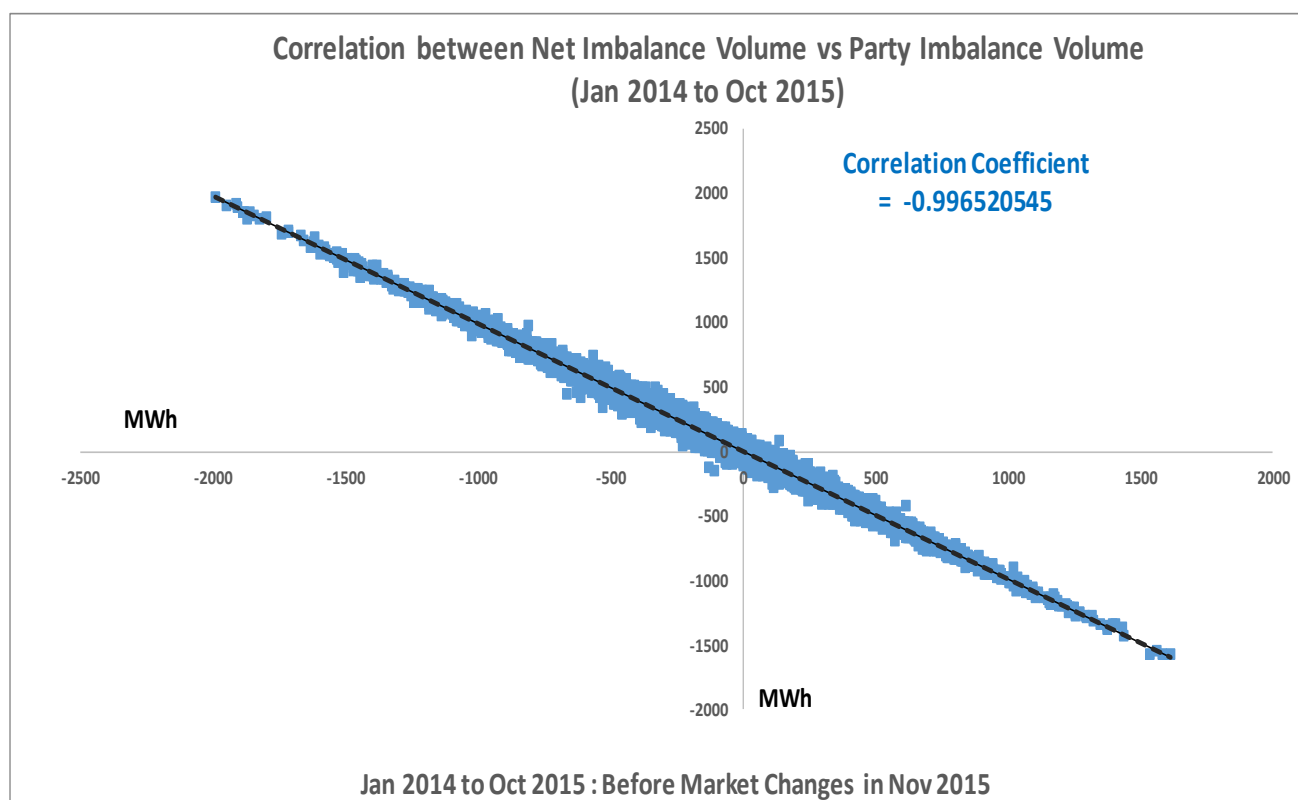
Table 6: Market Imbalance vs Party Imbalance correlation per market changes periods

Market Imbalance vs Party Imbalance			
	Jan 2014 to Nov 2015	Nov 2015 to Oct 2018	Nov 2018 to Jun 2019
Correlation Coefficient	-0.9965	-0.9859	-0.9852

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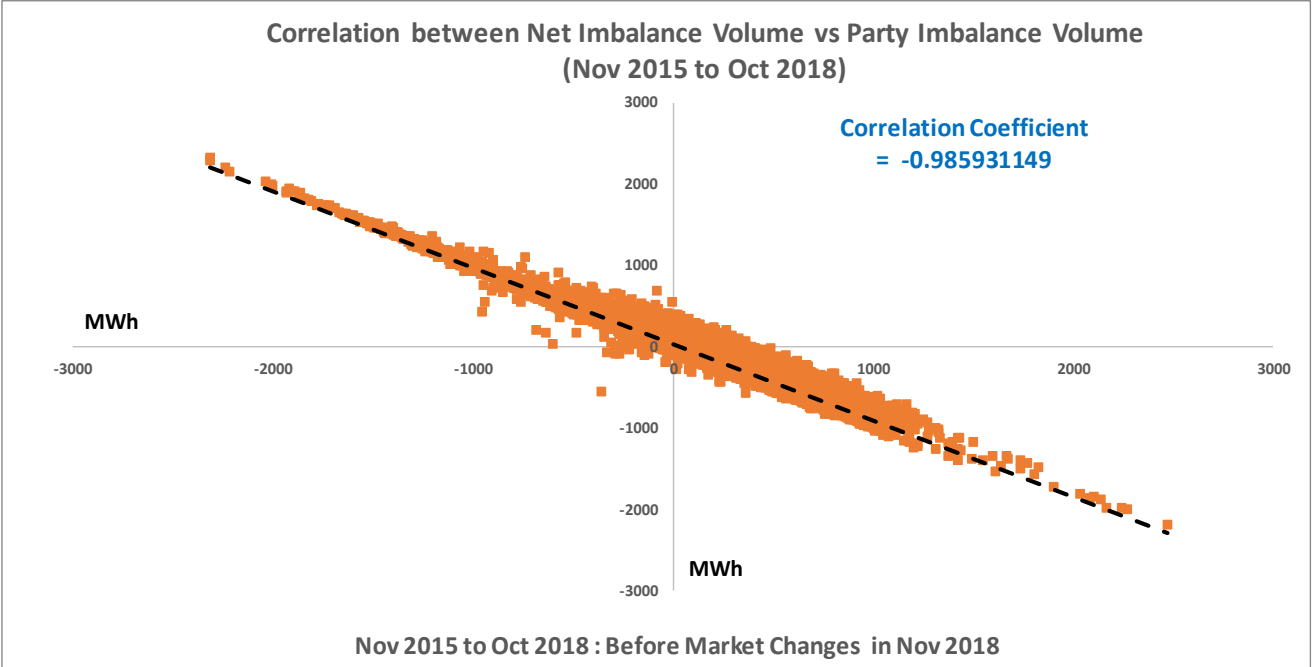
- 5.11 The correlation coefficients for all three periods point to a strong negative correlation between market imbalance and party imbalance.
- 5.12 For the period before the significant market changes that were introduced in November 2015, the correlation was -0.9965. This indicates a strong negative correlation, and in essence a tendency for parties to take actions in favour of market imbalance in order to favourably resolve market imbalance.
- 5.13 For the period after the market changes of November 2015, the correlation coefficient was -0.9859. This represents a slight reduction in the correlation from previous period, indicating a small portion of market participants may have changed their behavioural patterns in regards of taking actions in the opposite direction to the market imbalance.
- 5.14 For the period after the changes of November 2018, the correlation coefficient was -0.9860, a rather negligible change in the correlation from previous period. No significant change in behavioural patterns of actions taken by parties in regards of direction of market imbalance.
- 5.15 The graphs below shows the correlations between market imbalance and party imbalance for the periods before and after market changes.

