



Utility Scale Storage Performance and Opportunities in the FCAS Regulation Market

Never Stand Still

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National Electricity Market (NEM) Context

Out with the old:

- Centralised
- Synchronous

In with the new:

- Variable
- Nonsynchronous
- Renewable

What is FCAS?

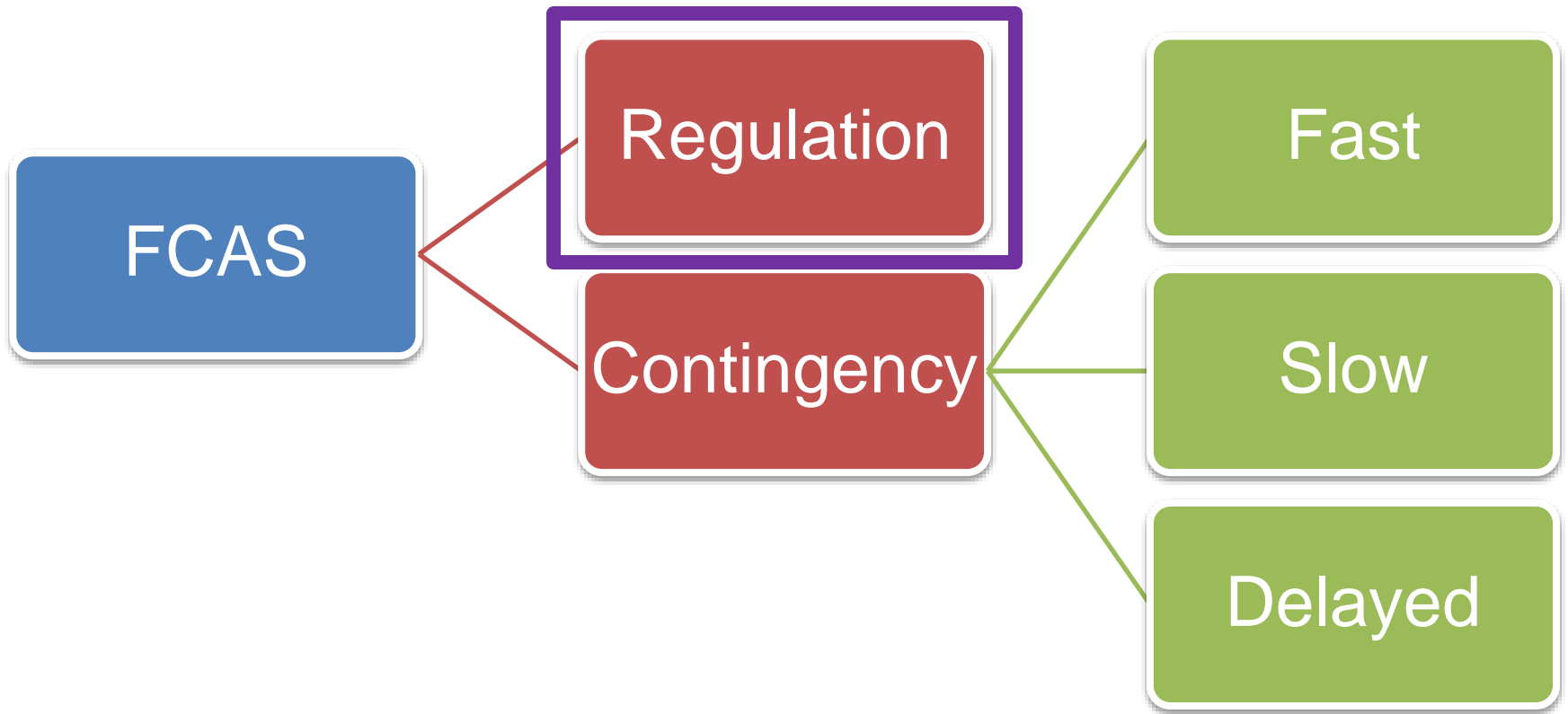
Frequency Control Ancillary Services

49.85Hz

NORMAL OPERATING BAND

50.15Hz

What is FCAS?



