NYISO Voltage-constrained Transfer Limit Analyses

CRPP studies

Summer Operating studies

ATR studies

…….

Issues

1. **Pre-contingency assessment**

2. **Post-contingency assessment**

3. **Design criteria**

Pre-contingency assessment

1. **Inaccuracies in the Con Edison system representation**
   - ✓ **A/S over-voltages pre-contingency**
   - ✓ **Approx. 150 MVARs lower capacitive compensation at A/S**
   - ✓ **Substantial overspill on the A line (Linden-Goethals), aprox. 200 MW**
   - – **Other topography errors in the Astoria pocket**

2. **NYCA system representation only partially a “level 5” representation, especially in the SENY area (except Zones I and J)**
   - – **Does not <u>effectively</u> assess the voltage profile of the entire study area**

3. **Severe underutilization of installed system resources in supporting system voltages under high transfers**
   - – **375 MVAR of BPS shunt reactors erroneously dispatched I/S in Con Ed**
   - – **Some QMAX. Capabilities modeled lower than latest VSS points**
   - – **Underutilization of generators VAR support, due to inappropriate choice of GSU taps and/or Vterm**
   - – **Flows on regulated feeders of the I-to-J interface artificially held back**

Post-contingency voltage assessment

1. **Lack of clarity as to time frame for monitoring post-contingency voltage:**
   - **On-going discussion as to exact monitoring time frame**
   - **The NYISO has committed to clarify its criteria in writing.**
2. **Use of inaccurate power flow solution:**
   - **Transfer limits unnecessarily degraded**
3. **Con Edison's assessment of the NYISO power flow solution:**
   - **Benchmark tests of the NYISO's <u>post-contingency</u> system assessment against a fully detailed stability solution shows the NYISO power flow solution technique to be <u>significantly underestimating</u> the strength of the interconnected system**
   - **Shared results w/ the NYISO on September 16, 2005 asking their comments and requesting an independent evaluation**

NYISO Design Criteria

1. **The NYISO has verbally stated that it designs for "the loss of the largest generating unit when dispatched at its Max. MW capability, while at peak demand and transfer limits"**

2. **The following issues arise out of the aforementioned NYISO statement:**
    1. **The written NYSRC criteria does not have any such language.**
    2. **With its statement, the NYISO is subordinating system performance to deliverability of the largest generating unit(s).**
    3. **The NYISO is significantly underutilizing other available generating capacity in order to have Ravenswood #3 dispatched at at max.**
    4. **Unlikely concomitance of the aforementioned three conditions. In fact, operationally, the system would be dispatched to avoid such conditions.**

NYISO Post-Contingency Voltage criteria

- **Voltages monitored 30-60 seconds after the contingency occurs**
- **Recognizes only the automatic response of the system:**
  - Generators’ excitation & governor systems
  - SVC contribution
- **Other (slower-acting) controls frozen**
  - PARs and LTC transformers fixed at their pre-contingency solved tap position
  - Transmission switched shunts are locked
  - DC terminals locked
  - Operators’ actions (e.g. dispatching/committing generation – ramping steam units, turning on GTs)
  - Area Interchange disabled
- **Load represented as constant power (except for Con Ed loads)**
- **The above conditions describe post-transient conditions best evaluated via stability simulations**