**Graph 6: Correlation between Net Imbalance Volume vs Party Imbalance Volume
Nov 2014 to Oct 2015**

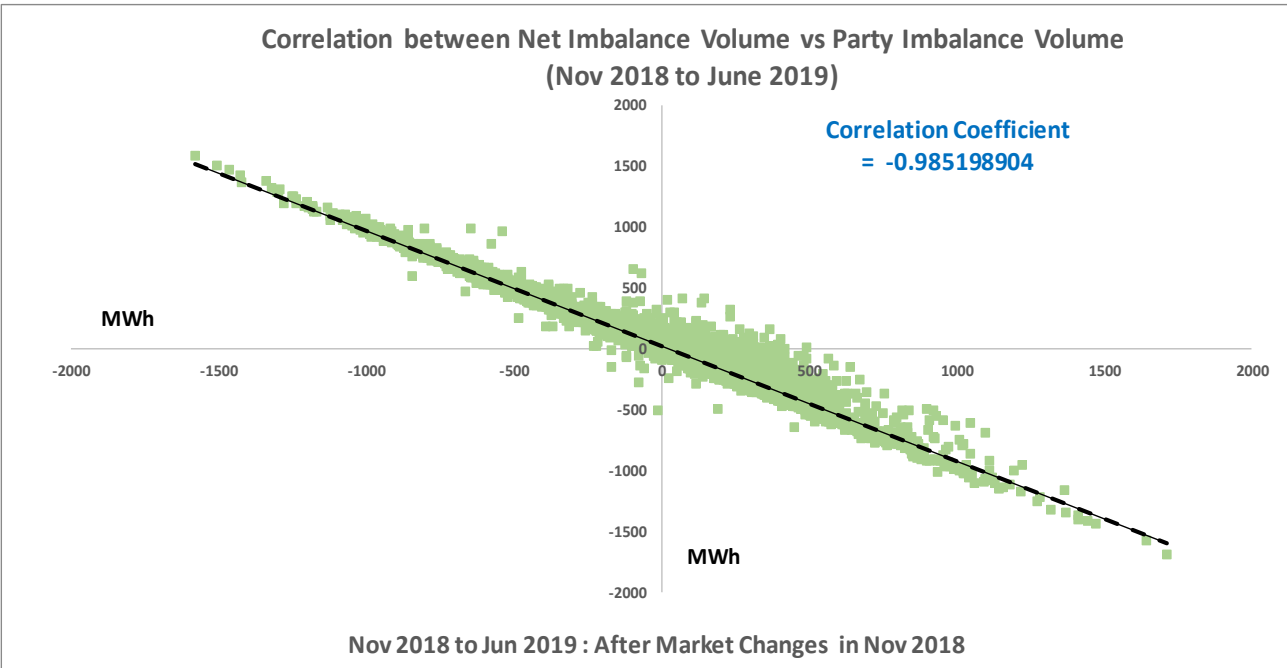


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**Graph 7: Correlation between Net Imbalance Volume vs Party Imbalance Volume
Nov 2015 to Nov 2018**



**Graph 8: Correlation between Net Imbalance Volume vs Party Imbalance Volume
Nov 2018 to Jun 2019**



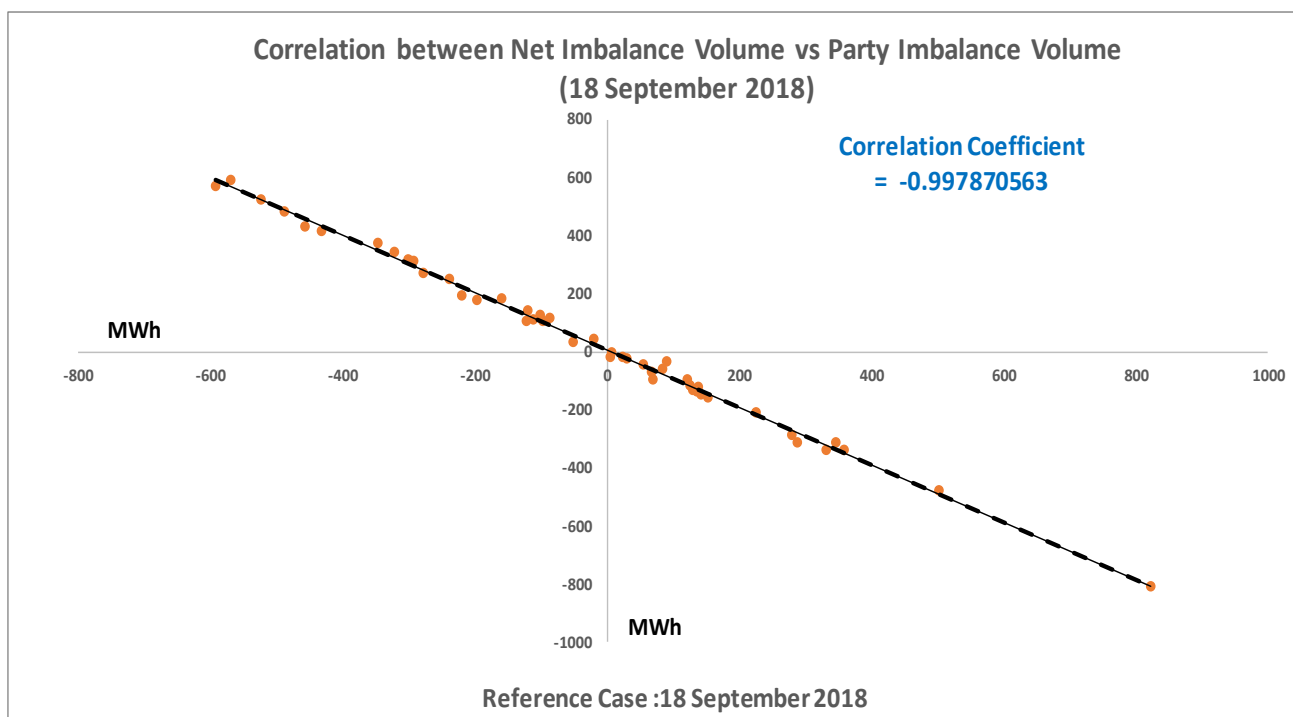
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- 5.16 The correlation between market imbalance and party imbalance for the 18 September 2018 in Table 7 below also shows a strong negative correlation, with a value of -0.9979. This is in line with the observed correlation for the periodic analysis, indicating that in general the market parties took action that were in favour of market imbalance.

