



TSAT Overview

Bill Blevins

Questions to be covered

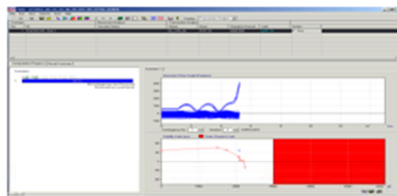
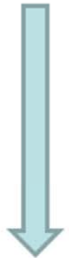
- 1) When & How often used?
 - Day Ahead
 - Daily at 3pm 2 days prior to DAM, and results posted in the 4pm Generic Limits extract
 - .
 - Real-Time
 - Hourly for SCED, run at 30 min intervals prior
 -
 - Available to be rerun on demand for SCED if necessary???
 - Yes
 - Will this be incorporated into the CRR auction model?
 - Yes eventually.....CRR to decide on how to use TSAT in the process.
 - -----
- 2) General thoughts from 2-3 month testing period. Why was it delayed a couple times?
 - Wanted to see the results across database loads. Needed some updates to fix some software issues. Got the software delivered December. Delay was due to the need to ensure we trained all the operators and with Blackstart going on it took some time to get the tools ready after the software delivery and the operators trained on how to use the tool. Also to have a meeting with Planning to review the observations we had been seeing.
 - Also added VSAT as a tool to use for W-N to handle Steady State limits for voltage stability.
 -
- 3) How does it work?
 - How does it update for changing topology (eg. new CREZ lines)?
 - How does it incorporate transmission outages?
 - See next slides
- 4) Where do you get your western fossil fuel gen run assumptions from for the DAM run & for the SCED run (since they affect the results)?
 - Using load based Gen Plan for current conditions. This is per the procedure we established before go-live. For SCED it uses the current on-line conditions.
 -