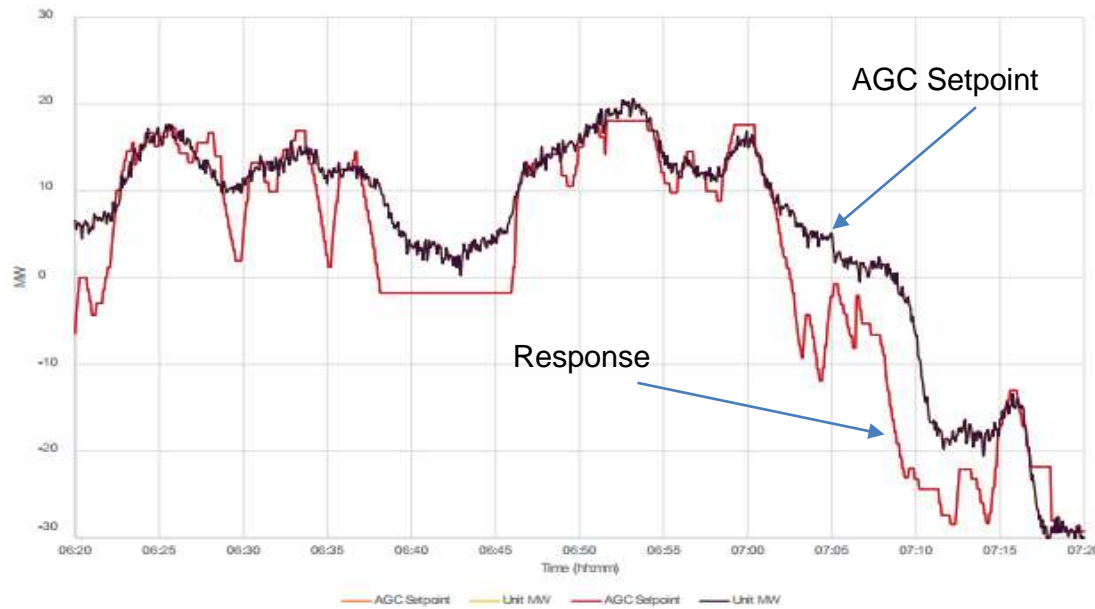
Hornsedale Power Reserve (HPR)

- South Australia
- One of the first nonsynchronous generator to provide FCAS Regulation services
- 30MW of its capacity in FCAS Regulation services



Large Conventional Steam Turbine

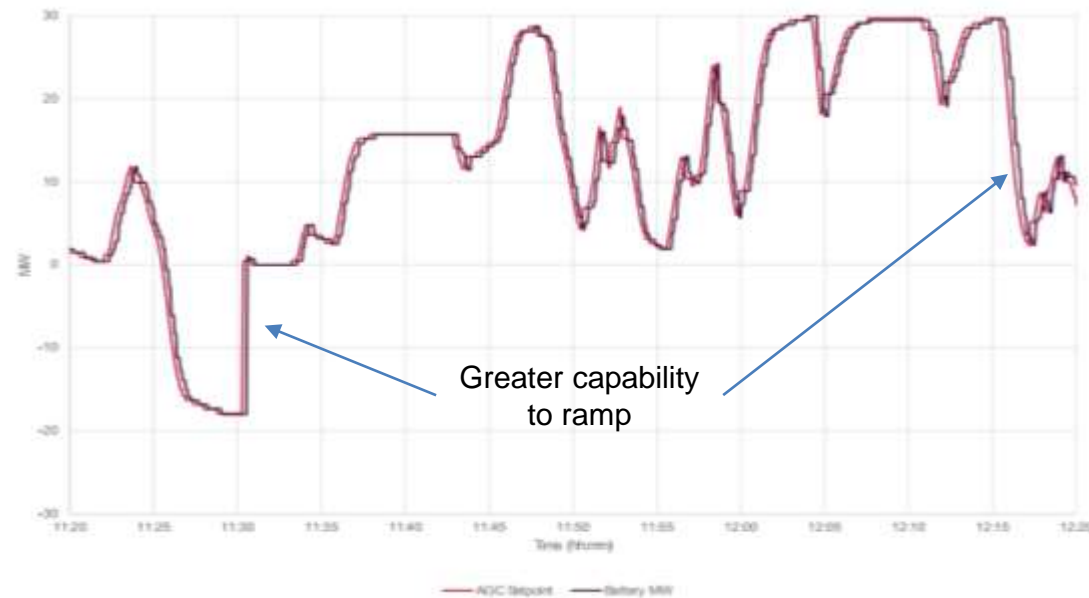
ISSUE
Both generators
paid the same!