Table 7: Correlation between Net Imbalance Volume vs Party Imbalance Volume for 18 September 2018

Market Imbalance vs Party Imbalance	
18 September 2019	
Correlation Coefficient	-0.9979

Graph 9: Correlation between Net Imbalance Volume vs Party Imbalance Volume 18 September 2018



- 5.17 The correlational analysis is further drilled down to the level of NPT/IC, which from evidence in the early pages of this paper, seem to have the tendency to take actions in the direction opposite to market imbalance, a behavioural trend that exhibits potential signs of 'NIV chasing'.
- 5.18 The Non-Physical Traders (NPT) and Interconnectors (IC) users are the category under this further analysis. Taking the periods of market change in perspective, the correlation between market imbalance and the IC/NPT imbalance is below:

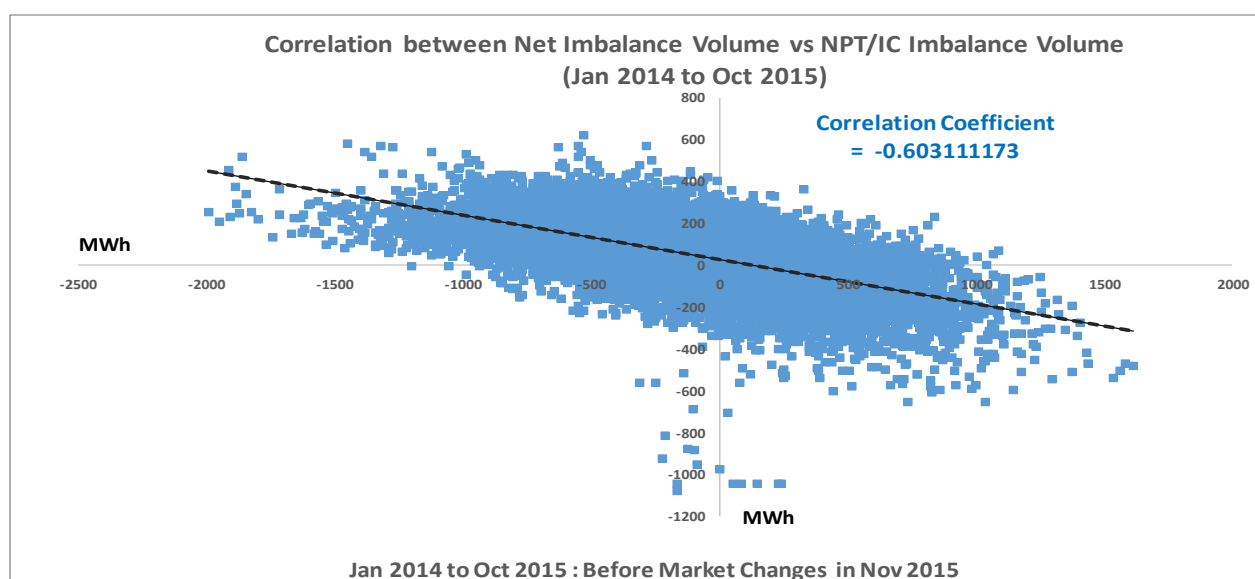
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Table 8: Correlation between Net Imbalance Volume vs NPT/IC Imbalance Volume per market changes periods

Market Imbalance vs NPT/IC Imbalance			
	Jan 2014 to Nov 2015	Nov 2015 to Oct 2018	Nov 2018 to Jun 2019
Correlation Coefficient	-0.6031	-0.4441	-0.3768

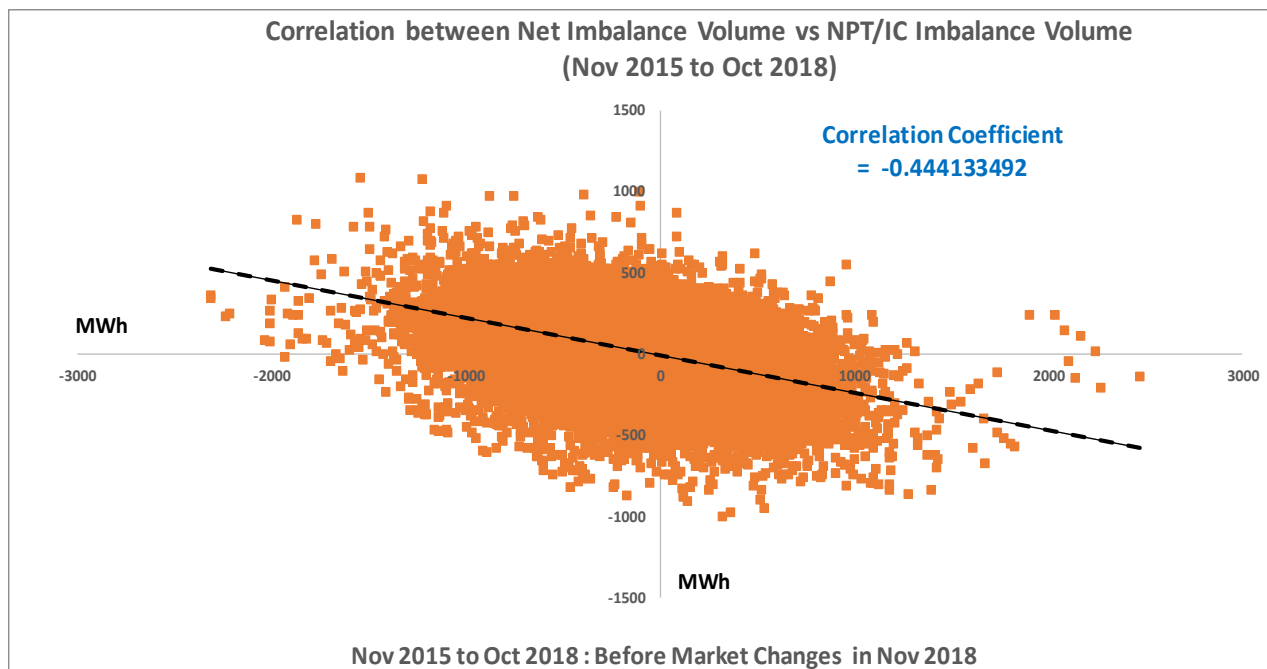
- 5.19 The correlation between market imbalance and imbalance for NPT/IC shows a negative relationship as expected, but a weaker relationship compared to the correlation for overall parties' level.
- 5.20 The correlation coefficient between market imbalance and imbalance for NPT/IC seems to have decreased or become weaker after the implementation of the market changes, dropping from -0.6031 (before Nov 2015 changes) to -0.4441 (after Nov 2015 changes). This represents about 16 points drop in the strength of the correlation. A further drop of six points is evident after Nov 2018 market changes, with the resulting correlation being -0.3768. This could be partly due to behavioural changes in their trading or optimisation strategies.
- 5.21 The trends in the reducing strength of the correlation between the market imbalance and the imbalance for NPT/IC indicates that in general NPT/IC may be taking some actions against the direction of market imbalance position. Such behavioural changes may have been influenced by changes in the market after November 2015, possibly sending signals to the NPT/IC that adopting the trading strategy of predicting market length and taking actions opposite to market imbalance position may put them in an optimal trading position ('cash-out'). This observed behavioural change could be interpreted as showing potential signs of 'NIV chasing'.
- 5.22 The graphs of the correlation between market imbalance and imbalance for NPT/IC are below:

Graph 10: Correlation between Net Imbalance Volume vs NPT/IC Imbalance Volume Nov 2014 to Oct 2015