TSAT Overview

- Determines transient security limits of power transfers



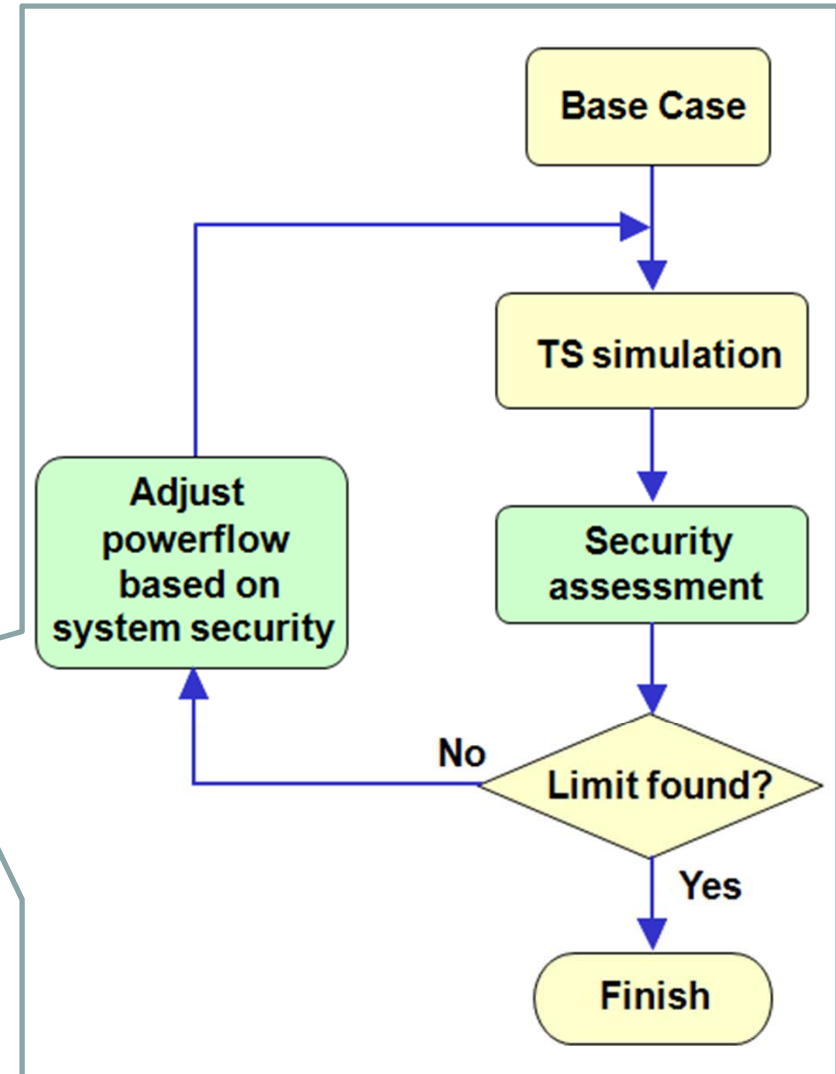
System initial condition



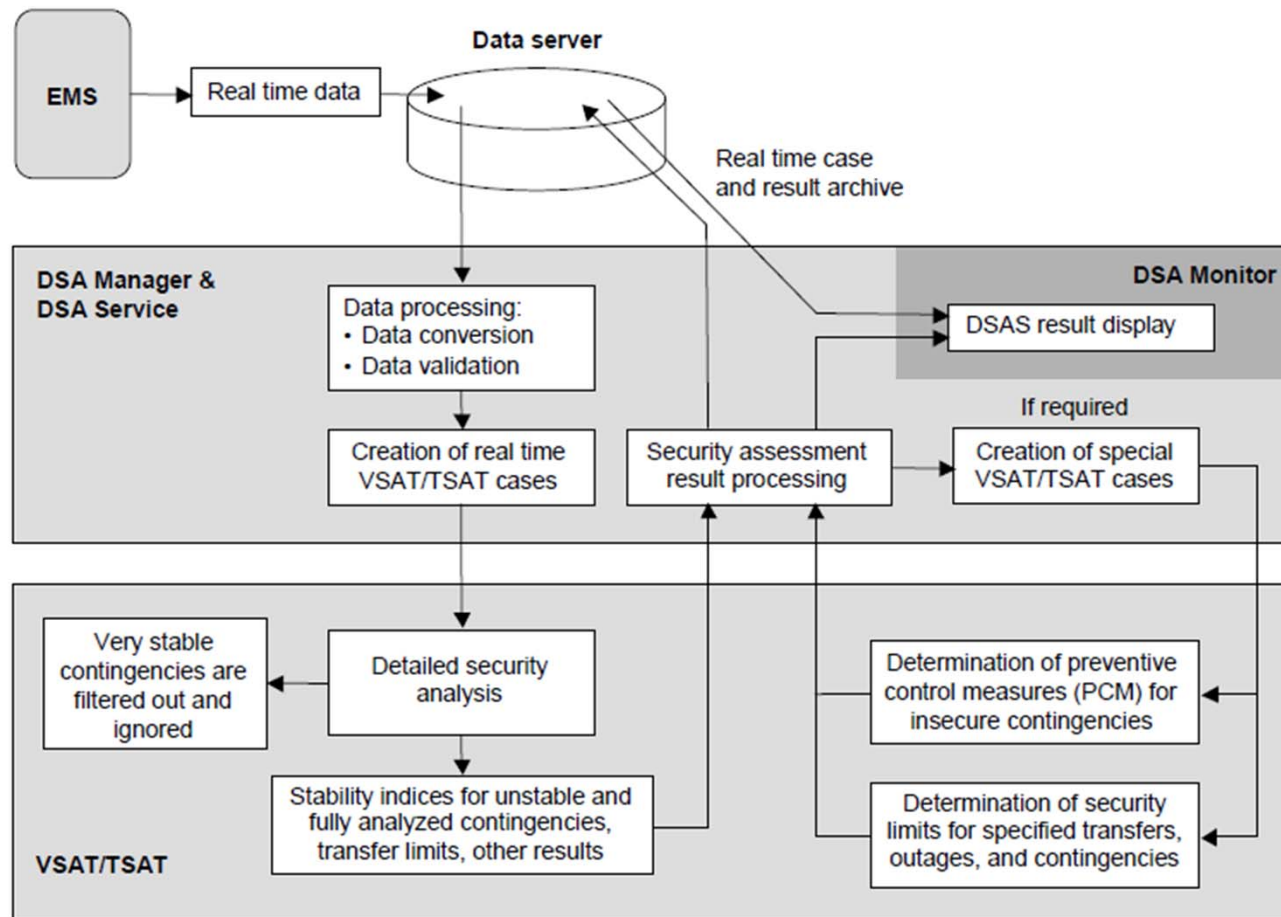
TSAT calculation

Transient Stability Limit				
TSA INTERFACE MARGINS: TSA Limits Update Time: 05-Jan-2012 10:15:48 VSA FILES TSA FILES				
Time	ID	Transfer	Contingency	Violation