Hornsedale Power Reserve

High Quality FCAS Regulation Services:

1. **Speed** of response
2. **Accuracy** of response

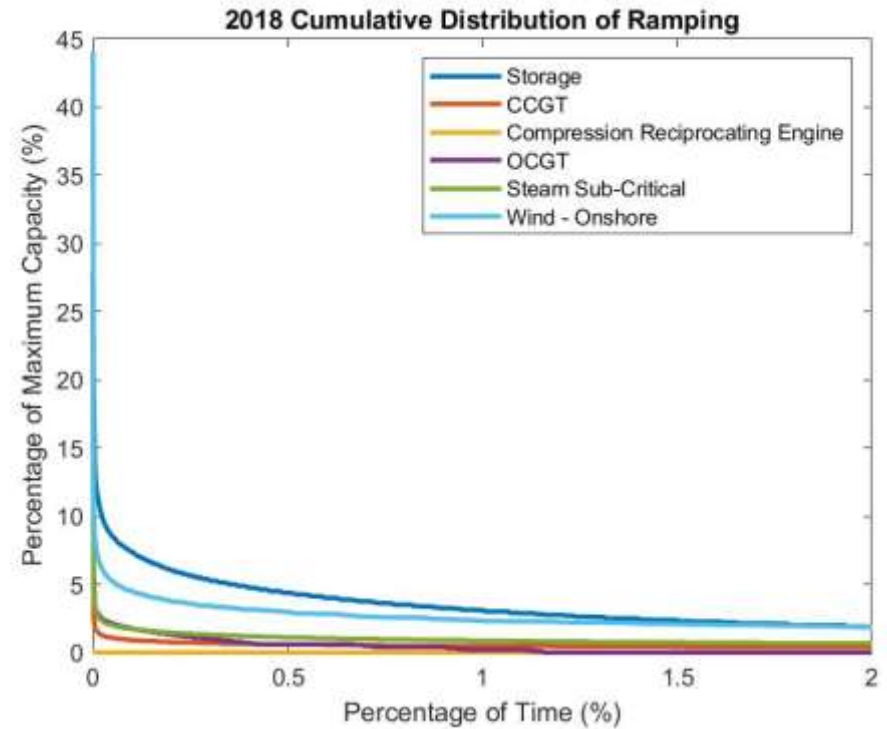
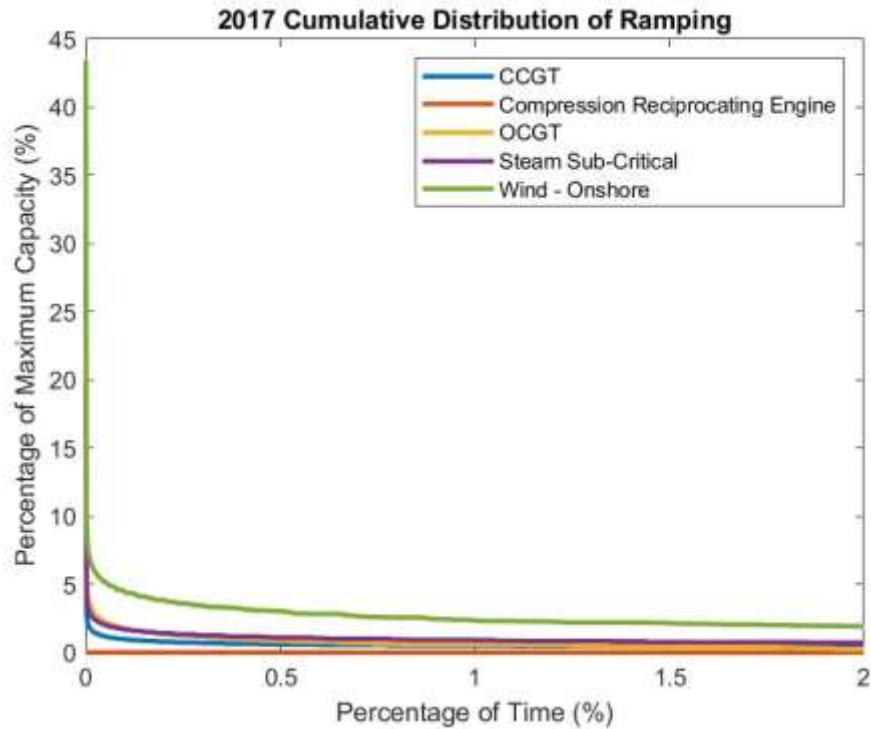