Post-contingency assessment

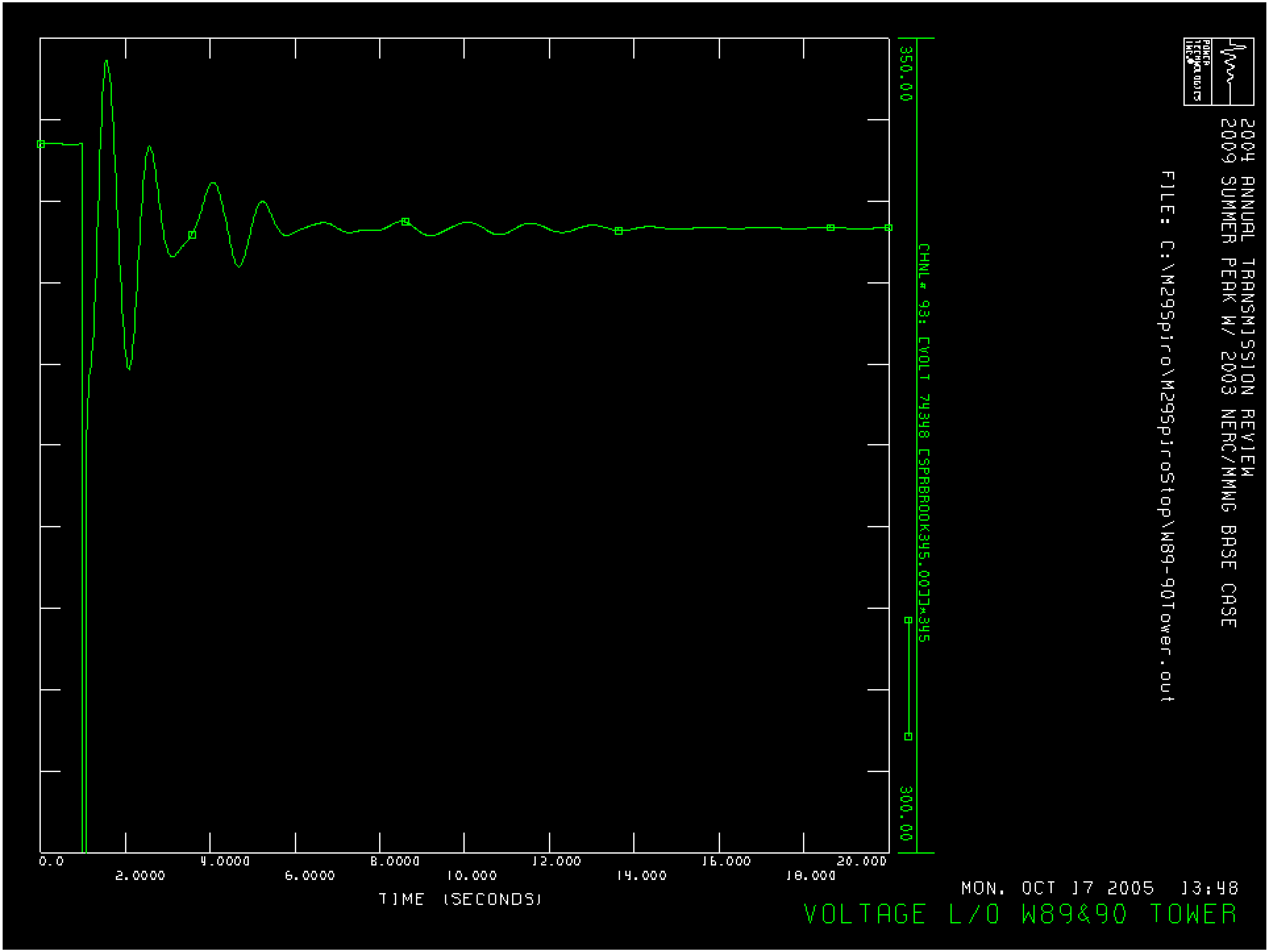
	NYISO voltage criteria	**NYISO power flow solution**	**Stability solution**
1.	Generators’ Excitation system action	***Not*** represented	Represented
2.	Generators’ Governor system action	***Not*** represented	Represented
3.	SVC action	Represented	Represented
4.	Load model	Constant MVA	Constant impedance
5.	No other operator action	Yes	Yes

Approximate power flow solutions

1. Variety of approaches:
    - INLF
    - FDNS
    - FNSL
2. Good computational speed.
3. Useful as a screening tool.
4. Need to be benchmarked against much more robust stability simulations.
5. Current practice for benchmarking DC thermal analysis with a detailed power flow.

Stability solution

1. Combines power flow with detailed representation of generation sources
    - Stator and rotor parameters
    - Excitation system
    - Governor system
2. Monitors a great variety of system parameters (during and post-events):
    - Frequency
    - Voltage
    - Machines' rotor angles
    - Generators' MW and MVAR output
3. Widely available
4. Used in critical studies by the NYISO
    - ATR
    - Blackout re-construction
    - Establishment of relay protection system for old and new generation projects.
    -
5. More conservative than power flow solution
    - Fault simulation (e.g. 3-phase-to-ground fault)
    - Stability-constrained T-Lims need to be 11% above thermal Limits



