Changes in Load influencing System Frequency

Wholesale Market Working Group

Market Analysis & Validation

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Background

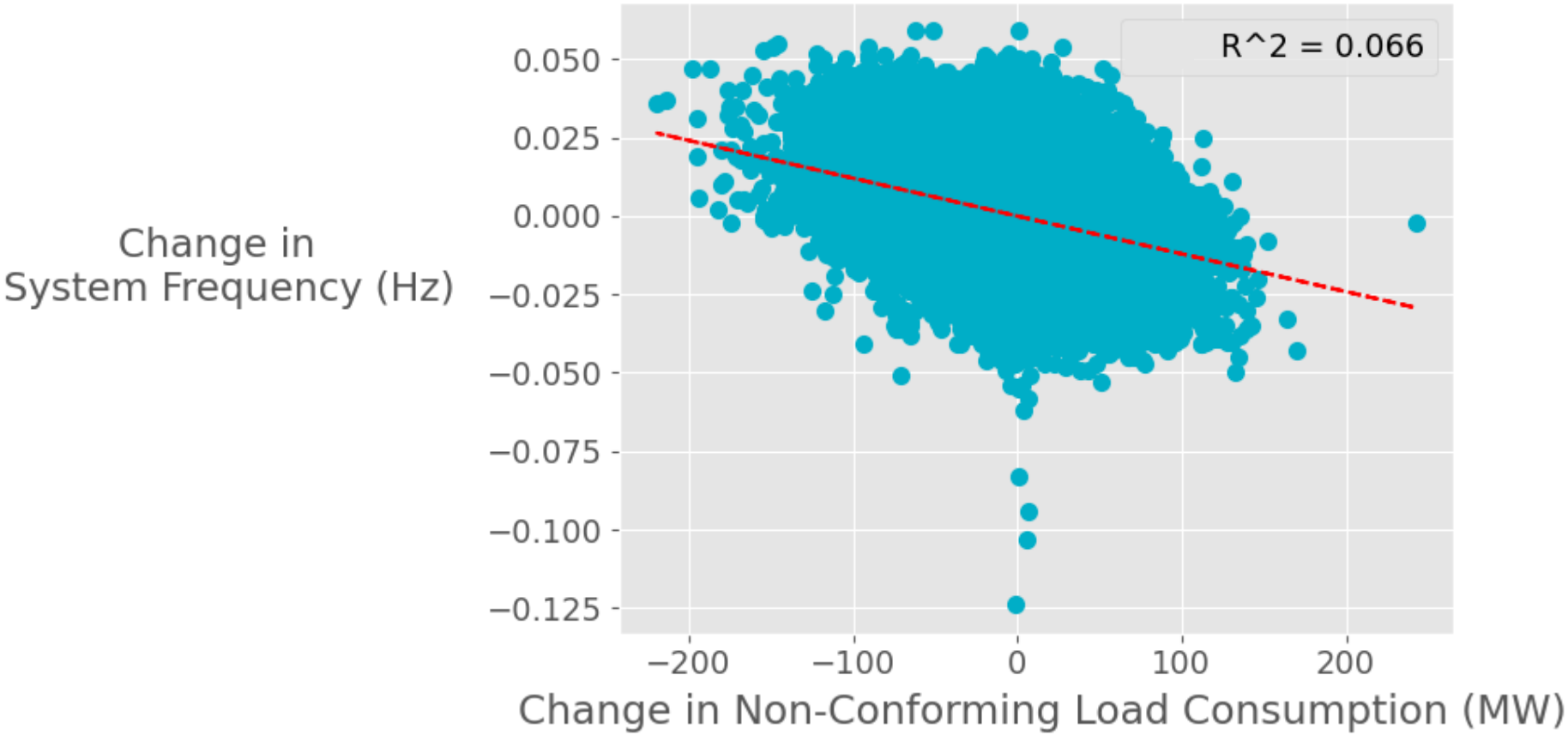
- Large flexible loads, such as crypto miners, are moving to the ERCOT system which increases the amount of fast ramping load resources.
- Questions about large flexible load's impact on frequency were raised in previous stakeholder discussions.

- Notes on Frequency: Sudden changes in load can change System Frequency.
  - A System Frequency of 60 Hz should be maintained.
  - Sudden drops in consumption can cause increases in frequency and vice-versa.
  - ERCOT may declare an Emergency Energy Alert (EEA) when frequency remains below 59.91 Hz for 15 consecutive minutes.
  - ERCOT shall declare an EEA when frequency falls below 59.5 Hz for any duration.