Research Areas

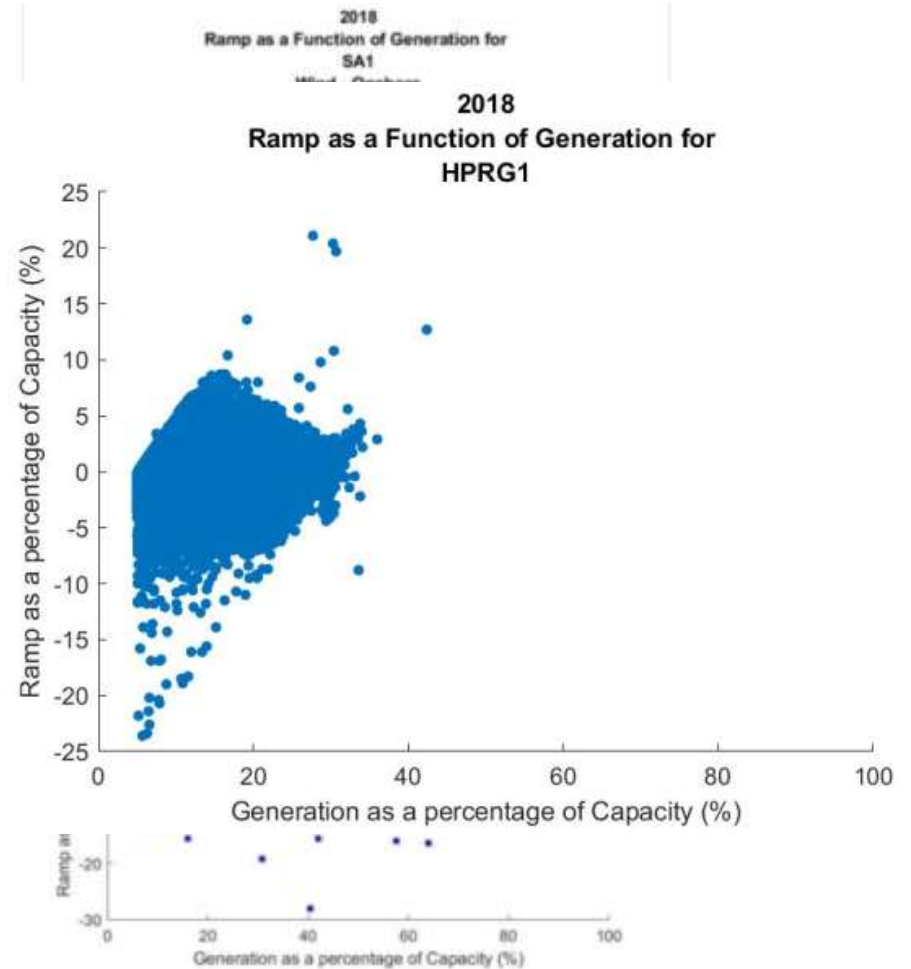
