

Historical Analysis of Dispatch Frequency

Additional Analysis following May 16, 2012 DTWG Meeting

SE-91 Renewable Integration



- At the March 23, 2012 Dispatch Technical Working Group (DTWG) meeting, IESO committed to address stakeholder concerns regarding dispatch frequency upon becoming dispatchable.
- Analysis was performed and the results were presented to DTWG members at the May 16, 2012. The presentation of these results can be found at the following link:
[http://www.ieso.ca/imoweb/pubs/consult/se91/se91-DTWG-20120516-Variable Generation Dispatch Study.pdf](http://www.ieso.ca/imoweb/pubs/consult/se91/se91-DTWG-20120516-Variable%20Generation%20Dispatch%20Study.pdf)

- The data presented at the May 16, 2012 DTWG simulated results for the time period of July 1, 2011 to December 31, 2011.
- DTWG members requested this same analysis be performed for all of 2011 instead of from July to December.
- Additional analysis was performed to co-relate the above results with the effects of the unconstrained 5-minute price
- Analysis was also performed to compare the 1- hour and 3-hour pre-dispatch results with simulated real-time shadow prices.

This year-long study had the same assumptions as the previous study:

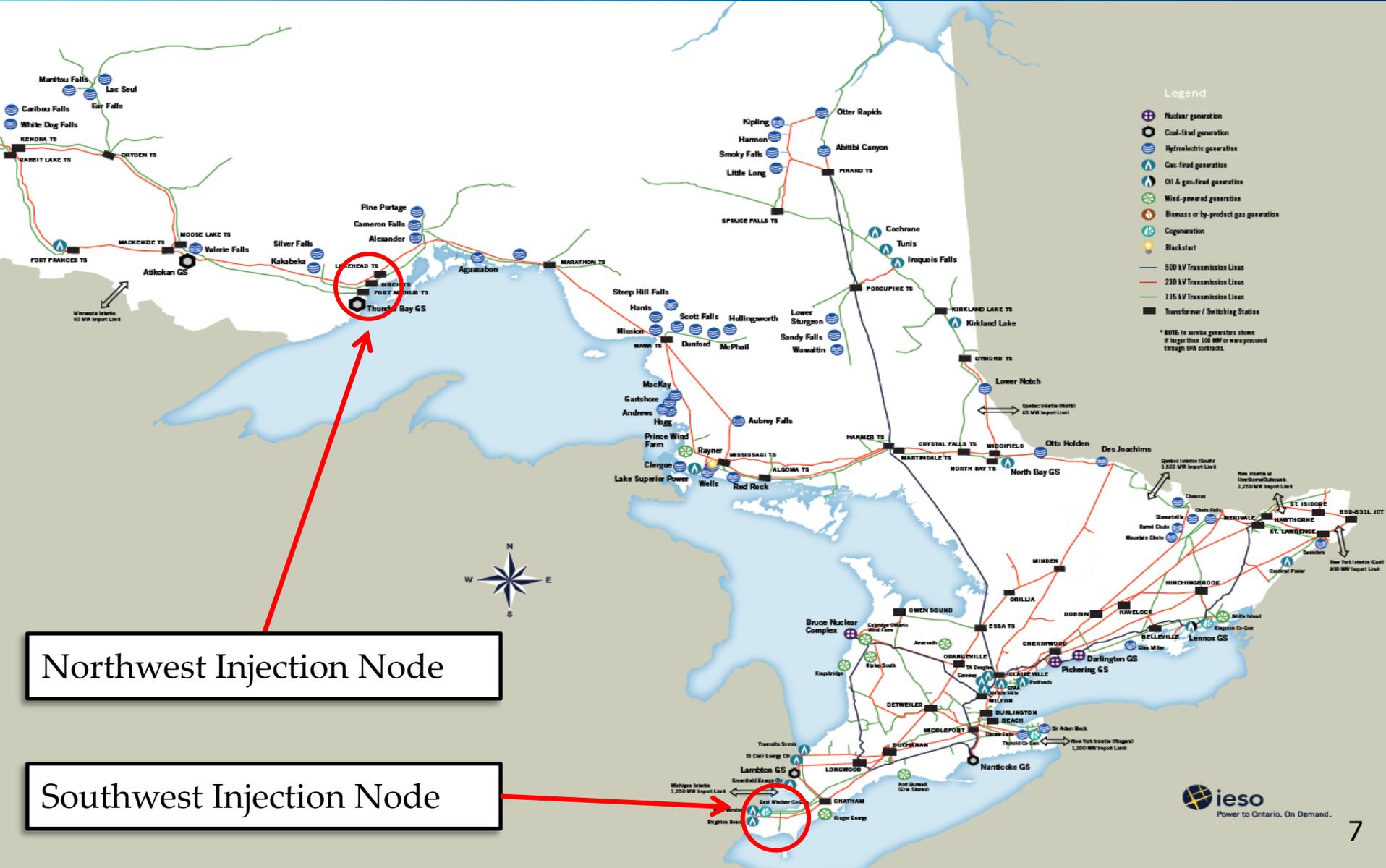
- The results of the study are only an approximation and do not take into account the reason for the simulated dispatch.
- Future dispatch results will differ materially from the historical results.
- The analysis performed did not calculate the magnitude (MW amount) of dispatches that would have been issued in each instance.