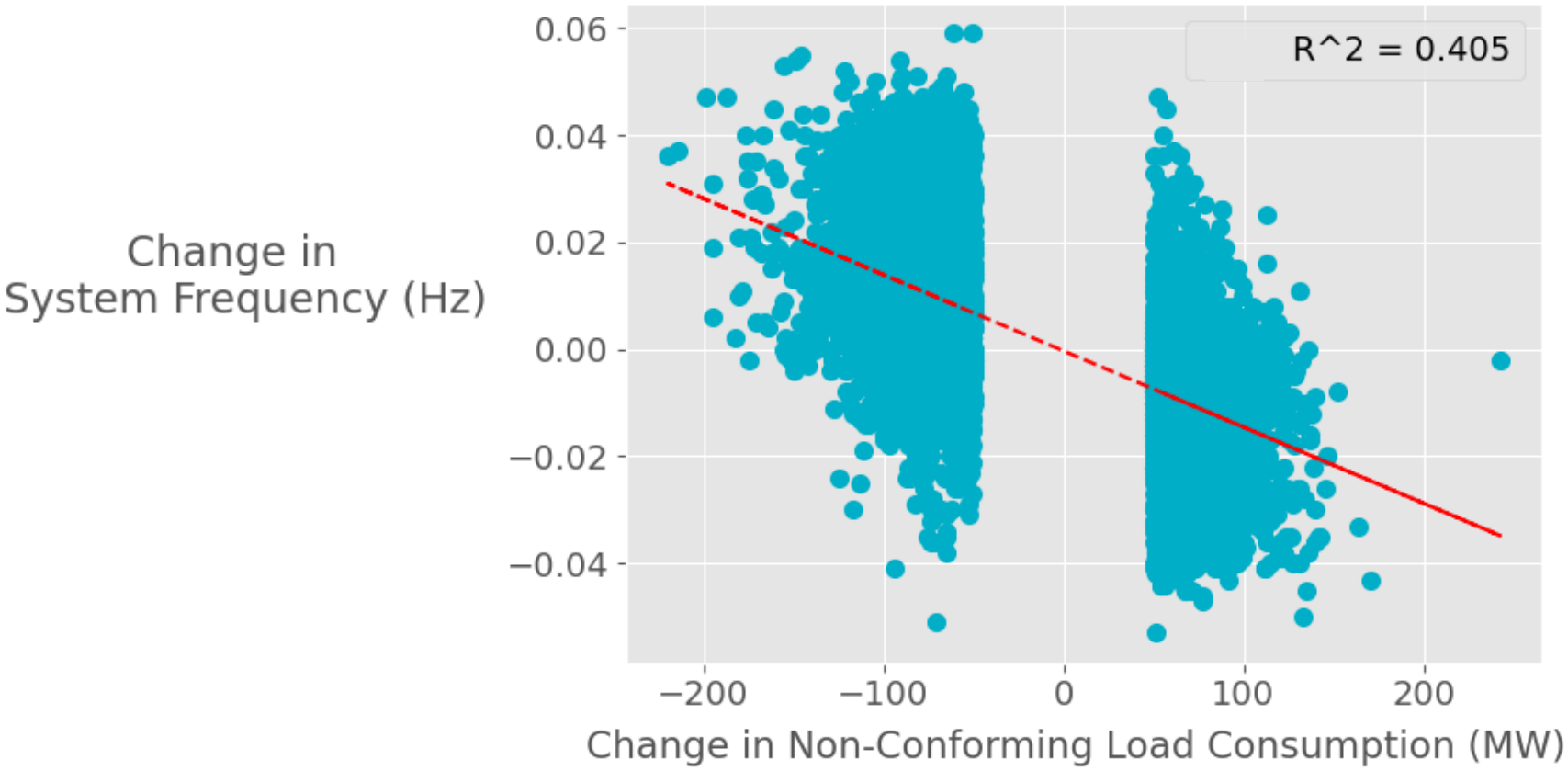
Study Methodology

- We are interested in the current and future impacts of Load Resources on System Frequency.
- There is little historical flexible load data, so aggregate Non-Conforming Loads are used as a stand-in. We expect all changes in load, regardless of load type, to have the same effect on frequency. However, there is a difference in how different types of load are able to respond.
- We compared Non-Conforming Load Consumption and System Frequency for each 4 second interval in October 2021.
- A month with low Total System Load was chosen to make any changes more noticeable.