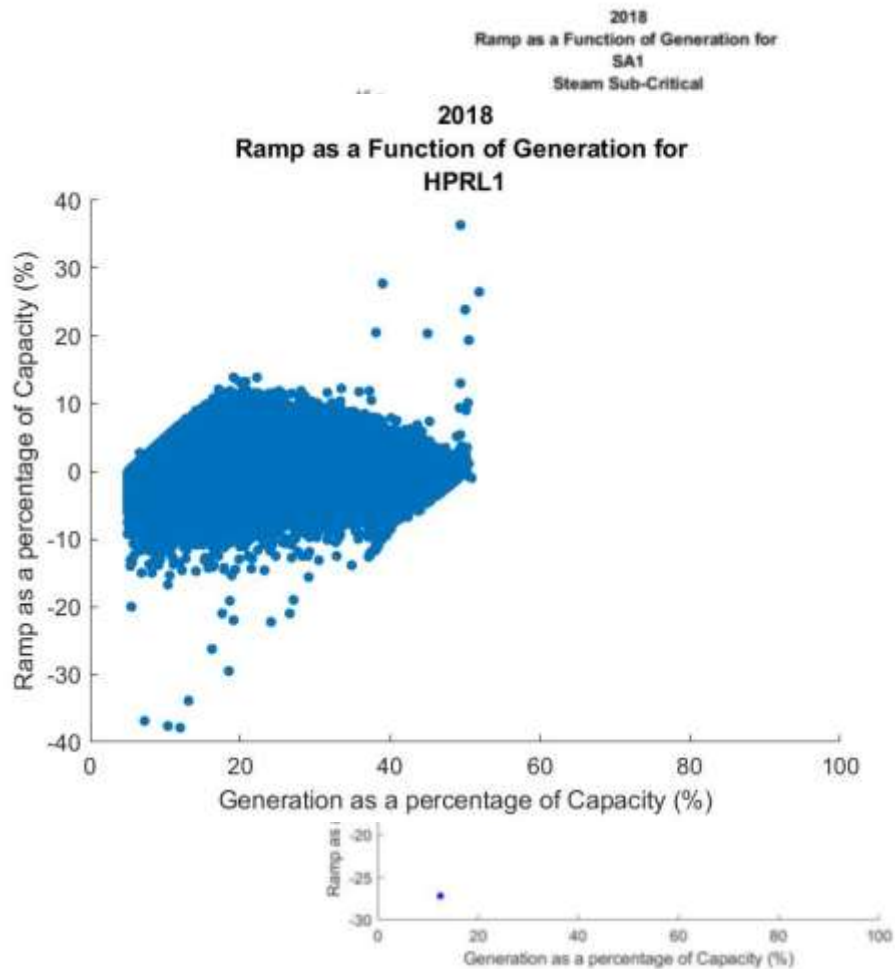
1. Generator Ramping Capabilities