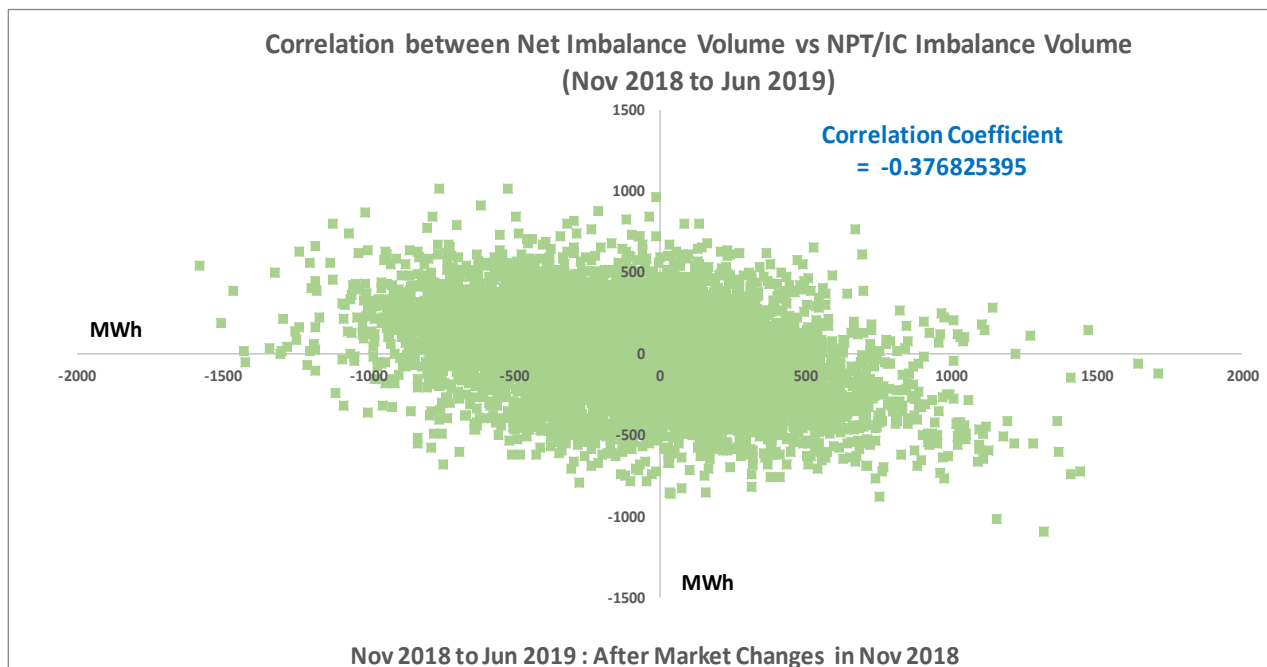


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**Graph 11: Correlation between Net Imbalance Volume vs NPT/IC Imbalance Volume
Nov 2015 to Oct 2018**



**Graph 12: Correlation between Net Imbalance Volume vs NPT/IC Imbalance Volume
Nov 2018 to Jun 2019**



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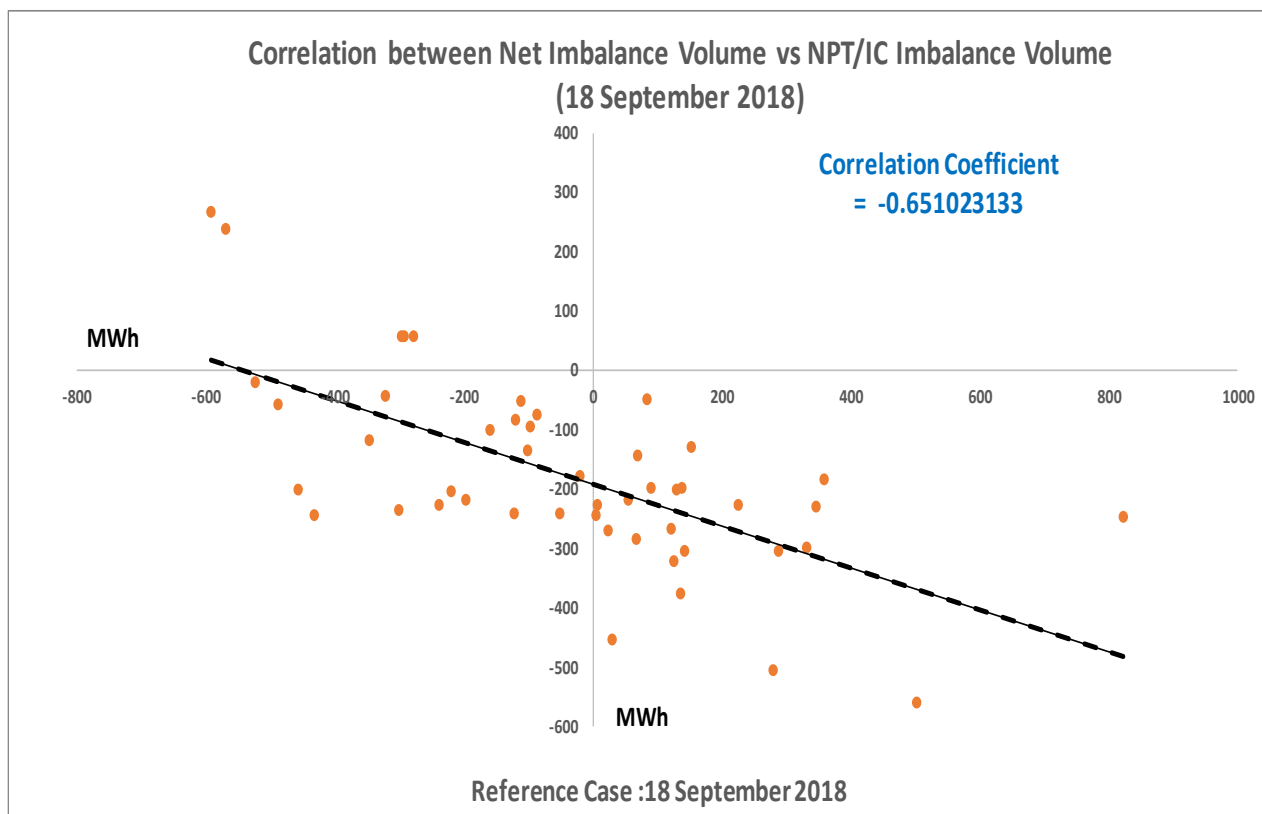
- 5.23 Drilling down to the correlation between market imbalance and imbalance for NPT/IC for the 18 September 2018, the results indicate a negative correlation within the range of what is observed for NPT/IC over the periods under review:

Table 9: Correlation between Net Imbalance Volume vs NPT/IC Volume for 18 September 2018

Market Imbalance vs IC/NPT Imbalance	
18 September 2019	
Correlation Coefficient	-0.6510

- 5.24 The correlation is negative which is expected, but a weaker negative correlation of -0.6510 compared to the correlation of imbalance for all Parties in relation to market imbalance. This is in line with the general observed behavioural trend for NPT/IC, and may potentially exhibit some signs of 'NIV chasing'.
- 5.25 The graph of the correlation between market imbalance and imbalance for NPT/IC for the 18 September 2018 is below:

