MISO Real Time Dynamic Security Assessment

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Summary

Purpose

- Introduce leading efforts on online stability assessment

- Illustrate MISO's use of these tools to maximize reliability and efficiency of markets.

Key Takeaways

- Real time dynamic stability limit calculations on stability limited interfaces.

- Enhanced reliability and efficient operations on stability limited interfaces.

MISO's industry-leading efforts in online stability assessment

- MISO is one of the first Reliability Coordinators (RC) in the US to implement such a sophisticated online transient and voltage stability assessment tool.
  - Stability assessment involves complex generation/transmission modeling and numerical integration techniques.

- Online capability is especially useful as NERC and the industry is working to clarify stability-related IROLs and corresponding operating obligations.

- Majority of ISO's in the US and world are currently working on implementing these tools into their operations.

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MISO Dynamic Stability Interface Limit Calculation (DSA Tool)

- MISO System Operations implemented calculation of real time dynamic stability limits on interfaces using online TSAT/VSAT tools in may 2012.

- MISO System Operations is currently running both Voltage Stability and Transient Stability studies for multiple stability limited interfaces and calculate limits on the interfaces.

  - Limits feed into MISO real time markets.

- By taking advantage of the capabilities of the real-time stability limit calculation tool we reliably maximize system use.

  - Online Voltage Stability runs every ~6 minutes and Transient Stability runs every ~15 minutes.

# MISO Dynamic Stability Interface Limit Calculation (DSA Tool)

- Analysis is performed for real-time system conditions captured by SCADA and solved by state estimator.

  - MISO TO's/TOP's transient stability criteria are implemented.
  - MISO TO's/TOP's critical contingencies are applied.
  - Transfers for interface limits are analyzed.

- The tool monitors voltage and dynamic stability in real time and determines safe operating limits in the operating horizon.

Benefits of Online DSA

- Reduction in real time market binding with higher transmission interface limits since we started using the limits from online TSAT/VSAT instead of operating guide limits.

- Below table illustrates the reduction in real time binding

Year	Interface limit calculated	# Real-time Binding Hours	Total real-time congestion costs (Million $)
2014	Offline	502	31
2015	Online	7	0.7
2016	Online	3	0.1

Real Time Limits on a Stability Interface

Online DSA Limits
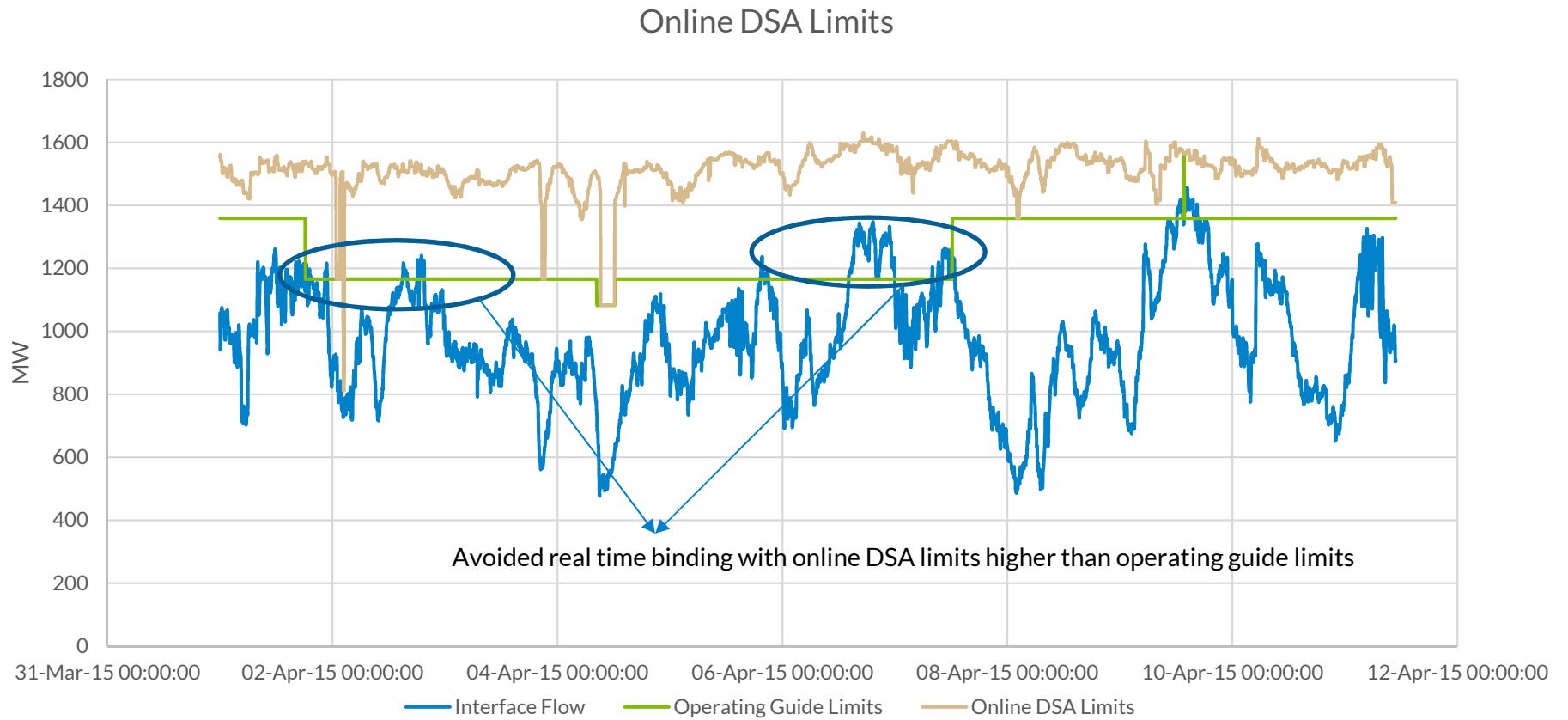
Benefits of Online DSA

- Higher amount of wind generation that can reliably flow on the AC System when it is not flowing on the HVDC system.

- Avoidance of arming generation tripping protection schemes for various system conditions.

- Unnecessary tripping of generators, when reliability is not a risk, enhances the use of the transmission system.

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Benefits of Online DSA

- Real time Stability limits are also being calculated for multiple generators that encounter local stability limits.

- More real time wind added into the system than the old studies had studied, which the online stability tools accounts for in the studies.

- Limits are calculated for all kinds of system conditions rather than one peak condition operating guide limits are calculated.

MISO Online DSA – Pre DSA

- Before the use of online DSA we had Operating Guides developed to monitor and manage stability constraints.

- Limits are calculated from offline planning studies (Voltage Stability and Transient Stability) for various prior outage conditions and are adhered to in real time markets.

MISO Online DSA – Pre DSA

- These prior outage off-line studies generally considers most limiting scenario (summer off-peak, high simultaneous transfer) in the calculation of the limits on the interfaces.

- One set of limits for the duration of an outage can unnecessarily constrain the system capability.

- Multiple forced outages require a manual restudy of limits, a time consuming task in System Operations.

MISO Online DSA – Pre DSA

- With the availability of online DSA, actual limits are being determined in near real time using the current conditions, enhancing system security.

- By taking advantage of the capabilities of the real-time stability limit calculation tool we can reliably maximize system use.

Questions?

Contacts / Follow-Up

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