Interface ID		Base (MW)	Limit (MW)	
05-Jan-2012 10:12:12	WN	WN		Hit the dispatch limit
	WN	-616.6	2525.1	
05-Jan-2012 09:57:12	WN	WN		Hit the dispatch limit
	WN	-564.9	2463.5	
05-Jan-2012 09:42:12	WN	WN		Hit the dispatch limit
	WN	-576.0	2434.6	
05-Jan-2012 09:27:12	WN	WN		Hit the dispatch limit

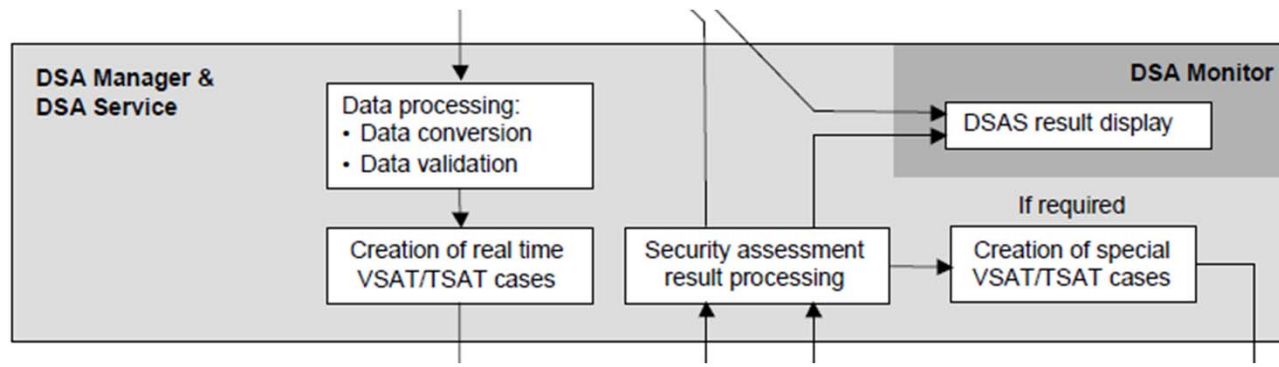
Max transfer through the pre-defined interface