**Graph 13: Correlation between Net Imbalance Volume vs NPT/IC Imbalance Volume
18 September 2018**



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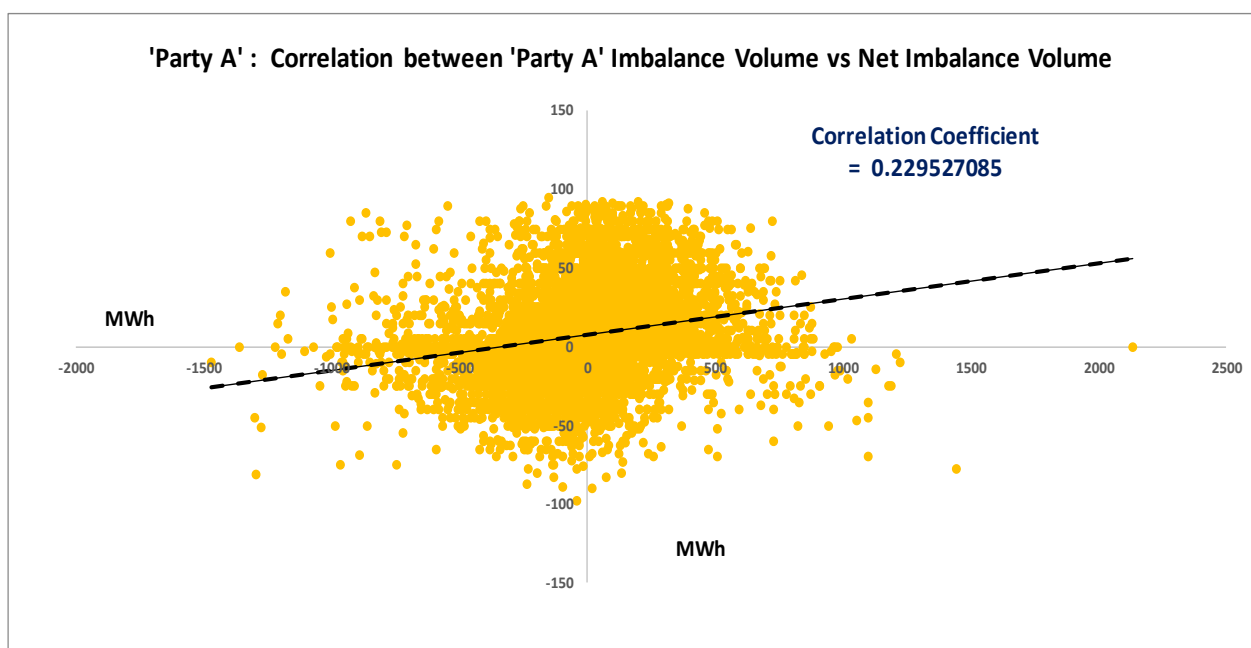
6. Test cases for signs of possible 'NIV chasing'

- 6.1 A further drill down into the evidence of demonstrated signs of 'NIV chasing' involves a sample of some Non-Physical Traders (NPT) and Interconnectors (IC) users.
- 6.2 The behaviours of the sampled NPT/IC are evidenced in the correlations between their Imbalance Volume and the NIV; and their absolutised volumes either in or opposite the direction of NIV.
- 6.3 The names and periods of the data used for these test cases of some NPT/IC parties are anonymised for confidentiality reasons.

6.4 Test case 1 : Correlation between 'Party A' Imbalance Volume vs Net Imbalance Volume

- a) The correlation between Imbalance Volume of 'Party A' and the NIV is evidenced in graph 14 below. A correlation of 0.2295 is indicative of a shift in the direction of correlations observed for normal behaviour of Parties' imbalance in relation to NIV. A positive correlation is indicative of a behaviour trend that is opposite the direction expected under normal circumstances. This is a demonstration of possible signs of 'NIV chasing'.

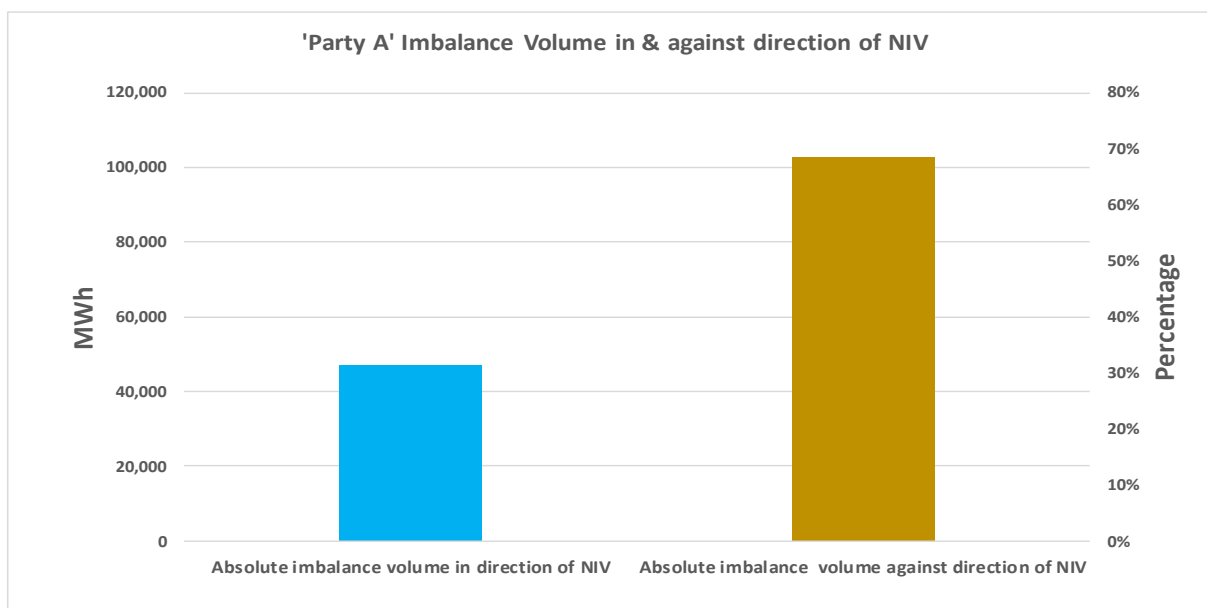
Graph 14: Correlation between 'Party A' Imbalance Volume vs Net Imbalance Volume



- b) The volumes traded by 'Party A' are also shown in the graph 15 below. 'Party A' seems to have over a certain period, traded with more of their Imbalance Volumes in the direction opposite the NIV than the volumes in the direction of the NIV. 'Party A' has 68% of their volumes in the direction against NIV; with 32% of their traded volumes in the direction of NIV. This is further evidence of actions indicative of 'NIV chasing'.