- The historical results do not represent the effects of the normal resource dispatch filtering process that takes place prior to dispatches being published.
- The filter threshold is any change from the previous dispatch instruction that is the lesser of 2% of the unit capability or 10 MW.

- In order to illustrate the effect of dispatch on geographic location, two injection nodes were chosen.
- Representative reference nodes were chosen to reflect nodal prices in northwestern Ontario as well as southwestern Ontario.

Note: The IESO market models hundreds of injections and withdrawal nodes. Data was analyzed using only two nodes for illustrative purposes. This analysis does not represent the effects of price on any other geographical or electrical location.

Study Injection Nodes (cont'd)



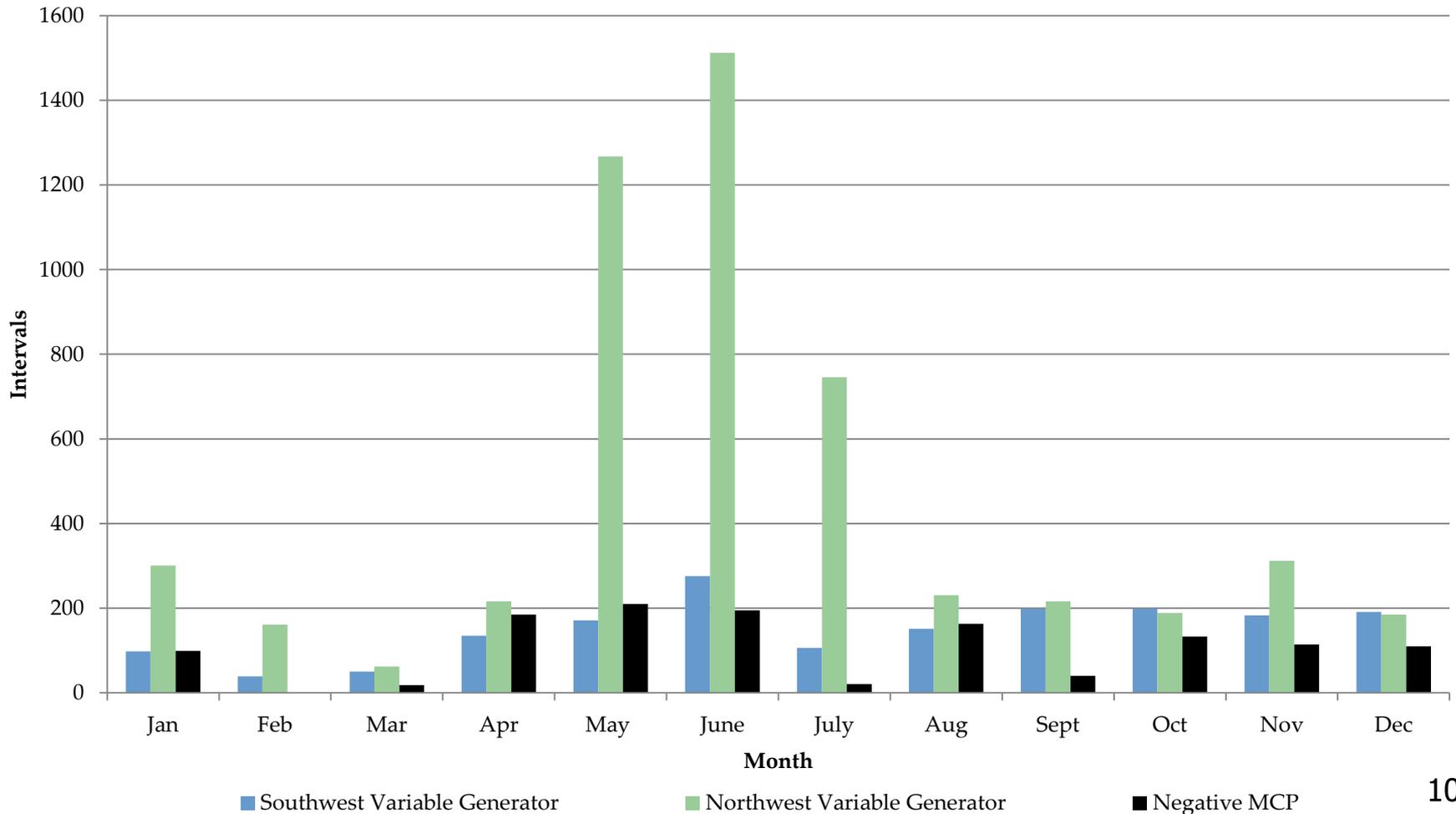
- The nodal prices for each interval were compared to a simulated variable generator offer price of -\$1.00 at the respective nodal bus.
- For the purpose of the simulation, if the historical price at the node was below the -\$1.00 offer price, the generator at this nodal point would have received a mandatory dispatch to reduce.
- For comparison, the 5-minute unconstrained price (MCP) was also studied. The number of intervals where MCP was negative was plotted on the same graph.

Factors that can influence nodal prices include:

- Primary demand;
- Amount of existing and new generation in the area;
- Interchange transactions;
- Security constraints;
- Economic constraints; and/or
- Line losses.

Note: The sensitivity of these factors on the study was not determined. The effect of these factors in the future is unknown, therefore, these results should not be viewed as a forecast.