TSAT Computation flow

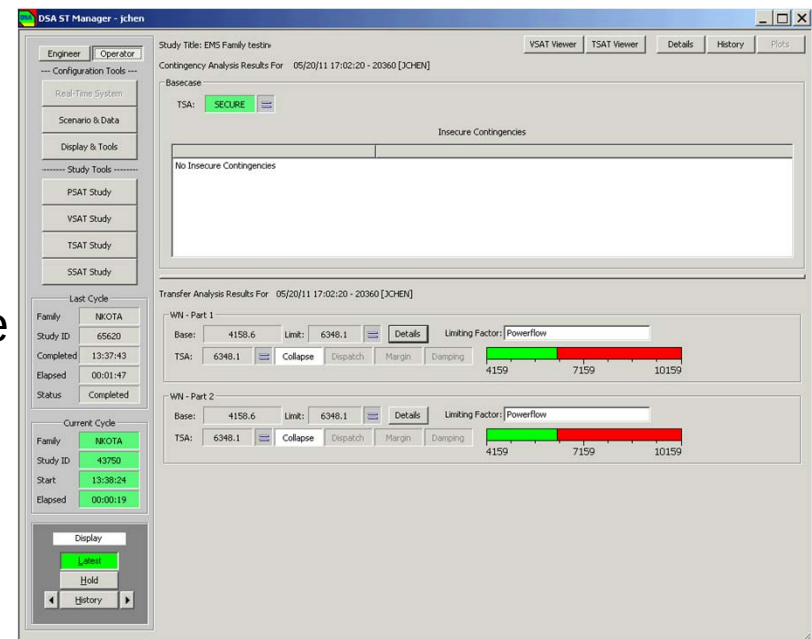


DSAManager/DSAManager ST

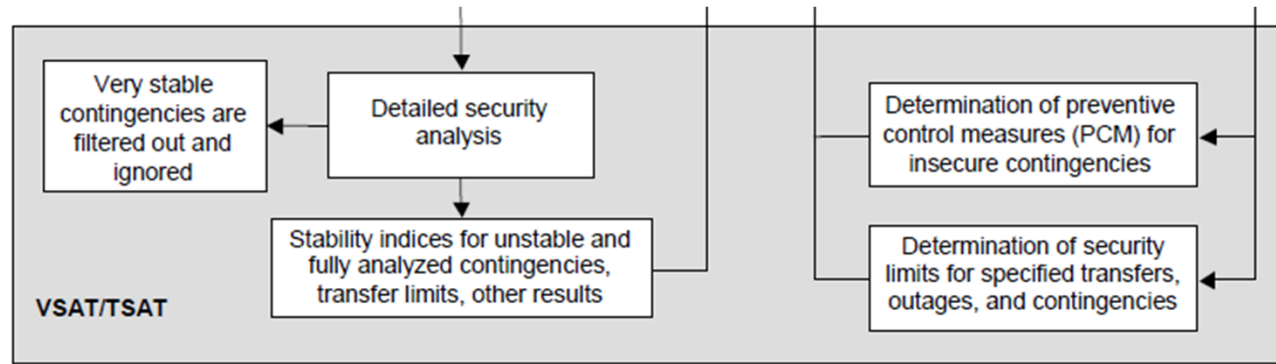


Roles of DSAManager/DSAManager ST:

- Data editor for the user to create, edit, and view all off-line models and data
- Preparation of VSAT/TSAT cases and all data for a given real-time or study case, for submission to VSAT/TSAT computation engines to perform all required security assessment.
- Display of all results on DSA Monitor when the security assessment is finished for a case.