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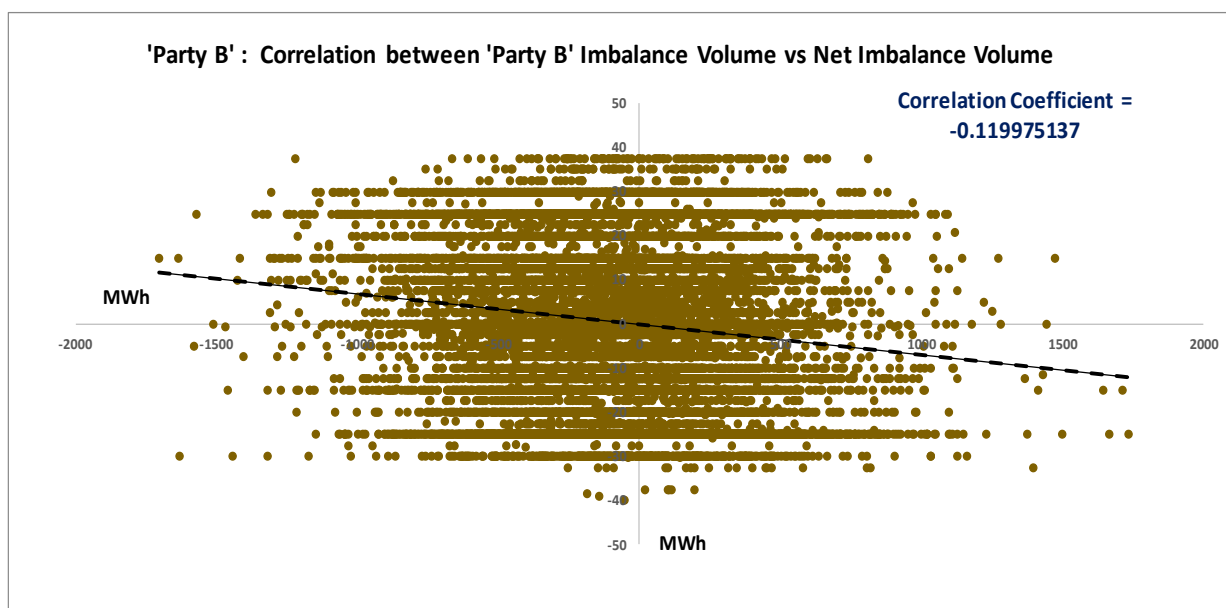
Graph 15: 'Party A' Imbalance Volume in and against the direction of Net Imbalance Volume



6.5 Test case 2: Correlation between 'Party B' Imbalance Volume vs Net Imbalance Volume

- a) The correlation between Imbalance Volume of 'Party B' and the NIV is evidenced in graph 16 below. The correlation coefficient is -0.1199, a negative correlation, but weaker in terms of the expected correlational relationship. It demonstrates that though the correlation is negative as expected, some of the behavioural actions of 'Party B' may be in the opposite direction to that of the NIV. Such correlations are demonstrative of 'NIV chasing'.

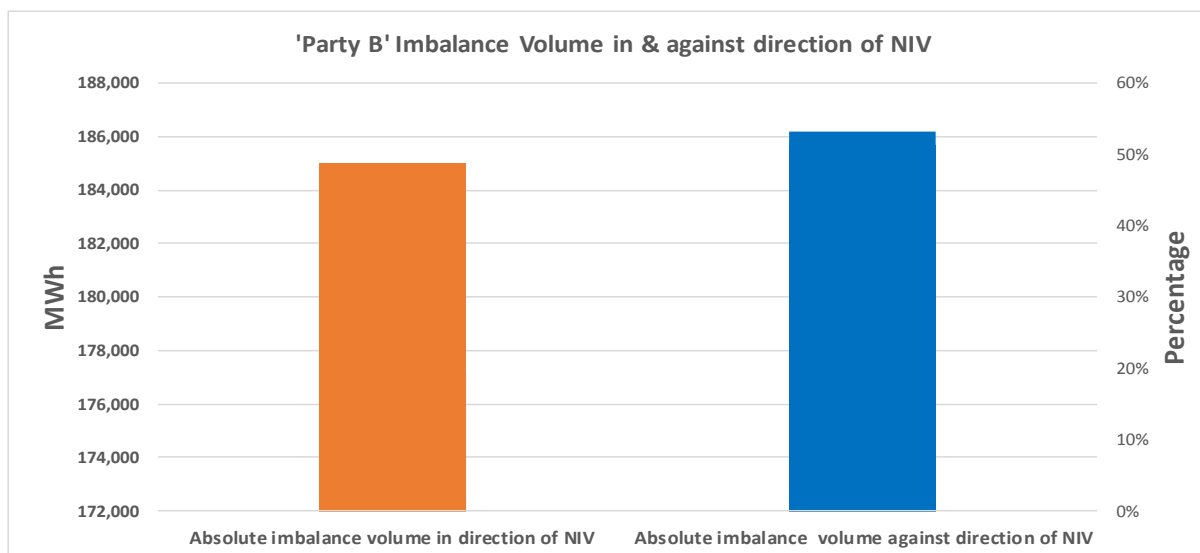
Graph 16: Correlation between 'Party B' Imbalance Volume vs Net Imbalance Volume



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- b) The volumes traded by 'Party B' are also shown in the graph 17 below. 'Party B' has 51% of their volumes in the direction opposite the NIV; with 49% of their traded volumes in the direction of NIV. This is evidence of a significant volume of actions opposite the direction of NIV.

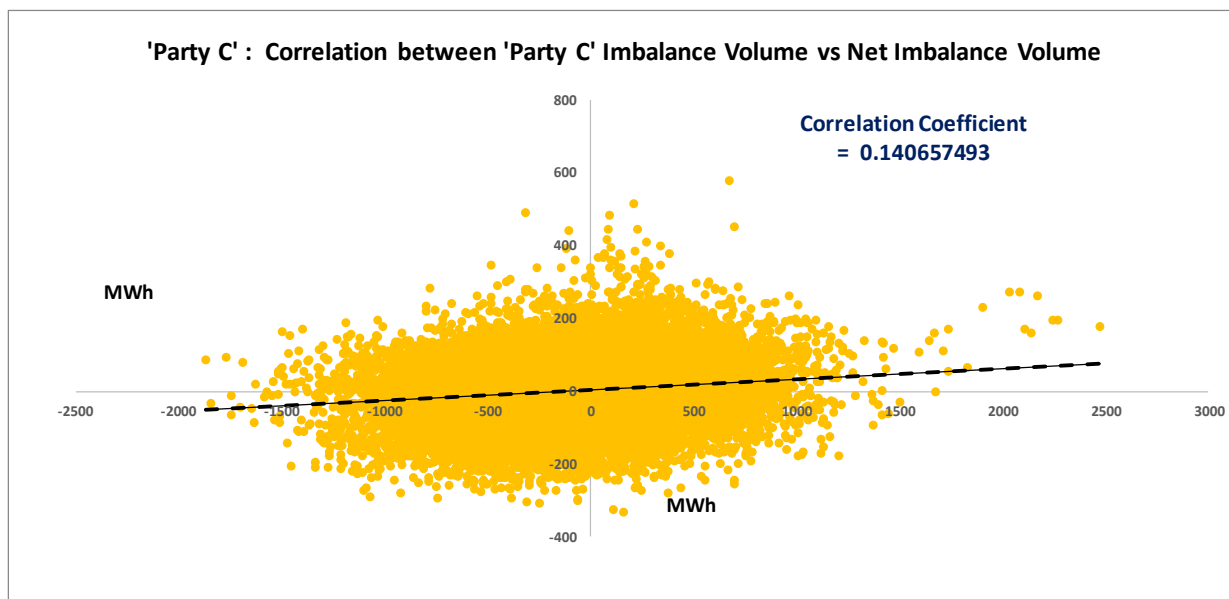
Graph 17: 'Party B' Imbalance Volume in and against the direction of Net Imbalance Volume



6.6 Test case 3 : 'Correlation between 'Party C' Imbalance Volume vs Net Imbalance Volume

- a) The correlation between Imbalance Volume of 'Party C' and the NIV is evidenced in graph 18 below. The correlation coefficient is 0.1406, a positive correlation, demonstrating some of the behavioural actions of 'Party C' are in the opposite direction to the expected behavioural trend of the parties. Such a correlation shows signs of 'NIV chasing'.

