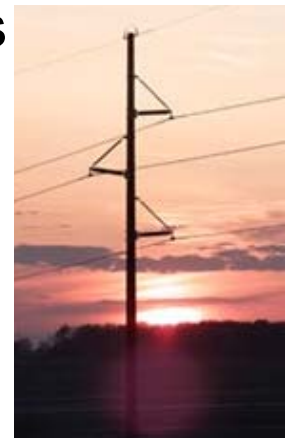
POM - OPM at American Transmission Co.

Edina Bajrektarević, Operations Engineer
February 10, 2005

ATC Overview

- ATC owns, plans, maintains and operates transmission assets in portions of Wisconsin, Michigan and Illinois
  - Does not own generation or distribution assets
  - Operates independently from all users
- Over $1.0 billion in assets
  - Over 8,900 circuit miles of transmission lines
  - Over 450 substations
- 25 entities have contributed transmission assets, cash or both to ATC including:
  - 7 investor-owned utilities
  - 12 municipal utilities
  - 4 electric cooperatives
  - 2 public power entities

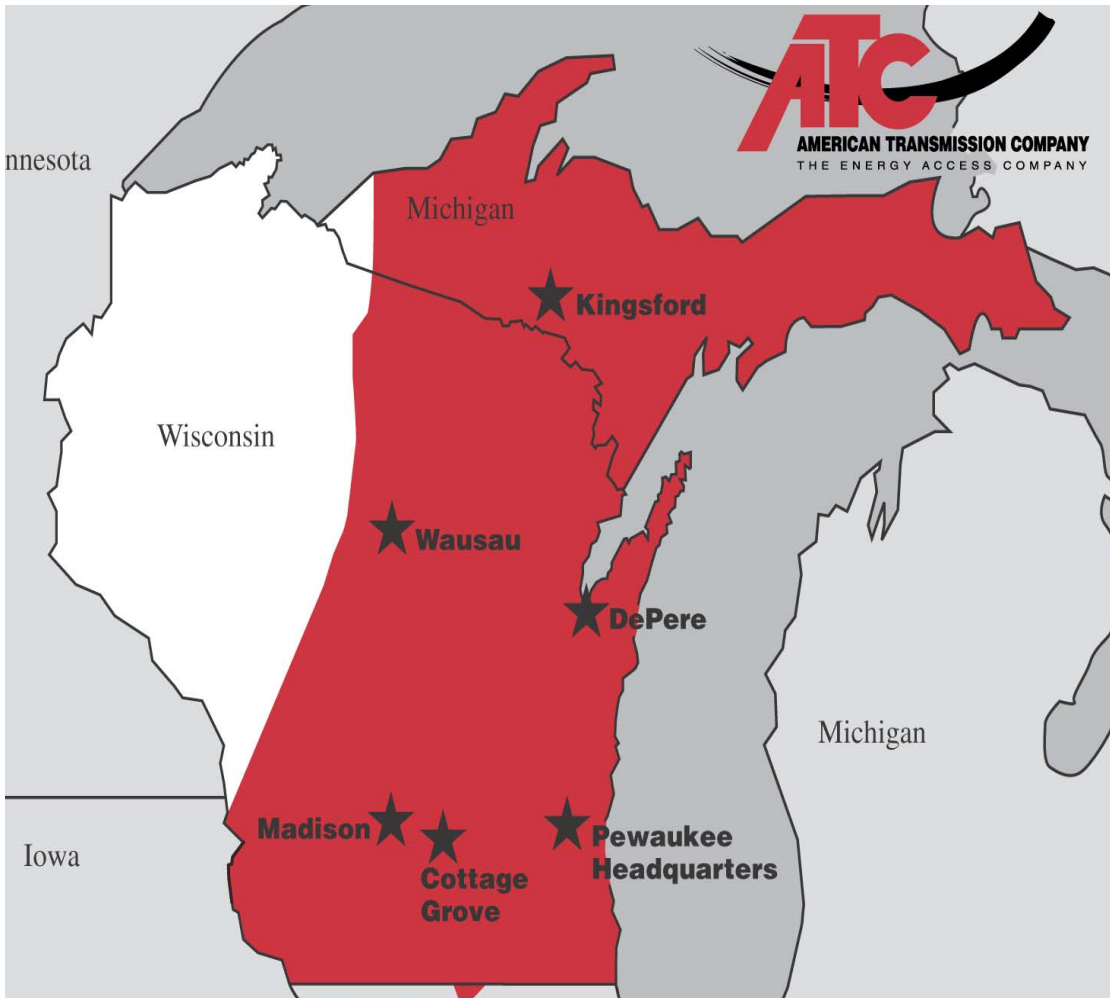


Service Areas

- Transmission Service is the ATC's business

  ATC's aims:

- Ensure reliable operation of the transmission network
- Provide an adequate infrastructure to meet the needs of all customers
- Operate independently, providing service without discrimination between customers



AMERICAN TRANSMISSION COMPANY LLC

Project Selection and Prioritization

Sun Wook Kang and Peter Burke

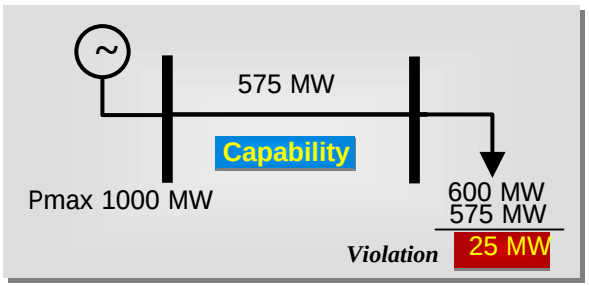
POM-OPM in System Operations

Edina Bajrektarević

Transmission System Project Selection/Prioritization

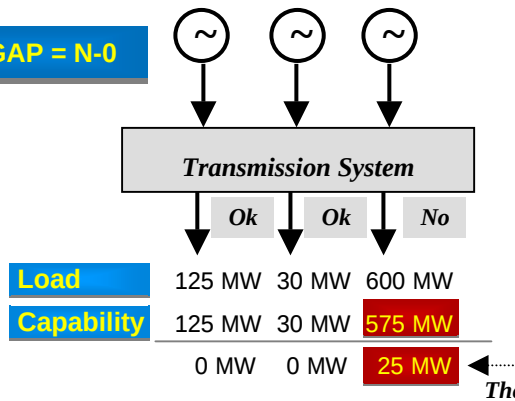
- *OPM will calculate transmission capability gap (TCG) at ATC, which is a measure of transmission system load capability deficit*

GAP = N-0, No Project Alternatives



- *TCG will be used as the metric for:*
  - *Real Time Grid Performance Measurement*
  - *Project Alternative Value/Benefit Measures*

GAP = N-0



GAP = N- [0, 1, 2, …], No Project Alternatives

Contingency	Probability	Gap {Do nothing}
CTG N-0	0.2000	25 MW
CTG (N-1)	0.0013	475 MW
CTG (N-2)	0.0011	302 MW
….	…	…
N CTG Summary		317 MW

Probability Weighted Sum converts total result into an expected value of future system performance