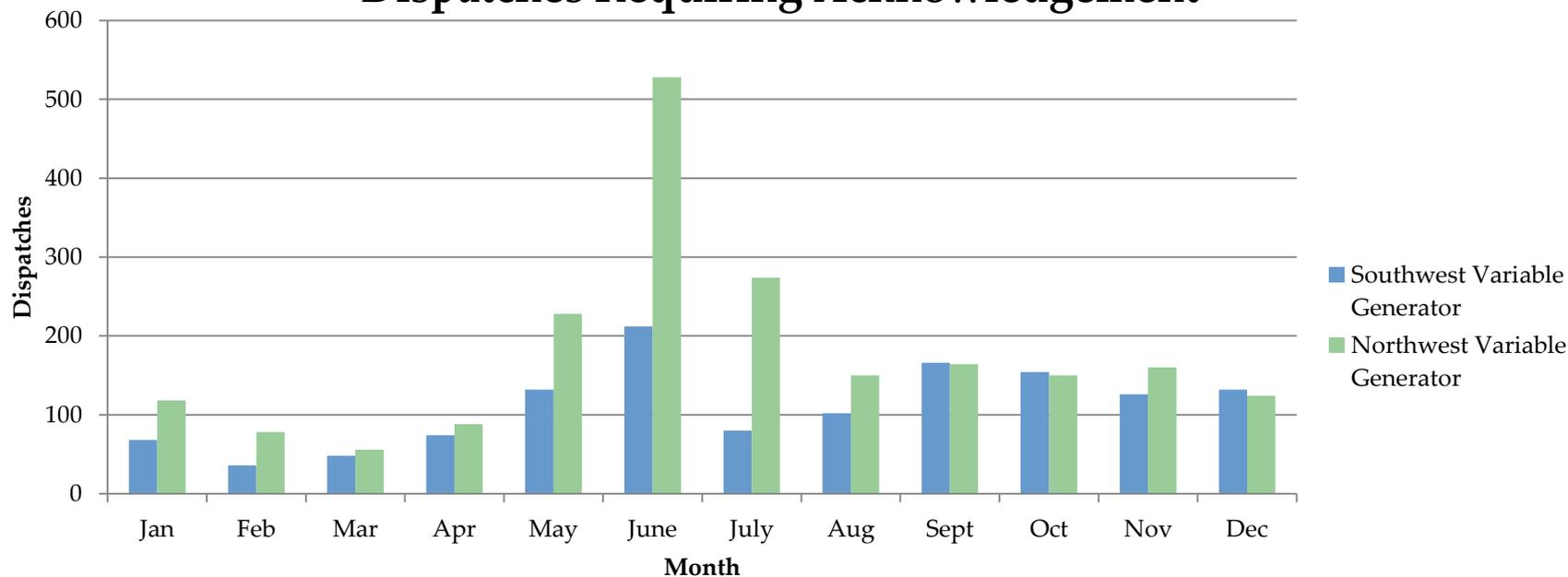
2011 Monthly Total Number of Dispatches And Times MCP was Negative



- 105,080 five-minute intervals during the study period of January 1, 2011 to December 31, 2011.
- A generator at the northwest injection node would have received a dispatch for 5.1% of the total intervals (5,398 intervals).
- A generator connected at the southwest injection node would have received a dispatch for 1.7% of the total intervals (1,798 intervals).

- The longest mandatory dispatch occurred May 2011 in the northwest with 210 consecutive mandatory dispatches.
- The highest number of mandatory dispatches occurred at the northwest node in the months of May to July.