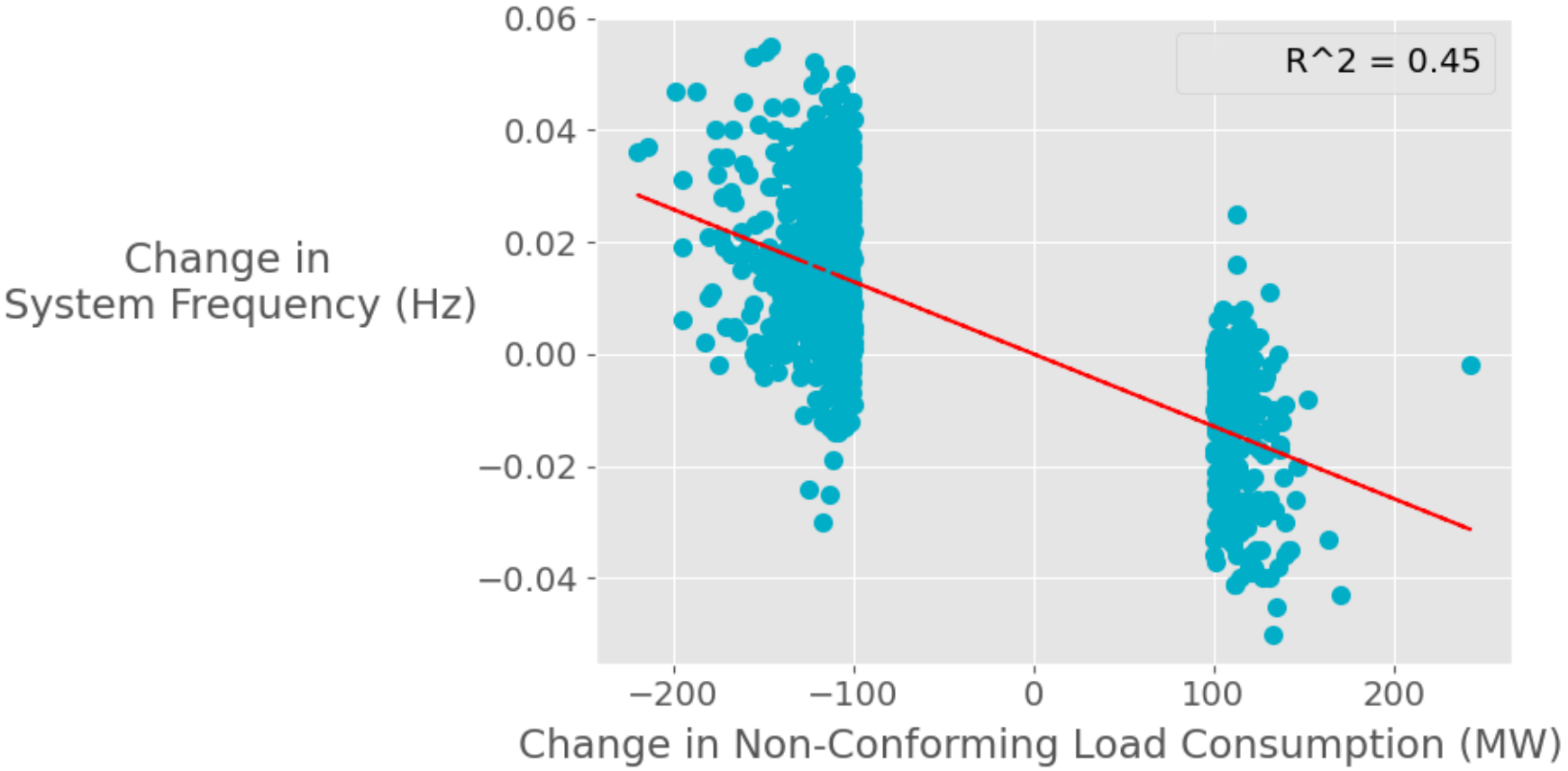
We see the expected trend between consumption and frequency. However, the correlation is weak.



