



NASPI SAR PROPOSAL
FOR REAL-TIME STABILITY MONITORING
FALL 2024

Outline

- PURPOSE
- RTA
- FAC-011-4
- IRO-002-7 WECC Variance
- SAR PROPOSAL
- NEXT STEPS
- Q & A

Purpose

- To propose the creation of a NASPI task force or subgroup that investigates the development of a [NERC Standard Authorization Request \(SAR\)](#) to accomplish the following:
 - Update required standards for RC's and TOPs to perform the following:
 - Monitor for undamped oscillations and source location,
 - Monitor for the formation of islands,
 - Monitor and detect angular separation,
 - Develop an operating plan that outlines actions to be taken when these instability situations occur, including:
 - Monitoring, Communication, Mitigation plans
 - Updates the RTA definition to recognize the requirements for monitoring stability in the real-time assessment timeframe

Purpose

- Why bring this task to NASPI?
 - Experience in developing standards and working within the standards community
 - Expertise in:
 - WAMS/PMU technology
 - Stability monitoring
 - Situational Awareness
 - Planning and Operations
 - Access to contacts at various organizations for assistance
 - NERC, DOE, NATF, etc.

Purpose

- The next major blackout may be the result of instability as we are not required:
 - to have an operating plan
 - to monitor in real-time
 - to communicate to each other during these situations
- Main Drivers:
 - Complexity in the power system resulting from:
 - DERs
 - Retired system inertia
 - Increased penetration of IBRs (battery, wind, solar, etc.)
 - Grid forming devices
 - Reduced frequency response
 - Lack of enforceable real-time stability monitoring in NERC standards

RTA

Let's step back almost 10 years ago ...

Real-time Assessment (RTA):

- The main driver for this requirement originated from the blackouts on August 14th, 2003, and the September 8th, 2011.
- Recommendations from both final reports on these blackouts were to ensure adequate real-time situational awareness regarding real-time and expected conditions on the power system, including SOL/IROL exceedances for System Operators to maintain reliability, interconnection, and to prevent cascading.

RTA

- Around 2016, the following NERC standard requirement was created in support of the RTA:
 - IRO-008 R4 & TOP-001 R13, which states that each RC/Transmission Operator shall ensure that a Realtime Assessment (RTA) is performed at least once every 30 minutes.
- Where NERC defines an RTA as:
 - An evaluation of system conditions using real-time data to assess existing (pre-Contingency) and potential (post-Contingency) operating conditions. The assessment shall reflect applicable inputs including, but not limited to: load, generation output levels, known protection system and Special Protection System status or degradation, transmission outages, generator outages, interchange, facility ratings, and identified phase angle and equipment limitations.

RTA

- RTA implementation was described in a definition and not the standard. NERC can change the required work to be performed by changing the definition alone (similar to other NERC decoupled standards / definitions).
- Industry realized that the wording used within the RTA definition was vague and left open for interpretation.
- To that end, in 2017 the NERC Operating Committee drafted a “Compliance Implementation Guidance for Real-time Assessment” document to provide examples and approaches to perform the RTA and maintaining compliance.

RTA

Pre-Contingent – real-time

- SCADA
- State Estimator

Post-Contingent – lookahead, model based

- RTCA
- Voltage Security Assessment
- Transient Security Assessment
- Cascade Analysis
- Etc.

NOTE: This is not an exhaustive list. Many companies leverage other in-house applications and other advanced power system applications.

FAC-011-4

- Significant changes to FAC-011 pertaining to monitoring of pre and post contingent system voltages and stability.
- R4.1 Specify stability performance criteria, including any margins applied. The criteria shall, at a minimum, include the following: **steady-state voltage stability; transient voltage response; angular stability; and System damping.**
- Monitor in RTA for 6.1.4. Instability, Cascading or uncontrolled separation that adversely impact the reliability of the Bulk Electric System does not occur.
- NOTE: SDT added confusion with the following footnote:
 - “Stability evaluations and assessments of instability, Cascading, and uncontrolled separation can be performed using real-time stability assessments, predetermined stability limits or other offline analysis techniques.”

FAC-011-4

- General questions:
 - How is damping monitored? How is island formation monitored? How is angular stability/separation monitored?
- Many TOP/RCs are implementing
 - VSA/TSA tools online for lookahead post-contingent analysis to determine if stability is maintained
 - Cascading analysis to determine if there would be large outages or uncontrolled separation, islands, large loss of load, etc.
 - These are model/simulation base assessments requiring good data with expected results. Garbage in = Garbage out ... they cannot cover for all failures resulting in oscillations.
- Real-time stability monitoring does not appear to be within scope, save for WECC RC/TOPs (next slide...)
- Further analysis of FAC-011-4 and potential changes from a real-time perspective are required

IRO-002-7 WECC Variance

- WECC is ahead of the curve in North America
 - Variance requires a common Western Interconnection-wide methodology, addressing modeling and monitoring, in coordination with other Reliability Coordinators
- Most WECC RC/TOPs monitor for oscillations in their footprint using a wide area monitoring system and PMUs.
- A great start, but this too can benefit from the proposed changes in this SAR.

Back to the RTA

- When I was brought on to the guidance drafting team, the first thing I noticed was the lack of stability monitoring requirements within the RTA.
 - Only SOL monitoring and Angle Limitations are mentioned.
- With the addition of changes to FAC-011-4, the new IBR standards and the existing IRO-002-7 WECC variance, I believe the time is right for the RTA definition to be augmented to reflect stability monitoring requirements (both pre and post contingent).

Back to the RTA

Pre-Contingent – real-time

- SCADA
- State Estimator

- WAMS
 - Island Detection
 - Oscillation Monitoring
 - Magnitude/Damping
 - Location
 - Angular Separation

Post-Contingent – lookahead

- RTCA
- VSAT
- TSAT
- CA Cascade
- N-1-1
- Etc.

NOTE: This is not an exhaustive list. Many companies leverage other in-house applications and other advanced power system applications.

SAR Proposal

- Form a NASPI task force or subgroup to help lead the discussion on the requirements for monitoring stability in real-time as discussed in the previous slides.
- Utilities from other parts of the world already rely exclusively on WAMS technology for monitoring stability, inertia, and corrective action (Iceland, Brazil, UK, etc). Do they monitor out of necessity and/or are there regulation rules around monitoring? Task force to investigate and report on these instances

SAR Proposal

- The NASPI analysis may indicate that stability should already be monitored in real-time with a defined Operating Plan to address known stability issues as in the case of the IRO-002-7 WECC variance. This variance and related system events/near misses will act as the justification for the SAR.
- This task force will develop and propose a SAR that makes stability monitoring in real-time a requirement by suggesting changes within existing or potentially new NERC standards and definitions.

Next Steps

- Present proposal at Fall NASPI work group meeting for discussion with wider NASPI audience
- Based on discussion at the WG, NASPI Leadership to review proposal and determine validity of approach.
- If proposal is accepted, create NASPI task force or subgroup to assume responsibility for this SAR project; including potential standard drafting team participation.
- Task force to develop a work plan and present work at the upcoming NASPI spring meeting

Thank you!