- This peak coincides with the frequency of thunderstorms in the region when the operating security limits become more restrictive
- High Risk limits were observed in the northwest 33 times in the month of May compared to 2 times in March.

Dispatches Requiring Acknowledgement



- This graph represents the transitions of dispatch obligation, i.e., No dispatch-Mandatory and Mandatory-Release.
- Each transition would have required VG operator acknowledgement to accept or reject the dispatch instruction.

DTWG members requested additional analysis be performed to compare the pre-dispatch schedule with real-time shadow prices.

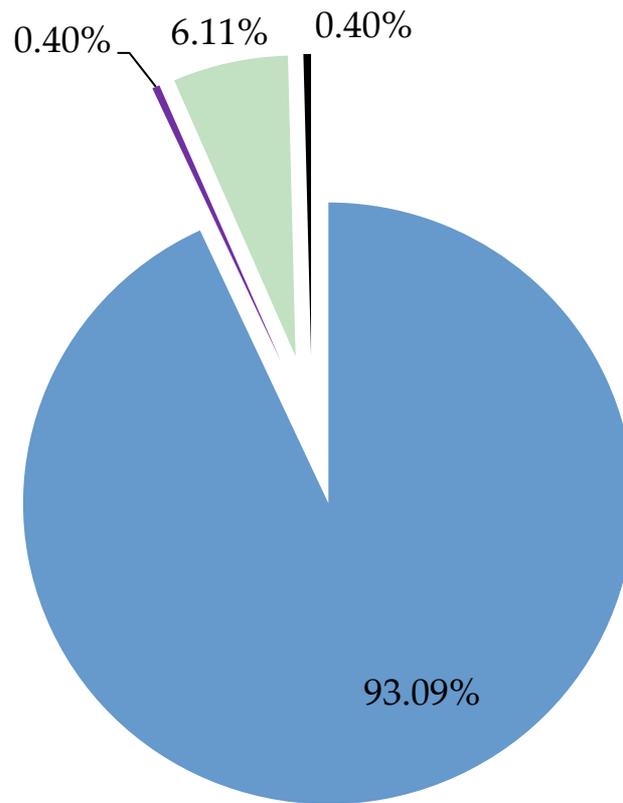
The same raw data as the previous study was used for the number of simulated dispatches.