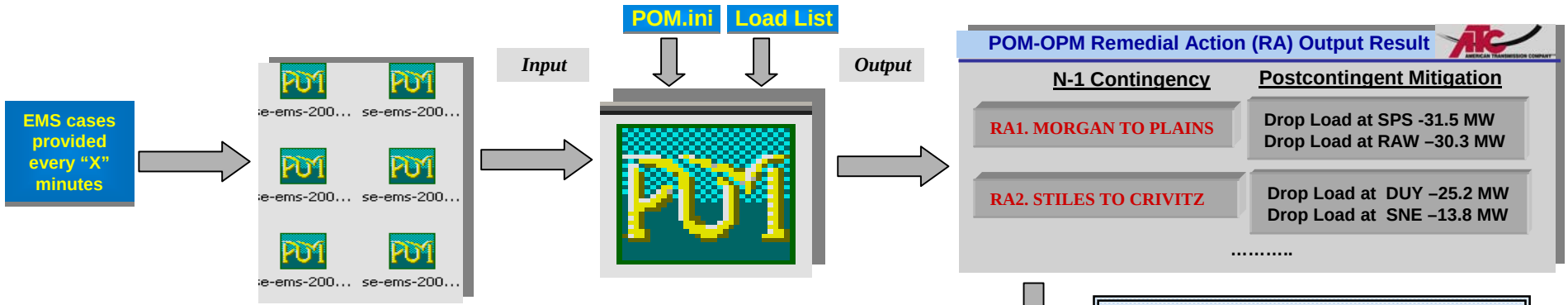
GAP = N- [0, 1, 2, …], with Project Alternatives

Project Alternative	Cost	Gap {Benefit}
None	$0	317 MW
β1	$105	37 MW
α9	$125	42 MW
β2	$190	31 MW
β1+β2	$325	105 MW

- ***"How do I get the most for $xxx?***

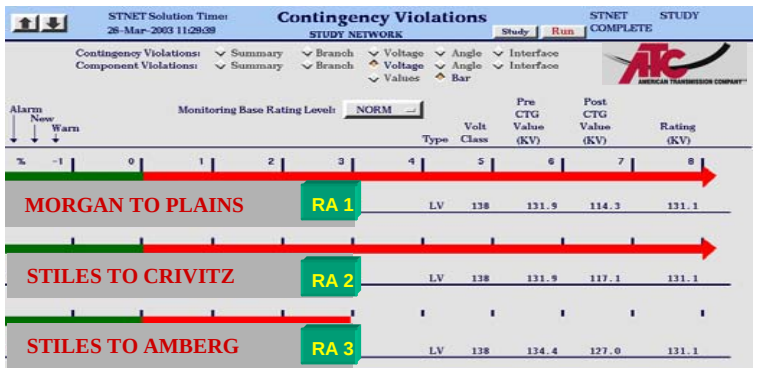
Use of Remedial Actions in Operations by using POM-OPM

- *Develop load reduction capabilities at ATC to allow System Operators to quickly shed the load in an emergency situation*



- *"All Control Areas shall operate so that instability, uncontrolled separation, or cascading outages will not occur as a result of the most severe single contingency…"* ***NERC Manual. Policy 2 on Transmission Operations***

- *The System Operator will curtail and restore the load by confirming selection on EMS Load Shed Application shown below*



- *Employ POM-OPM Software to determine which loads would be the best to curtail to mitigate transmission problems.*

EMS Network — **Manual Load Curtailment**

WE –Energies Control Area

STATION	ACTUAL WATTS	ACTUAL VARS	BREAKER STATUS
RAW	30.3	25.9	☐
TIF	145.3	18.3	■
TOD	120.7	12.7	■
SPS	31.5	30.3	☐

WPS Control Area

STATION	ACTUAL WATTS	ACTUAL VARS	BREAKER STATUS

Reliability On-going Studies

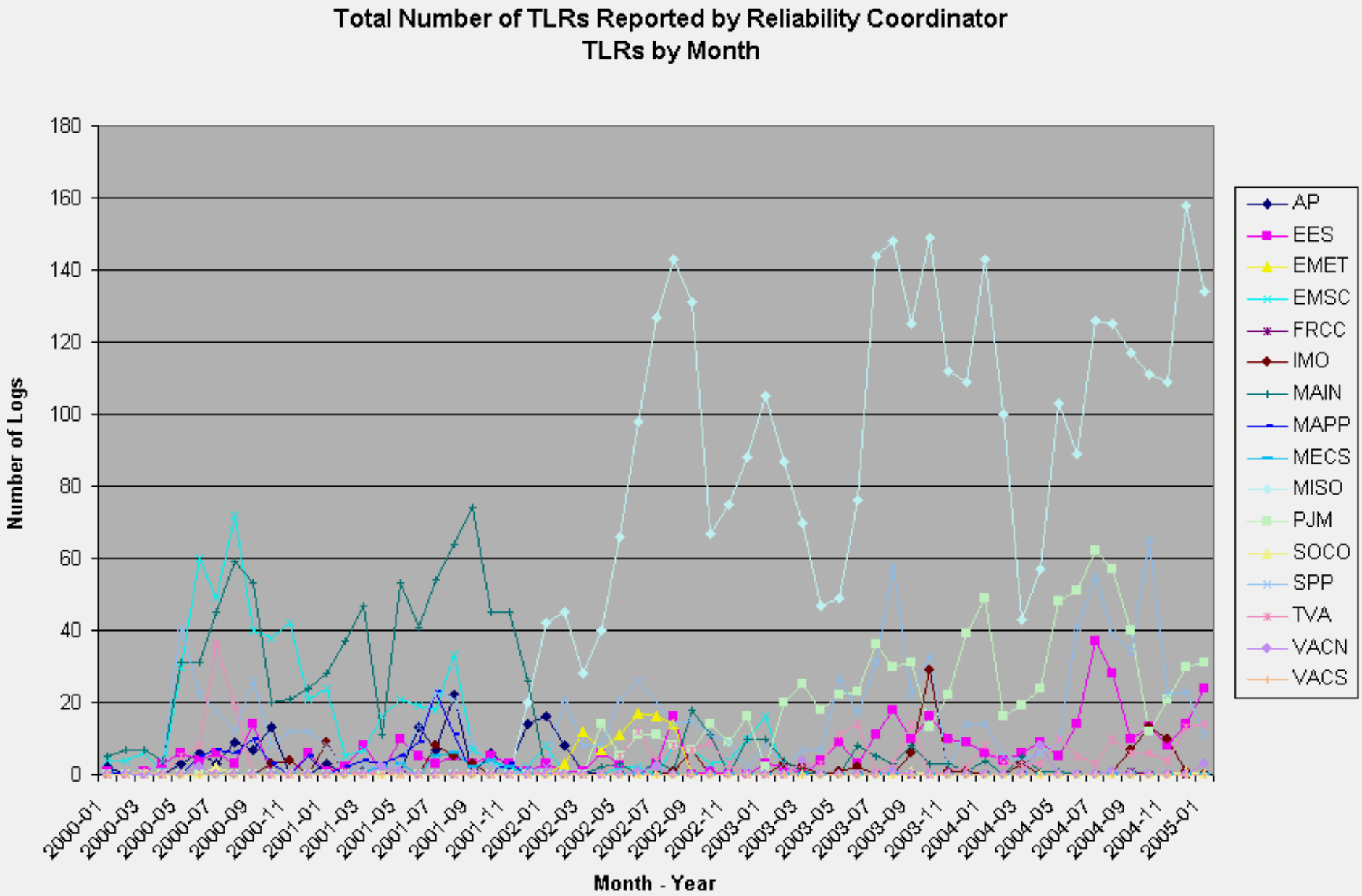
- Transmission System Analysis using:
  - POM contingency network analysis (N-1, N-2, and Complex contingencies),
  - OPM Mitigation analysis (unit commitment, redispatch, branch, load shed, recently Operating Procedure/Validation of Op Guides)
  - EMS Areva Power Flow and Contingency Program
  - PSSE Power Flow
- Plan for transmission outages and maintenance work
- Plan for multiple contingencies