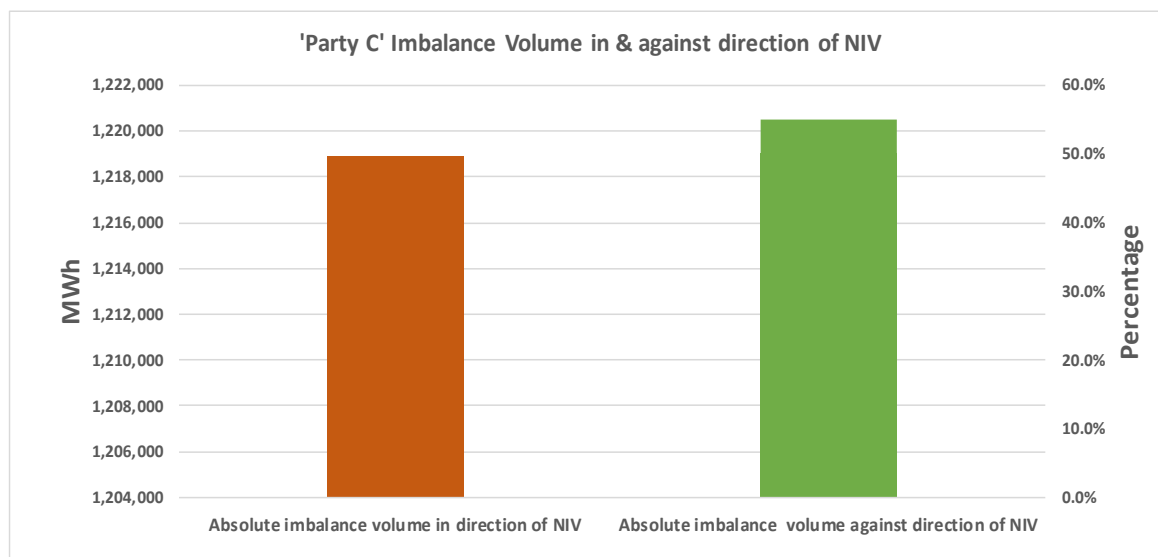
Graph 18: Correlation between 'Party C' Imbalance Volume vs Net Imbalance Volume



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- b) The volumes traded by 'Party C' are also shown in the graph 19 below. 'Party C' has 50.2% of their volumes in the direction against NIV; with 49.8% of their traded volumes in the direction of NIV. This is evidence of a considerable volume of actions in direction opposite the direction of NIV.

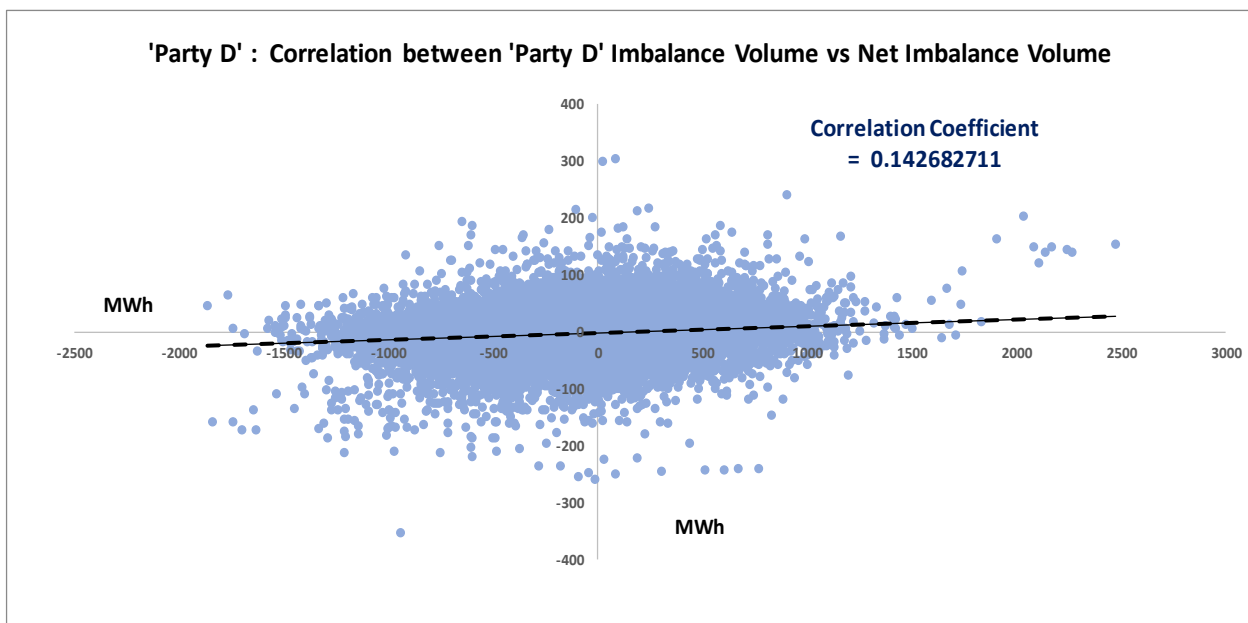
Graph 19: 'Party C' Imbalance Volume in and against the direction of Net Imbalance Volume



6.7 Test case 4 : Correlation between 'Party D' Imbalance Volume vs Net Imbalance Volume

- a) The correlation between imbalance of 'Party D' and the NIV is evidenced in graph 20 below. The correlation coefficient is 0.1427, a positive correlation, demonstrating some of the behavioural actions of 'Party D' are in the opposite direction to expected behavioural trend of the parties. Such a correlation can be interpreted as showing signs of 'NIV chasing'.

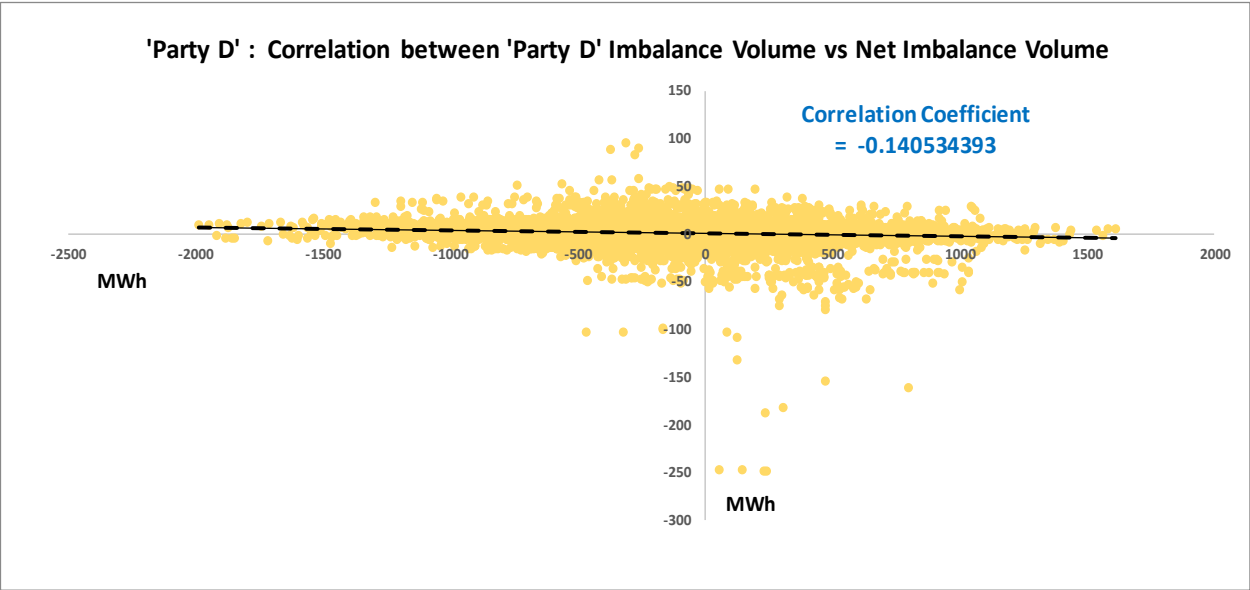
Graph 20: Correlation between 'Party D' Imbalance Volume vs Net Imbalance Volume