2. Impact of HPR on FCAS Regulation

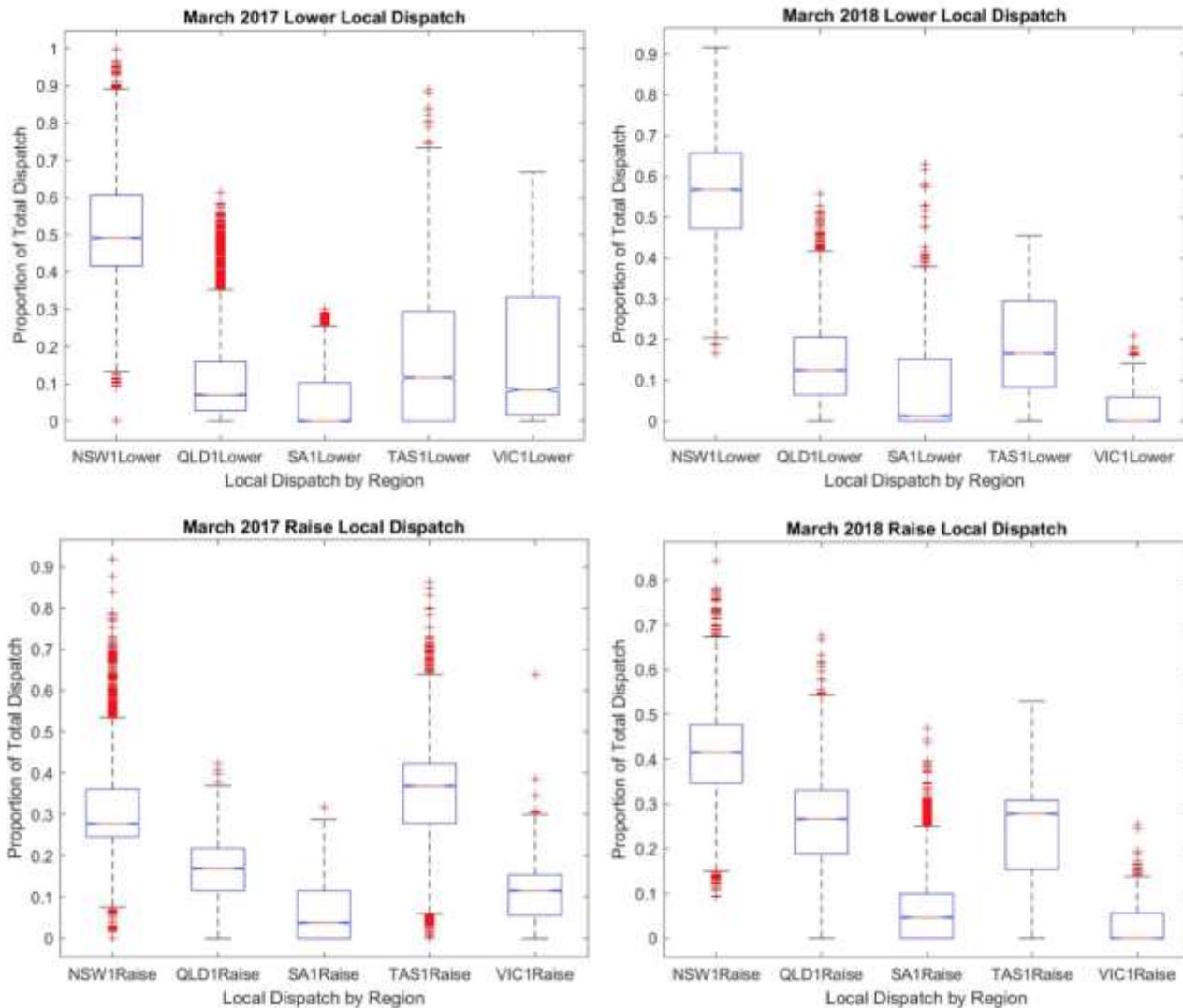
Generator Ramping Capabilities



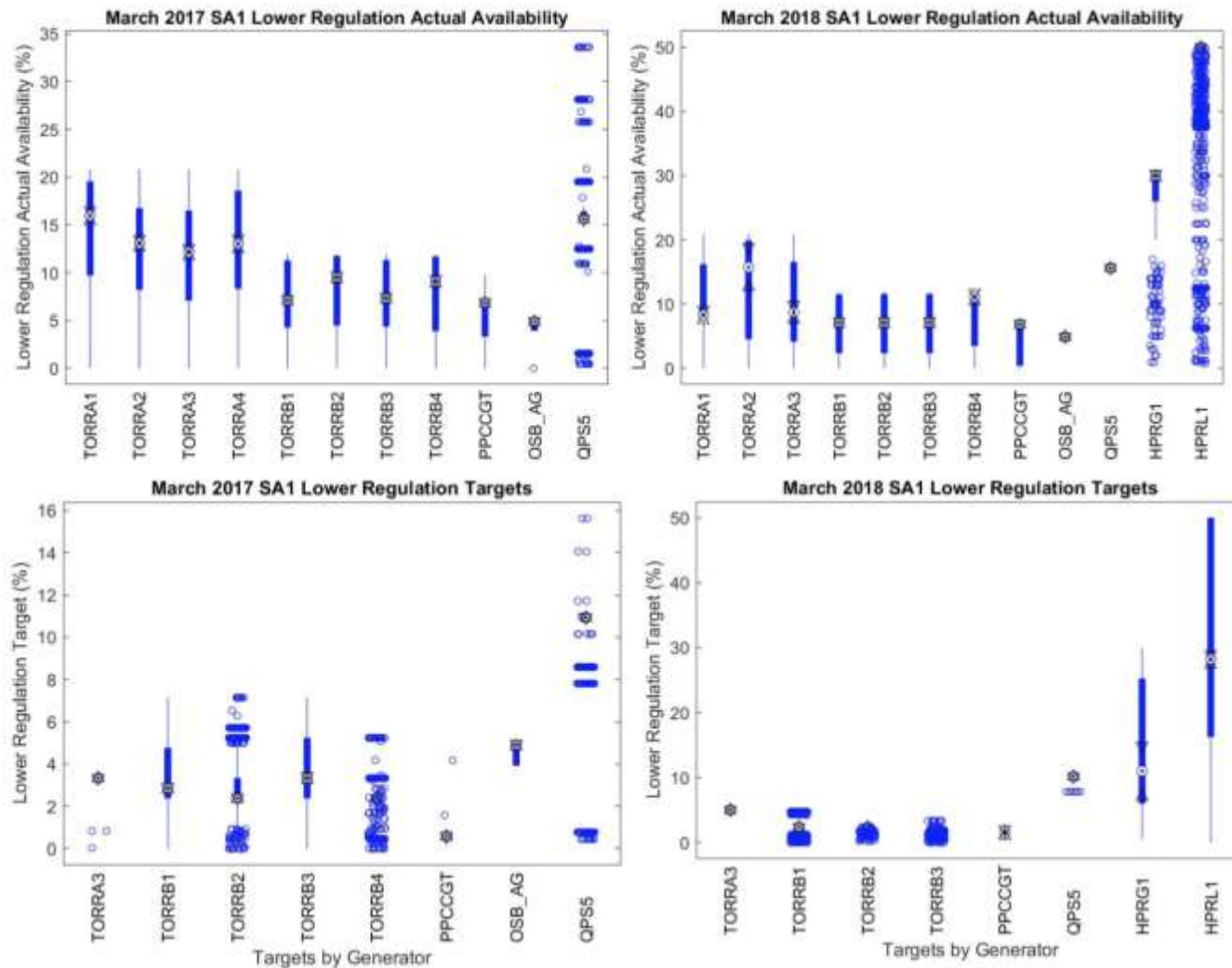
SA Generators' Ramping Capabilities



Impact of HPR on Regional FCAS Regulation



Impact on Generator Availability & Targets



How can we improve the FCAS Regulation Market?

- PJM Interconnection Market in the US
- Two different AGC signals:
 - **RegA:** Traditional generators
 - **RegD:** Dynamic generators
- Performance metrics
 - Performance Score
 - Benefits Factor (only RegD)



Conclusions and Future Work

Storage key
FCAS Regulation
source

Increase in SA
FCAS Regulation

Difficult to assess
impact of HPR on
other generators

Performance
metrics incentivise
high quality FCAS
Regulation

Storage in FCAS
Contingency and
FFR??

Thank you... and any Questions?