Reliability On-going Studies

- (N-1) Plan for transmission outages and maintenance work
  - Identify thermal violations, voltage violations, and stability violations given anticipated system load and combination of outages for the specific time period
  - Identify which outage is causing the most trouble. Determine whether identified problems can be remedied without shedding the load
  - Prioritize Scheduled Transmission Outages
  - Develop Mitigation Plan for approved outages (this will include pre-contingent unit commitment/ redispatch/reconfiguration, and post-contingent unit commitment/redispatch/reconfiguration/load shed)

Two Study Examples

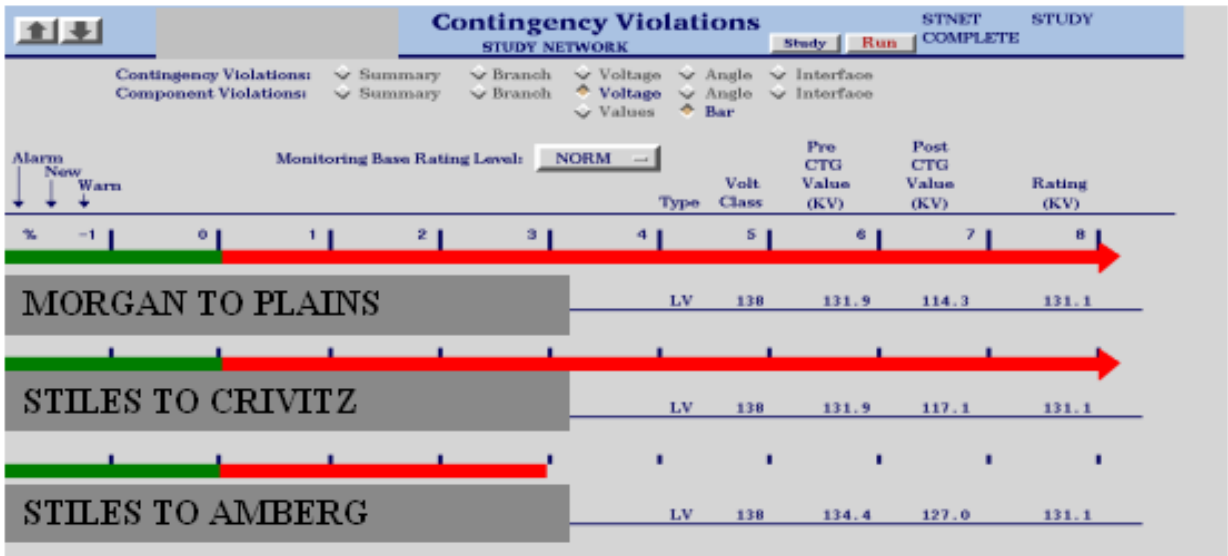
- Albers – Paris 138 kV line overload for loss of Wempletown – Paddock 345 kV line. **Flowgate 3522**
- Flow South. **Flowgate 3567** with highest number of TLRs recorded.


Total Number of TLRs Reported by Reliability Coordinator
TLRs by Month
Number of Logs
180
160
140
120
100
80
60
40
20
0
2000-01
2000-03
2000-05
2000-07
2000-09
2000-11
2001-01
2001-03
2001-05
2001-07
2001-09
2001-11
2002-01
2002-03
2002-05
2002-07
2002-09
2002-11
2003-01
2003-03
2003-05
2003-07
2003-09
2003-11
2004-01
2004-03
2004-05
2004-07
2004-09
2004-11
2005-01
Month - Year
AP
EES
EMET
EMSC
FRCC
IMO
MAIN
MAPP
MECS
MISO
PJM
SOCO
SPP
TVA
VACN
VACS

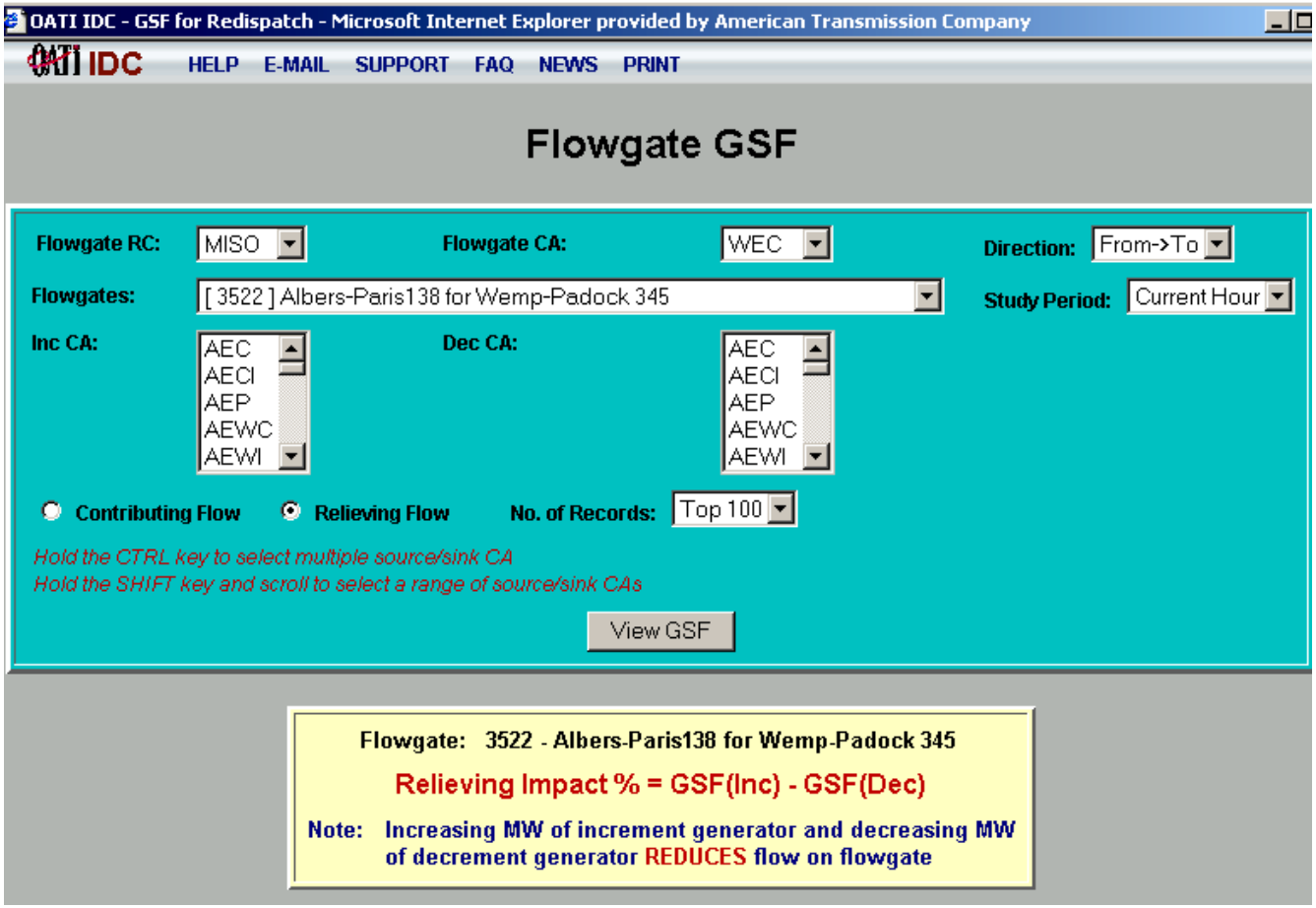
NERC Policy 2 on Transmission Operations

- Basic reliability requirement regarding single (N-1) contingencies. All Control Areas shall operate so that instability, uncontrolled separation, or cascading outages will not occur as a result of the most severe single contingency.