The hourly pre-dispatch nodal prices for these same nodes was then compiled and compared with the hours where a simulated mandatory dispatch occurred in real-time.

- This analysis was performed for both the T-1 pre-dispatch (one hour prior to the dispatch hour) and the T-3 pre-dispatch run (3 hours prior to the dispatch hour).
- There was no material difference (less than 1%) between the T-1 and T-3 results and as such, only the T-1 conclusions are presented

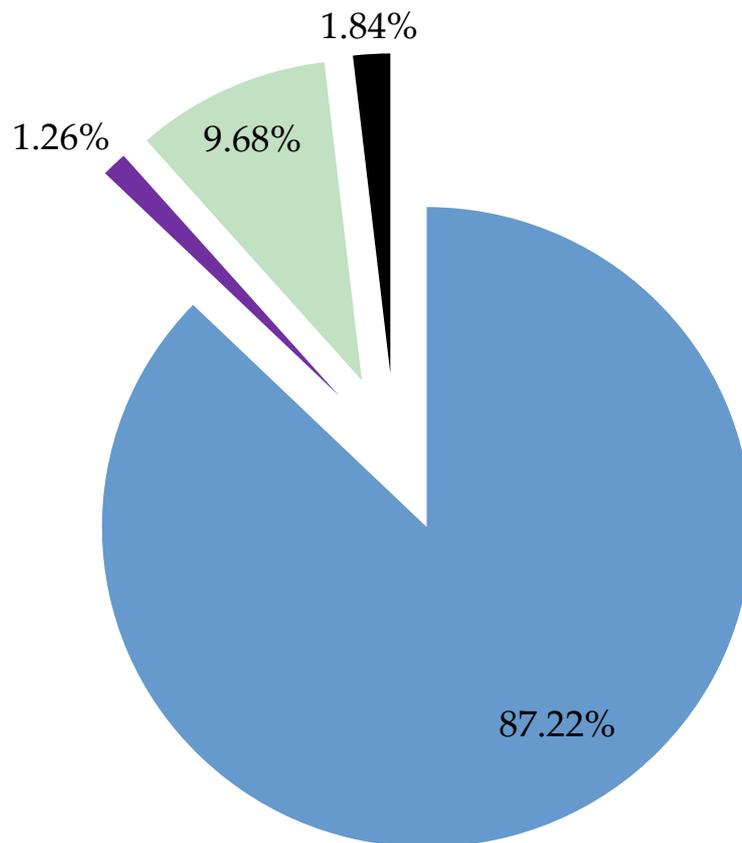
Southwest Hour Ahead PreDispatch Shadow Prices

- Not Dispatched & Not Forecast
- Not Dispatched & Forecast
- Dispatched & Not Forecast
- Dispatched & Forecast



Northwest Hour Ahead Predispatch Shadow Prices

- Not Dispatched & Not Forecast
- Not Dispatched & Forecast
- Dispatched & Not Forecast
- Dispatched & Forecast



- The preceding slides illustrate the ability of pre-dispatch results to predict real-time outcomes at the reference nodes.
- Pre-dispatch accurately forecasts the majority of the time when no economic or security constraints would result in a mandatory dispatch.

- Study results show that in northwestern Ontario 5.1% of the total dispatches would have been mandatory and 1.7% in southwestern Ontario.
- Study results do not differentiate between security, economic, or locational constraints.
- This is not a forward looking analysis, it is a historical study of 2 injection nodes in Ontario.
- There are times when Predispatch results do not reflect what occurs in real-time.
- This highlights the importance of an operator available to respond to dispatches that were not evident in the pre-dispatch timeframe.