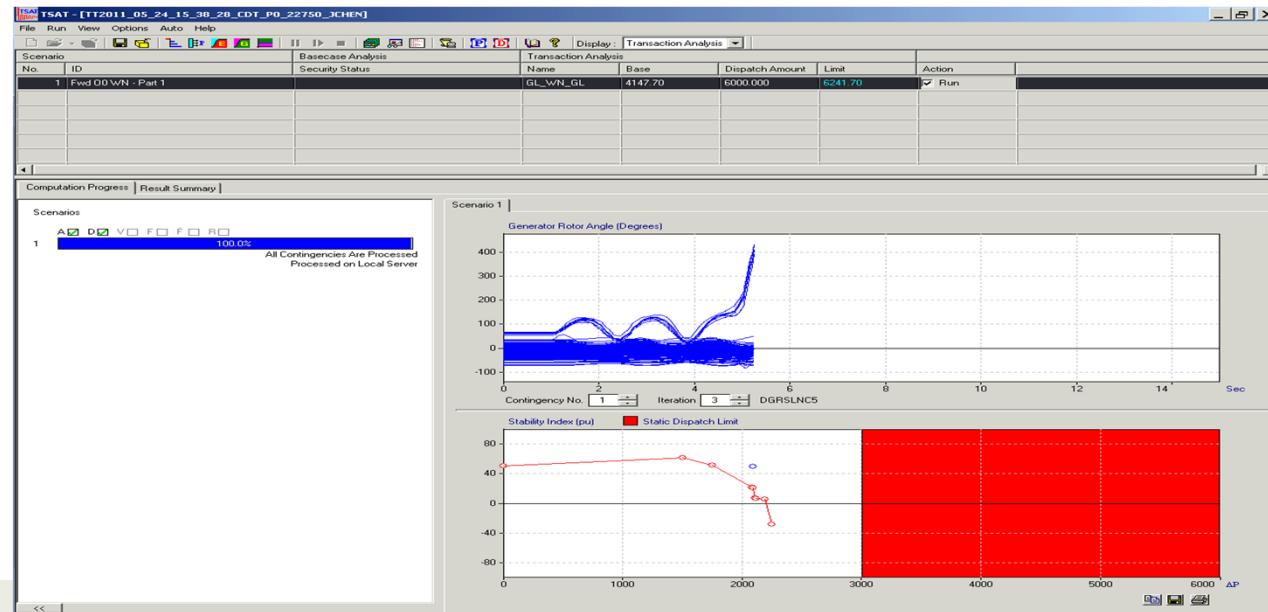


VSAT/TSAT computation engines



Roles of VSAT/TSAT computation engines:

- Run security assessment for each VSAT/TSAT scenarios



Limit Factors

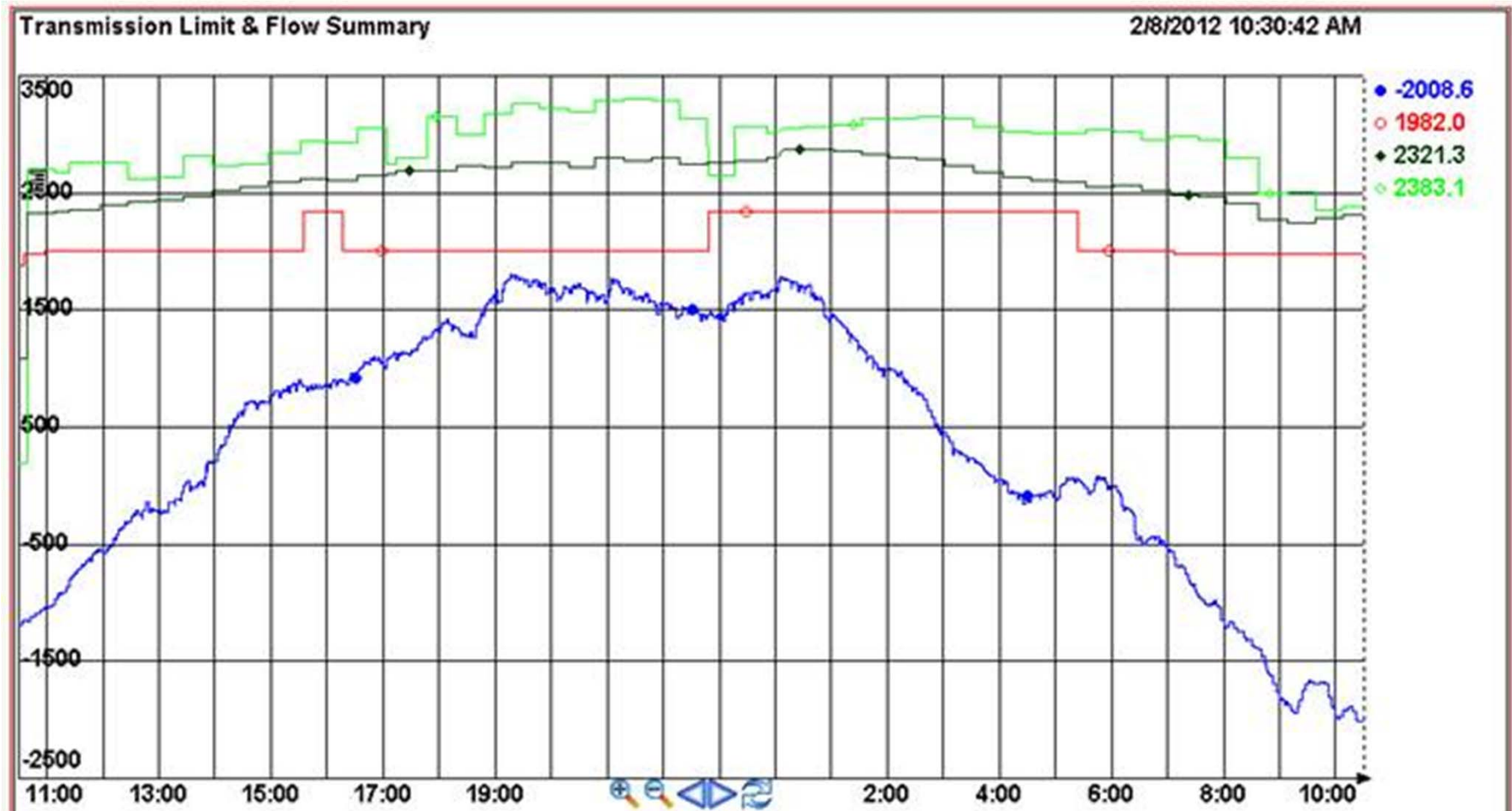
Transient Stability Limit				
TSA Limits Update Time: 04-Jan-2012 14:12:07			VSA Normal	TSA Normal
Time	ID	Transfer	Contingency	Violation
Interface ID		Base (MW)	Limit (MW)	
03-Aug-2011 16:22:53	WN	WN	DMGSLNG5	Damping
	WN	179.8	2139.9	