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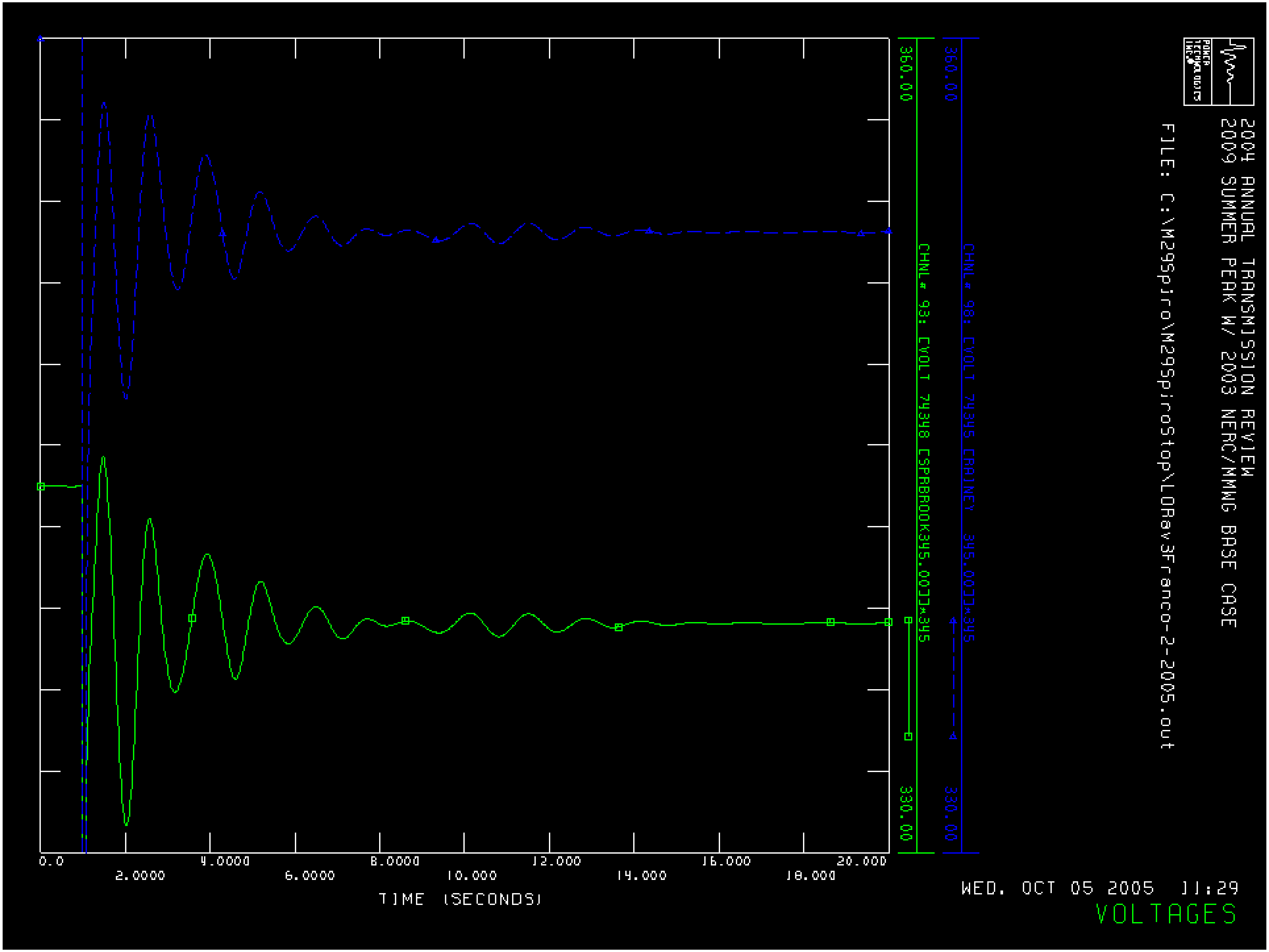