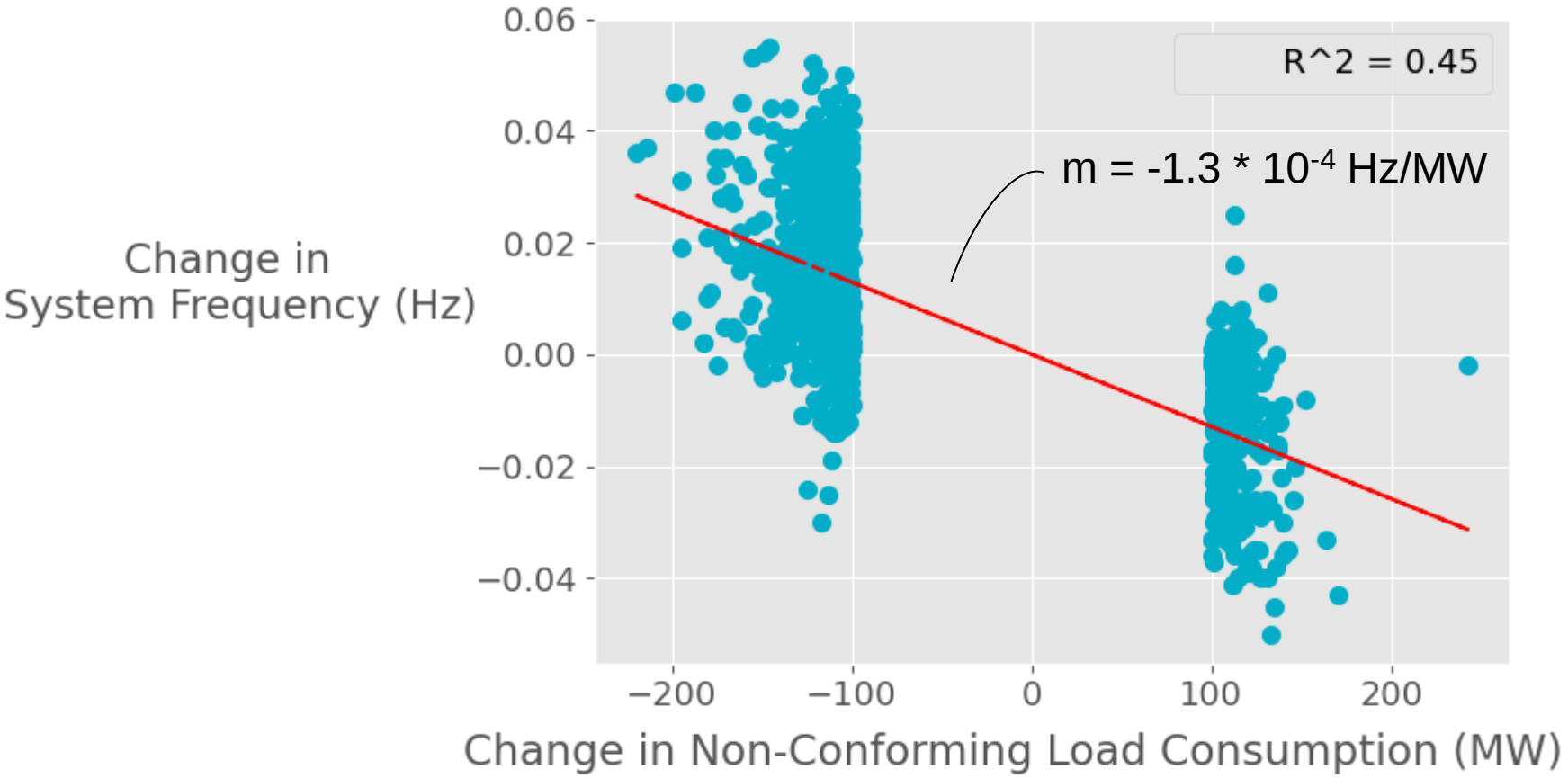
The correlation becomes much stronger if we only look at consumption changes over 50 MW.



And stronger still if we only look above 100 MW.



The trend line gives an idea of how dramatically changes in load change frequency. A 100 MW increase in load would have amounted to an average decrease in frequency of .013 Hz.



Summary

- Though there are many factors that influence frequency, we observed a robust correlation between changes in Non-Conforming Load consumption and changes in frequency.
- There is no reason to believe changes in large flexible load behave differently than changes in Non-Conforming Load consumption. This is especially true for loads that are not CLRs.
- Large flexible loads have not driven large changes to frequency. This could change.