  "From Nerc Manual. Policy 2 on Transmission."



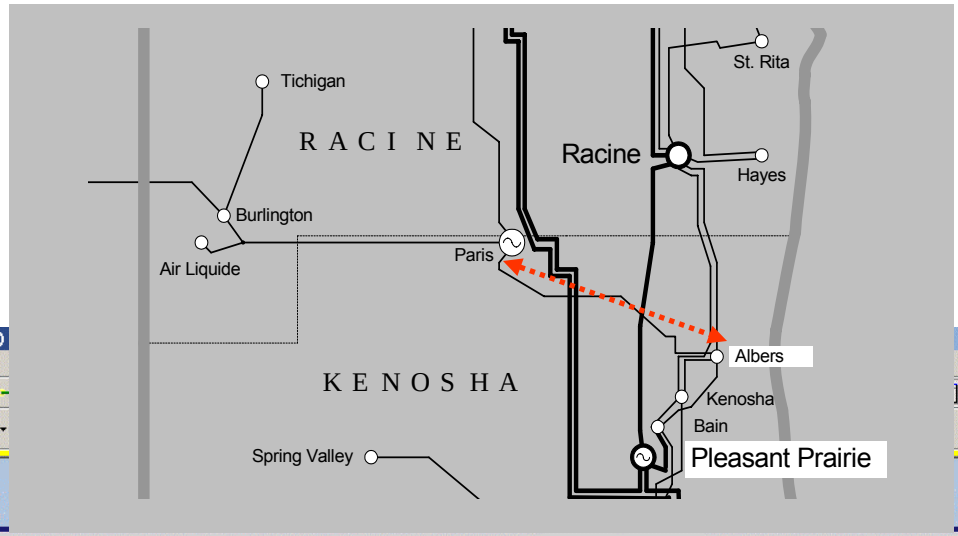
Albers – Paris Thermal Flowgate

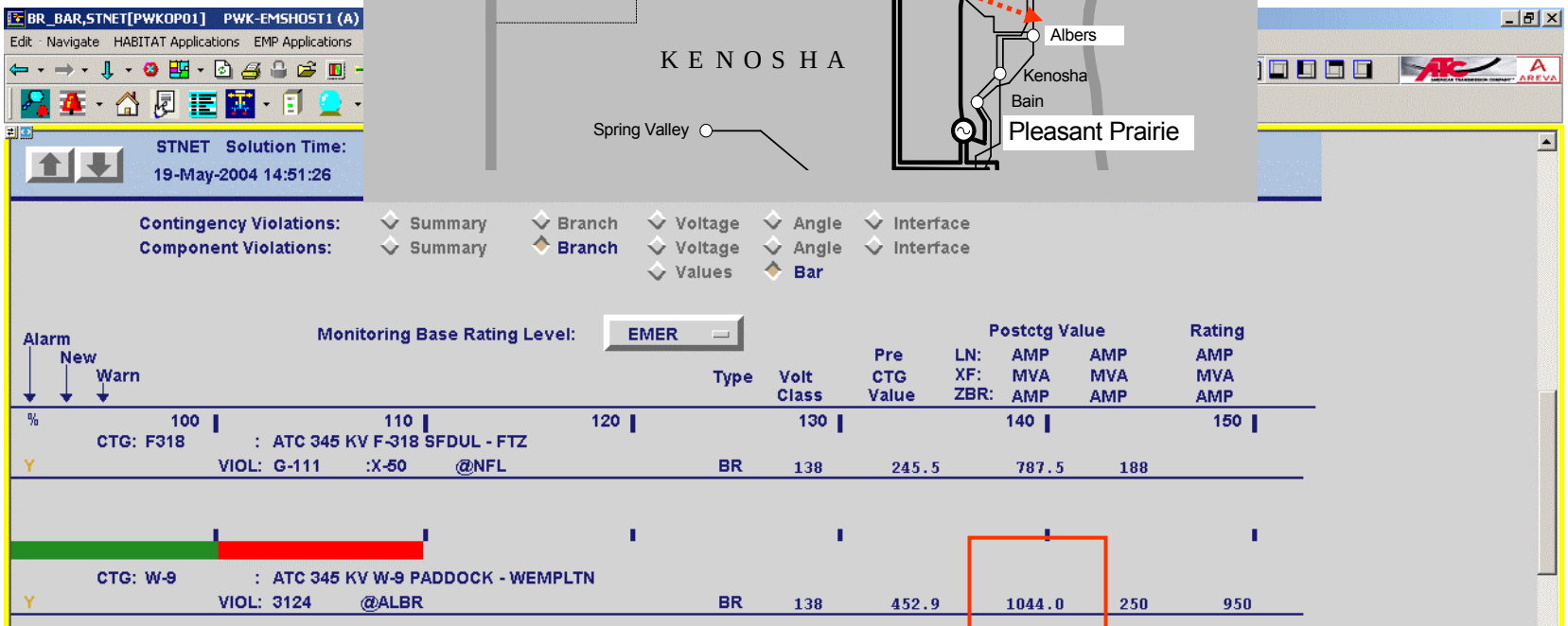


Albers – Paris Thermal Flowgate

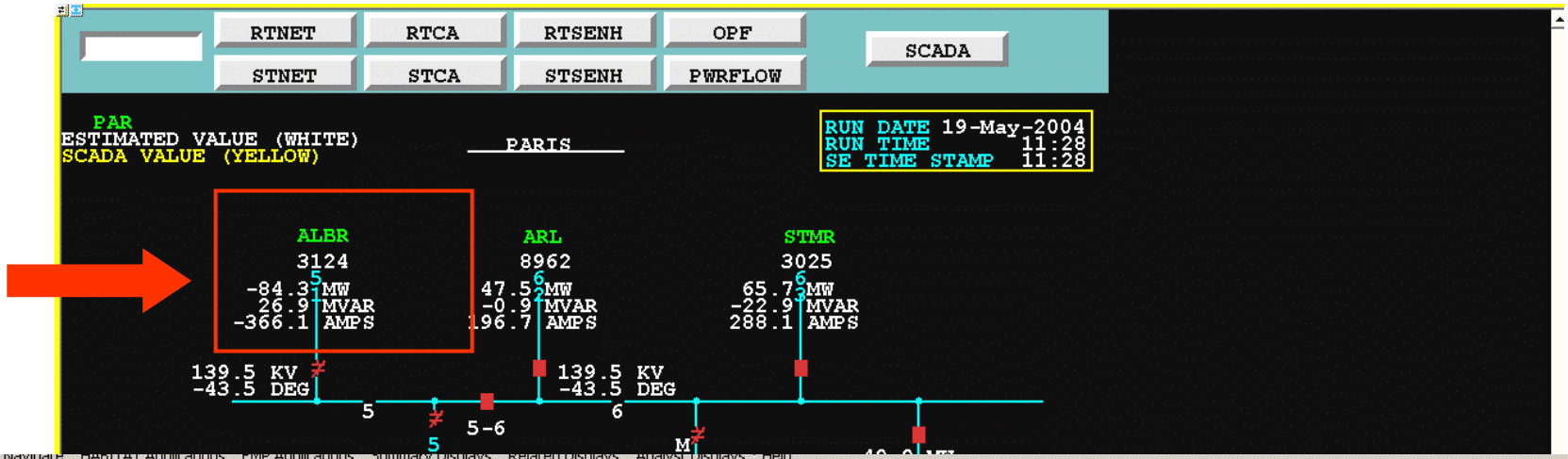
- Pre CTG Value 452.9 Amps, Post CTG Value: 1044 Sum Emergency Rating*: 950 Amps