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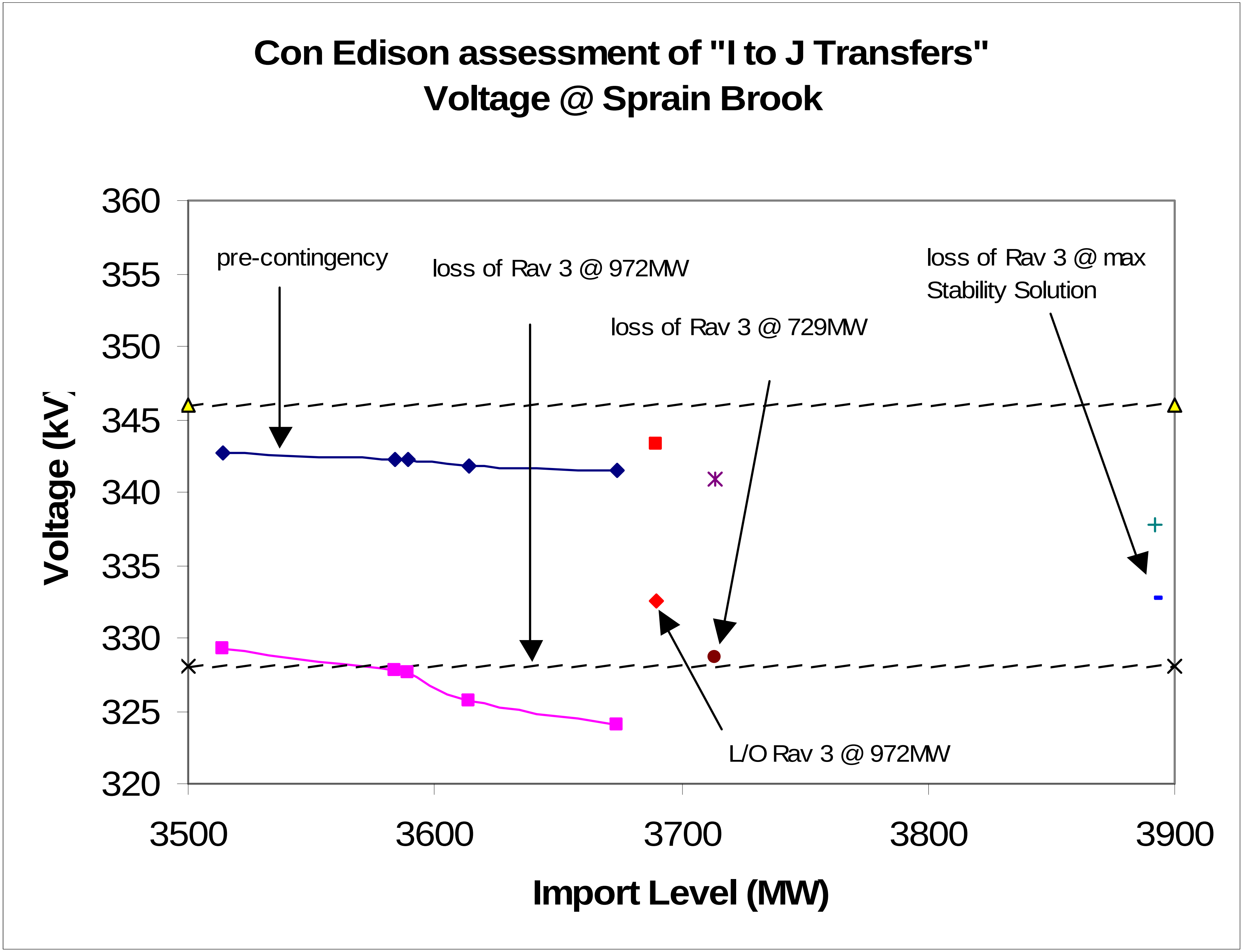

Con Edison assessment of "I to J Transfers"
Voltage @ Sprain Brook
pre-contingency
loss of Rav 3 @ 972MW
loss of Rav 3 @ max Stability Solution
loss of Rav 3 @ 729MW
L/O Rav 3 @ 972MW
Voltage (kV)
360
355
350
345
340
335
330
325
320
3500
3600
3700
3800
3900
Import Level (MW)

Summer 2006 - I to J transfers at 3680 MW

Ravenswood #3 at max. output: 972 MW

(the NYISO calls 3300 MW the limit on I-to_j transfers)

	Pre-contingency	Post-contingency	
		L/O Rav 3 at 972 MW	L/O W89/W90 common tower
$V_{\text{Sprain Brook}}$	343.3 kV	332.6 kV	333.3 kV
SVC_{Leeds}	81 MVARs	270 MVARs	200 MVARs
SVC_{Frazer}	42 MVARs	247 MVARs	51 MVARs

Note: SVCFrazer's Qmax = 325 MVARs, SVCLeeds' Qmax = 270 MVARs

Post-contingency solution used is the NYISO's approximate power flow solution.