- **Collapse**
Static power flow turns unsolved first when the power system is stressed based on transfer definition. It could due to static voltage stability limit.
- **Dispatch**
No static voltage stability limit or transient stability limit is hit, no more generation can be dispatch in source.
- **Margin**
Transient stability index, which is measured in terms of power swing-based energy margin or power angle based margin.
- **Damping**
Electromechanical oscillations, which is measured in terms of damping of the worst oscillatory mode.
- **Transient voltage drop/rise**
Transient voltage violation, which is measured in the term of the maximum time duration of violating pre-defined voltage drop/rise threshold.

Incorporation of TSAT with VSAT and Current Matrix

- **The previous matrix of W-N Limits will not be abandoned**
- **If Thermal Generation is on-line in the West, THEN**
 - Limit = Minimum of the VSAT and TSAT results
- **If NO Thermal Generation is on-line in the West, THEN**
 - Limit = Minimum of the VSAT results and the matrix
- **This assumption is utilized both in off-line studies as well as in real-time**

Example of the improvement of using TSAT and VSAT across several hours



How applied to DAM/CRR markets

- **Day-Ahead Market**

- No changes for DAM Operator in receiving data from Ops Engineering where the W-N limits are calculated prior to DAM
 - Implementing TSAT in real-time may introduce variability in W-N limits, leading to a wider difference between the limits utilized in DAM and those in real-time.
 - This would be because of the variations of the system in real-time.
- ERCOT considering enhancement to posted Generic Transmission Limit spreadsheet to include adjustment % and final value used in DAM (example, where the 2214MW IROL limit is scaled down to be 1945MW in DAM).
 - Spreadsheet would include additional data
 - Would remove daily operator notice of values used in DAM by 0600.

How applied to DAM/CRR markets (continued)

- **Congestion Revenue Rights Auction**

- W-N values in CRR auctions have been relatively static for recent model months.
- Although TSAT analysis and impacts were considered in the March CRR model build process three weeks ago, it was recognized that March forecasted conditions would be primarily constrained with little influence from TSAT with mild weather and wind patterns.
- For April and future CRR Model builds, the CRR Engineer will leverage the TSAT tool, similar to an Operations Engineer, when determining a value for CRR Auction.
 - The trend in W-N Limits will also be evaluated each month.

TSAT Implementation



?