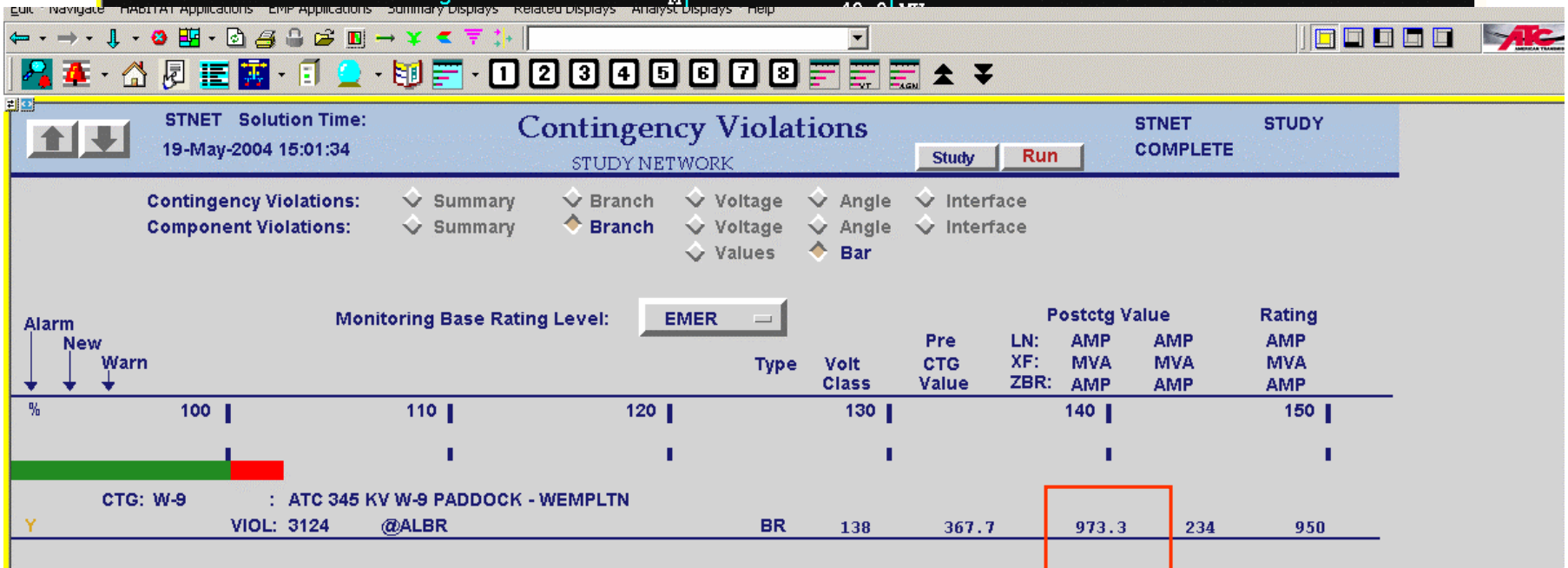
*Note that these ratings are introduced for illustration purpose





50 MW Redispatch Implementation





Effect of the Redispatch

CE	BYRON;2U25.0 2	-0.2
CE	BYRON;2U25.0 2	-0.2
CE	BYRON;1U25.0 1	-0.2
CE	BYRON;1U25.0 1	-0.2

WEC	PRS GT1 13.8 1	49.8
WEC	PRS GT2 13.8 2	49.8
WEC	PRS GT3 13.8 3	49.8
WEC	PRS GT4 13.8 4	49.8

Effect of Redispatch	MW	Pre CTG Values	Post CTG Value	Sum Emergency
Base Case	-	105 MW, 456 Amps	1044.3 Amps	950 Amps
Inc Paris, Dec Byron	50	84.3 MW, 366 Amps	973.3 Amps	950 Amps
Inc Paris, Dec Byron	+10	80.1 MW, 348 Amps	954 Amps	950 Amps
Total Redispatch	60	Post CTG Value: 954 Amps		

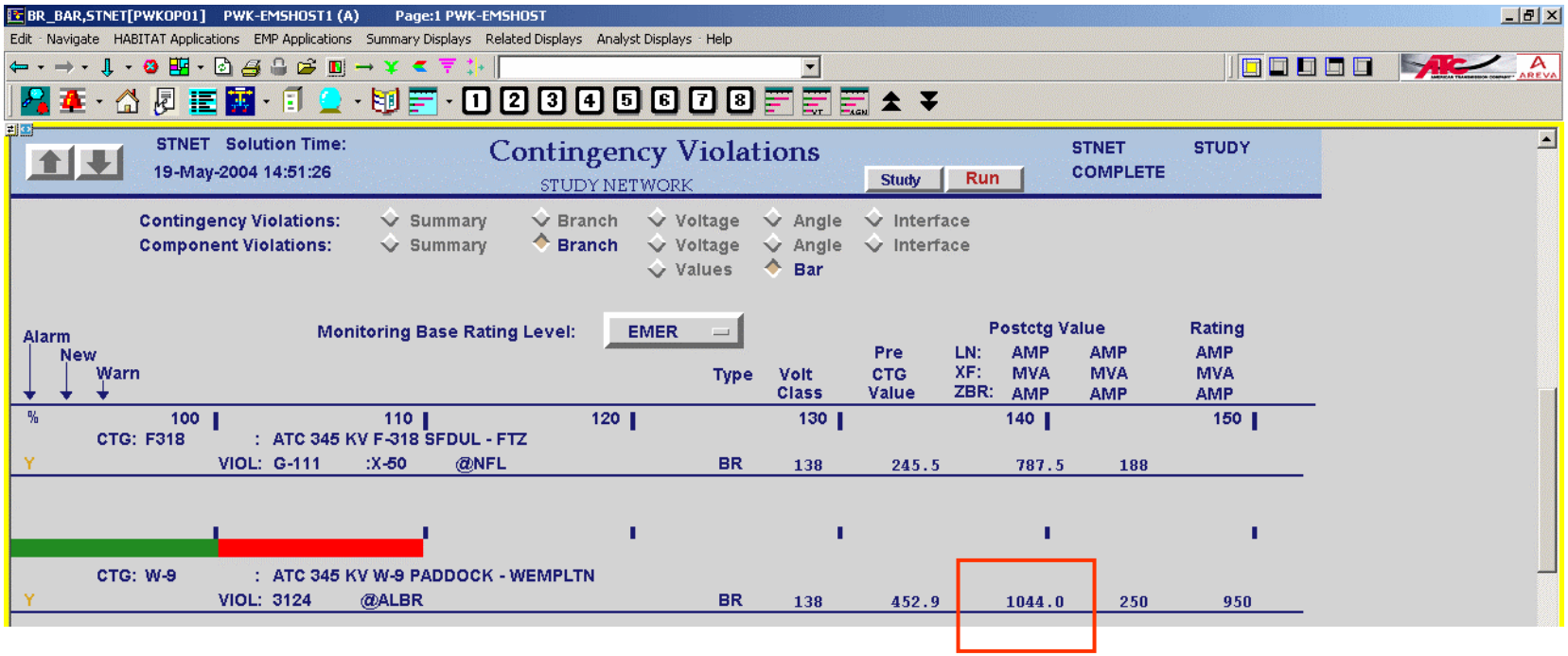
Expected Redispatch Relief = 50 MW *(0.49 - (- 0.02)) = 25.5 MW