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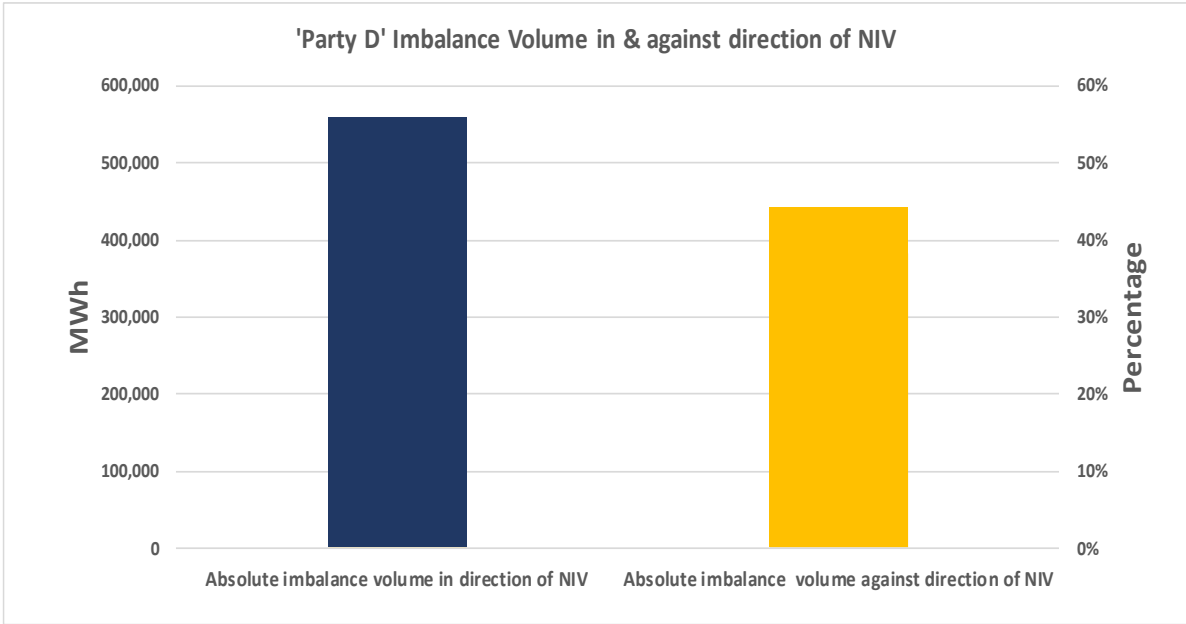
- b) The case of 'Party D' under consideration shows a swing in behaviour taking data for the same Party for a different period. The correlation of -0.1405 for that period showed a negative correlation with NIV, though a weaker correlation, indicating some actions taken by 'Party D' were in opposite direction to that of the NIV. This is a huge variation for the correlation for another period for the same 'Party D', where the correlation is positive (0.1427), and a drop of at least 28 points in the correlation.

Graph 21: Correlation between 'Party D' Imbalance Volume vs Net Imbalance Volume



- c) The volumes traded by 'Party D' for the period under consideration are also shown in the graph 22 below. 'Party D' has 44% of their volumes in the direction against NIV; with 56% of their traded volumes in the direction of NIV.

Graph 22: 'Party D' Imbalance Volume in and against the direction of Net Imbalance Volume



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7. Conclusions

- 7.1 This investigation covers a broad scope in regards to the correlational relationships by time interval between imbalance on one hand, and Net Imbalance Volume (NIV) on the other hand. Factors potentially driving behavioural changes in the market such as 'structural changes' and their effects are assessed over the respective time periods. BSC Modification P305 may have contributed to these market behavioural changes in the last few years.
- 7.2 NIV chasing could be a trading strategy for some market participants, enabling them to be paid more or pay less than they would have otherwise paid or been paid if they traded their position over the counter ahead of real time.
- 7.3 The percentage of Imbalance Volumes for parties as a whole in the direction opposite NIV has increased from 33% in 2014 to 42% in June 2019. Non-Physical Traders and Interconnector users demonstrate an increasing trend in their Imbalance Volumes in opposite direction to NIV from 30% to 46% for 2014 to 2019 (up to June 2019).
- 7.4 Structural changes in the market arrangements or fundamentals have the potential to influence the behavioural trends of market participants and their trading strategies respectively. This could subsequently influence market imbalance. Market participants may have adjusted their trading strategies ('NIV Chasing') in response to market structural changes in recent years to gain competitive advantage or minimise any impact on their optimal market position.
- 7.5 The correlation between market imbalance and imbalance for all parties is a negative correlation as expected. The strength of the correlation decreased slightly after significant changes were introduced in the market pricing arrangements.
- 7.6 The investigation evidence points to a strong negative correlation between imbalance of all Parties and the NIV (-0.9965); with indications of a negligible change in the correlational relationships (-0.9859 & -0.9852) even after the significant changes in the market arrangements driven by BSC Modification P305.
- 7.7 The correlation between market imbalance and the imbalance for Non-Physical Traders (NPT) / Interconnectors (IC) users is a weaker negative correlation, with the strength of the correlation becoming much weaker after the periods of significant changes in the market pricing arrangements. This reflects trends in the volume of actions by NPT/IC that are in opposite direction of NIV. This observed trend exhibits signs of potential 'NIV chasing'.
- 7.8 On 18 September 2018, the correlation between market imbalance and Parties' imbalance shows a strong negative correlation, indicating most parties took actions in the direction in favour of market imbalance. However the case of Non-Physical Traders (NPT) / Interconnectors(IC) users was slightly different, and in line with their observed behaviour of taking actions against the direction of the market imbalance, with a correlation of -0.6510. Though the trend in correlation for NPT/IC does exhibit signs of 'NIV chasing', it may be inconclusive to state categorically that the incidence of negative System Price when market was short on 18 September 2018 was driven by 'NIV chasing'.
- 7.9 Further analysis carried out on some of the NPT/IC Parties as test cases demonstrates that overall, a significant proportion of their volumes traded are in the opposite direction to NIV; with a corresponding correlation coefficient that is either a weaker negative indication or even a positive correlation. The evidence of a positive correlation provides a wide-ranging evidence that some level of 'NIV chasing' is potentially being carried out in the GB Electricity Wholesale market.

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