Expected Redispatch Relief = +10 MW*(0.49-(-0.02)) = 5.1 MW

Albers – Paris Thermal Flowgate

- Pre CTG Value 452.9 Amps, Post CTG Value: 1044 Sum Emergency Rating: 950 Amps

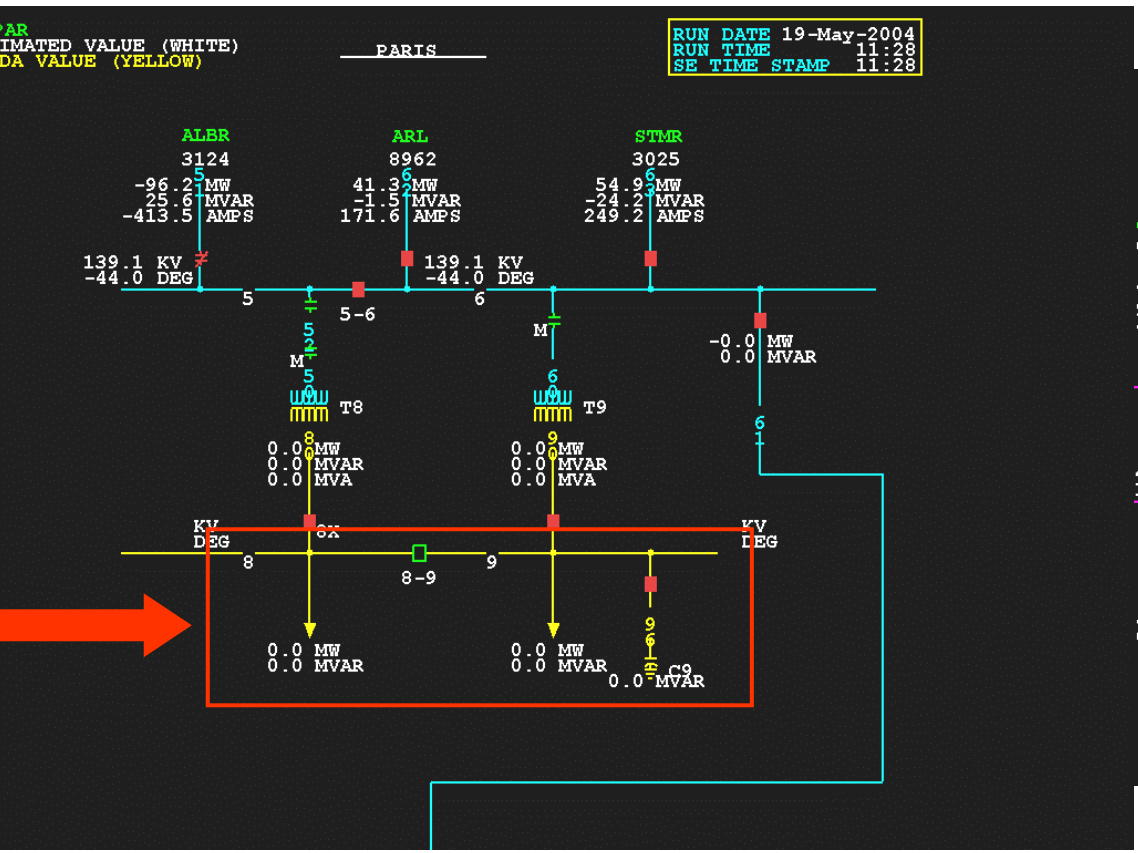
*Note that these ratings are introduced for illustration purpose

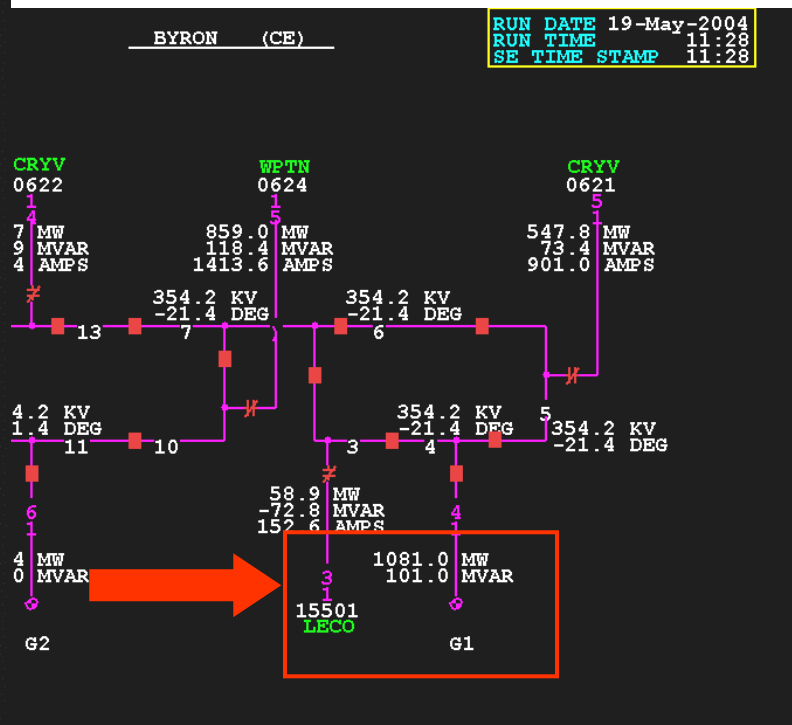


Let's try to mitigate this CTG by implementing Load Curtailment as Mitigation Option.

20 MW Load Shed Implementation

- 20 MW of Load Removed at Paris (this is just for illustration purpose)*
- 20 MW of Generation Dec at Byron. Improvements shown on next slide.





Effect of Load Shed

- The farther you are from fire, the less warmth you will get

LSF impact

WEC	PRS GT1 13.8 1	49.8
WEC	PRS GT2 13.8 2	49.8
WEC	PRS GT3 13.8 3	49.8
WEC	PRS GT4 13.8 4	49.8

Effect of Load Shed	MW	Pre CTG Values	Post CTG Value	Sum Emergency
Base Case	-	105 MW, 452 Amps	1044 Amps	950 Amps
Shed Paris, Dec Byron	20	96.2 MW, 413.5 Amps	1005 Amps	950 Amps
Shed Air Liquide	+9	93.8 MW, 402.8 Amps	995 Amps	950 Amps
Shed Burlington	+31	84.6 MW, 366 Amps	952 Amps	950 Amps
Total Load Shed	60	Post CTG Value: 955 Amps		

Redispatch Relief Paris = 105 – 96.2 = 8.8 MW

Paris Load Effect: 8.8 MW = 20 MW*(x-(-0.02)) = 0.42 LSF or 42%

Redispatch Relief Air Liquide = 96.2 – 93.8 = 2.4 MW

Air Liquide Load Effect: 2.4 MW = 9*(x-(-0.02)) = 0.25 LSF or 25%

Redispatch Relief Burlington = 93.8 – 84.6 = 9.2 MW

Burlington Load Effect: 9.2 MW = 31*(x-(-0.02))=0.27 LSF or 27%

Redispatch and Load Shed Impact

- Redispatch and Shed Load in the vicinity of the Constraint Element should provide same result.

Effect of Redispatch	MW	Pre CTG Values	Post CTG Value	Sum Emergency
Base Case	-	105 MW, 452 Amps	1044 Amps	950 Amps
Inc Paris, Dec Byron	50	84.3 MW, 366 Amps	973.3 Amps	950 Amps
Inc Paris, Dec Byron	+10	80.1 MW, 348 Amps	954 Amps	950 Amps
Total Redispatch	60	Post CTG Value: 954 Amps		

Effect of Load Shed	MW	Pre CTG Values	Post CTG Value	Sum Emergency
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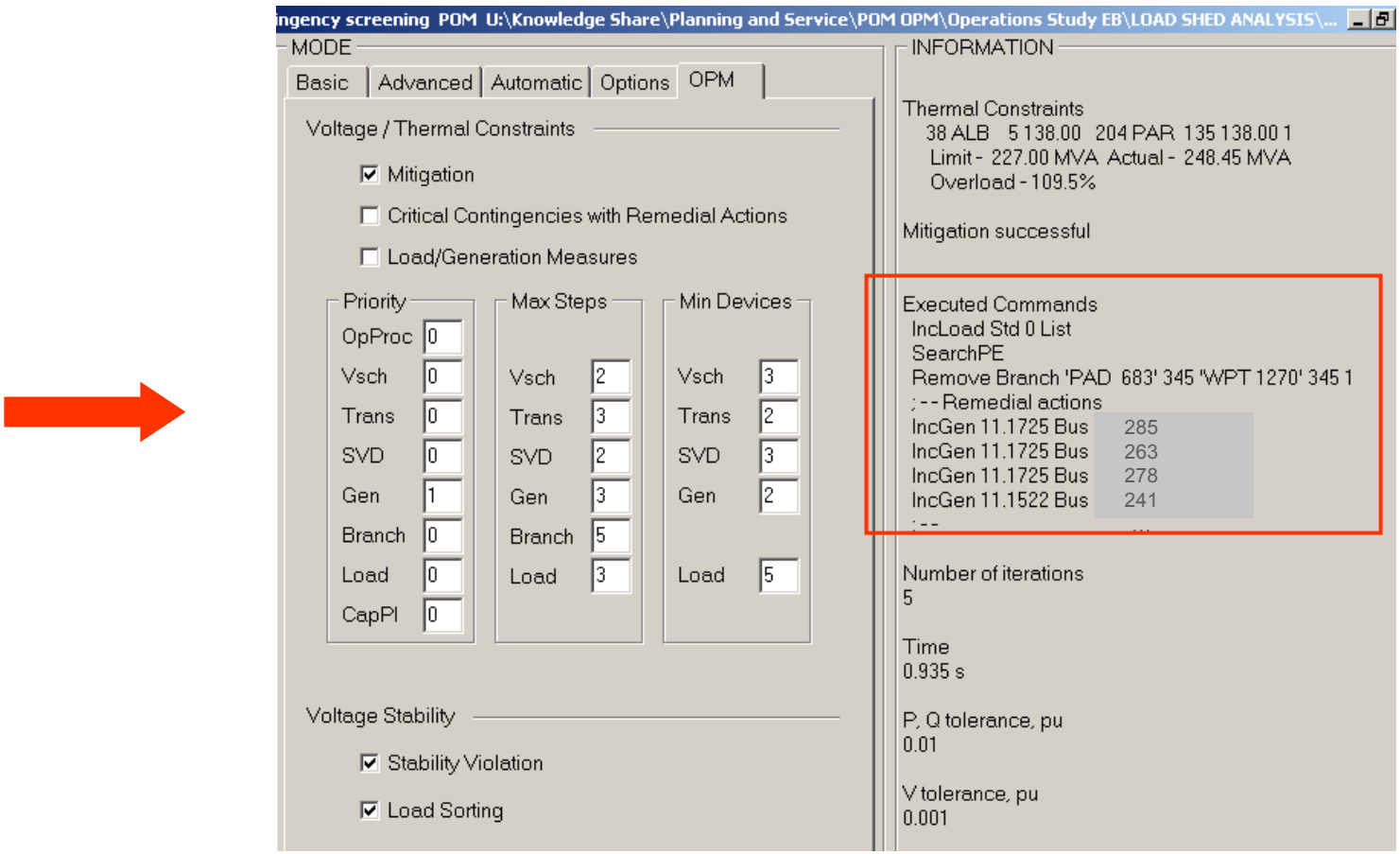
Shed Burlington	+31	84.6 MW, 366.7 Amps	952 Amps	950 Amps
Total Load Shed	60	Post CTG Value: 955 Amps		

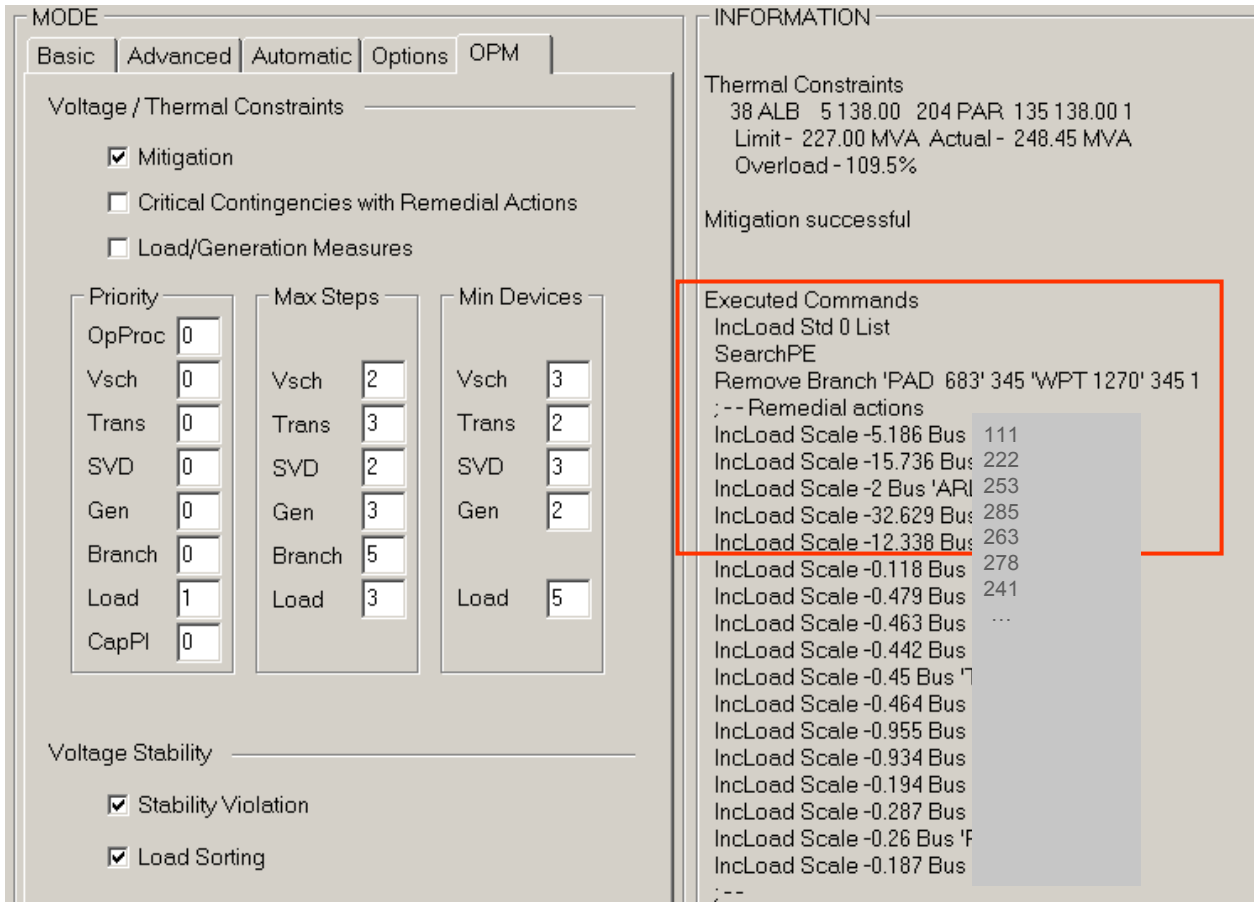
OPM Mitigation Plan
Generation Redispatch

- Remedial Action Scheme: Generation Redispatch Only. Estimate of 45 MW of redispatch needed to bring 3124 loading below emergency rating.



OPM Mitigation Plan
Load Curtailment

- Remedial Action Scheme: Load Curtailment Only. Estimate of 70 MW of load curtailment needed to bring 3124 loading below emergency rating.



Evaluate Effectiveness of Op Guide for Albers - Paris

- Implement Operating Procedure as Mitigation Option: Redispatch 60 MW where inc unit is Paris, and dec unit is Pleasant Prairie. Result proved that 60 MW **wouldn't mitigate** the contingent overload on Albers – Paris.

Operating Procedure:

If Branch 39249 39410 07 is Thermal then

IncGen 50 Generator 114 02

IncGen 10 Generator 113 03

IncGen -60 Generator 224 31

end

POM-OPM Result:

```
1 Op 1      39058 PAD 345  345.00 - 36406 WEMPLB 3 345.00 47
                  Pre-Mitigation
                  Thermal Constraints
                   39249 ALBERS-2 138.00 39410 PARIS WE 138.00 07
                      Limit -  215.00 MVA  Actual -  259.02 MVA (From)
                      Overload - 120.5%

                  Post-Mitigation

                  Commands

                  ; Predefined Operating Procedure 1
                    IncGen 50 Generator 114 02
                    IncGen 10 Generator 113 03
                    IncGen -60 Generator 224 31
                  Set Bus 1144 Vsch 0.95
                  Set Bus 39141 Vsch 1.049
                  Set Bus 1141 Vsch 0.98093
                  Set Bus 1074 Vsch 1.0121
                  Set Bus 36421 Vsch 1.05029
                  IncGen 1.272 Bus 39141
                  IncGen 3.594 Bus 114
                  IncGen 3.605 Bus 112
                  IncGen 3.612 Bus 113
                  IncGen 3.606 Bus 111
```

Evaluate Effectiveness of Op Guide for Albers - Paris

- Implement Operating Procedure as Mitigation Option: Redispatch 80 MW where inc unit is Paris, and dec unit is Pleasant Prairie. Result proved that 80 MW **would mitigate** the contingent overload on Albers – Paris.

POM-OPM Result:

1 Op 1 39058 PAD 345 345.00 - 36406 WEMPLB 3 345.00 47
Pre-Mitigation

Thermal Constraints
39249 ALBERS-2 138.00 39410 PARIS WE 138.00 07
Limit - 215.00 MVA Actual - 259.02 MVA (From)
Overload - 120.5%

Post-Mitigation

Commands

; Predefined Operating Procedure 1
IncGen 65 Generator 114 02
IncGen 15 Generator 113 03
IncGen -80 Generator 224 31

Operating Procedure:

If Branch 39249 39410 07 is Thermal then

IncGen 65 Generator 114 02

IncGen 15 Generator 113 03

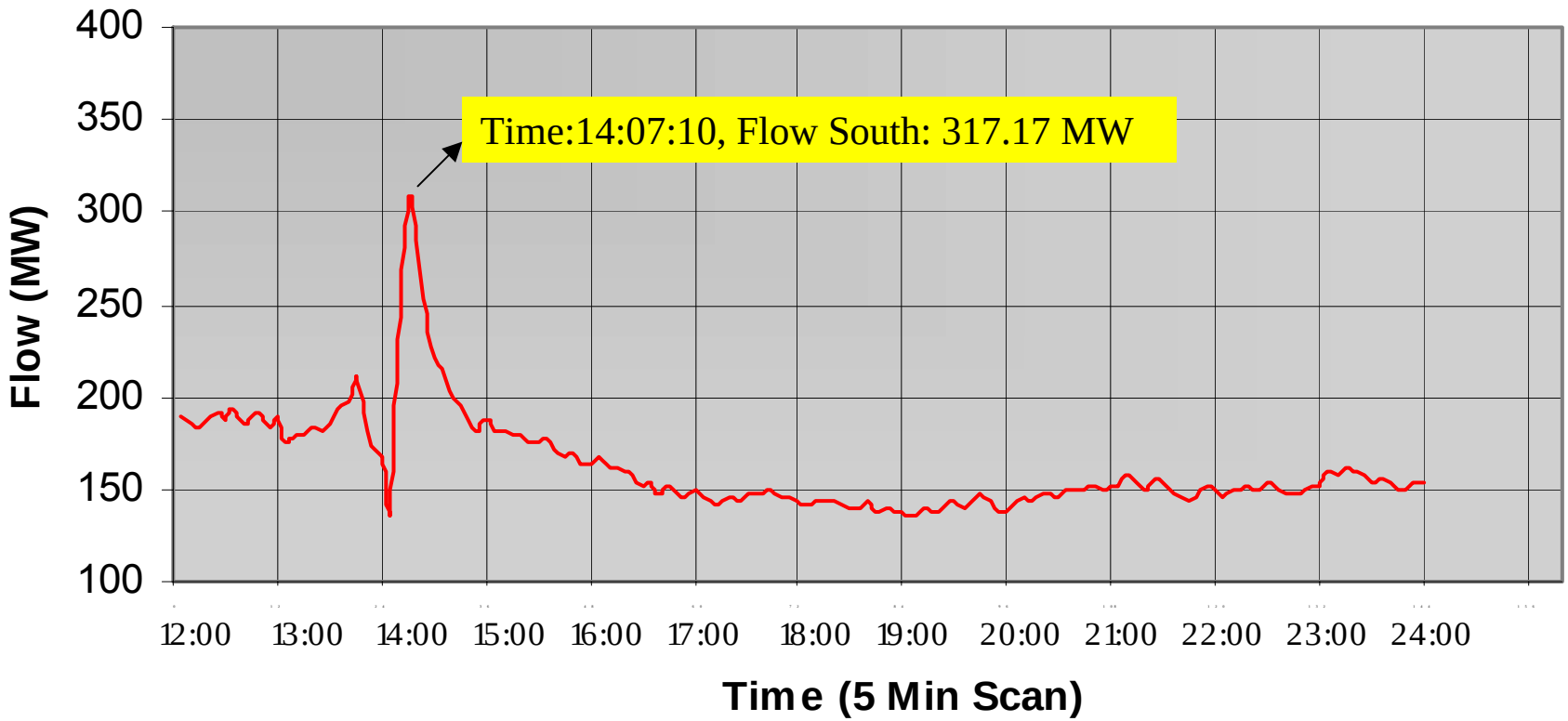
IncGen -80 Generator 224 31

end

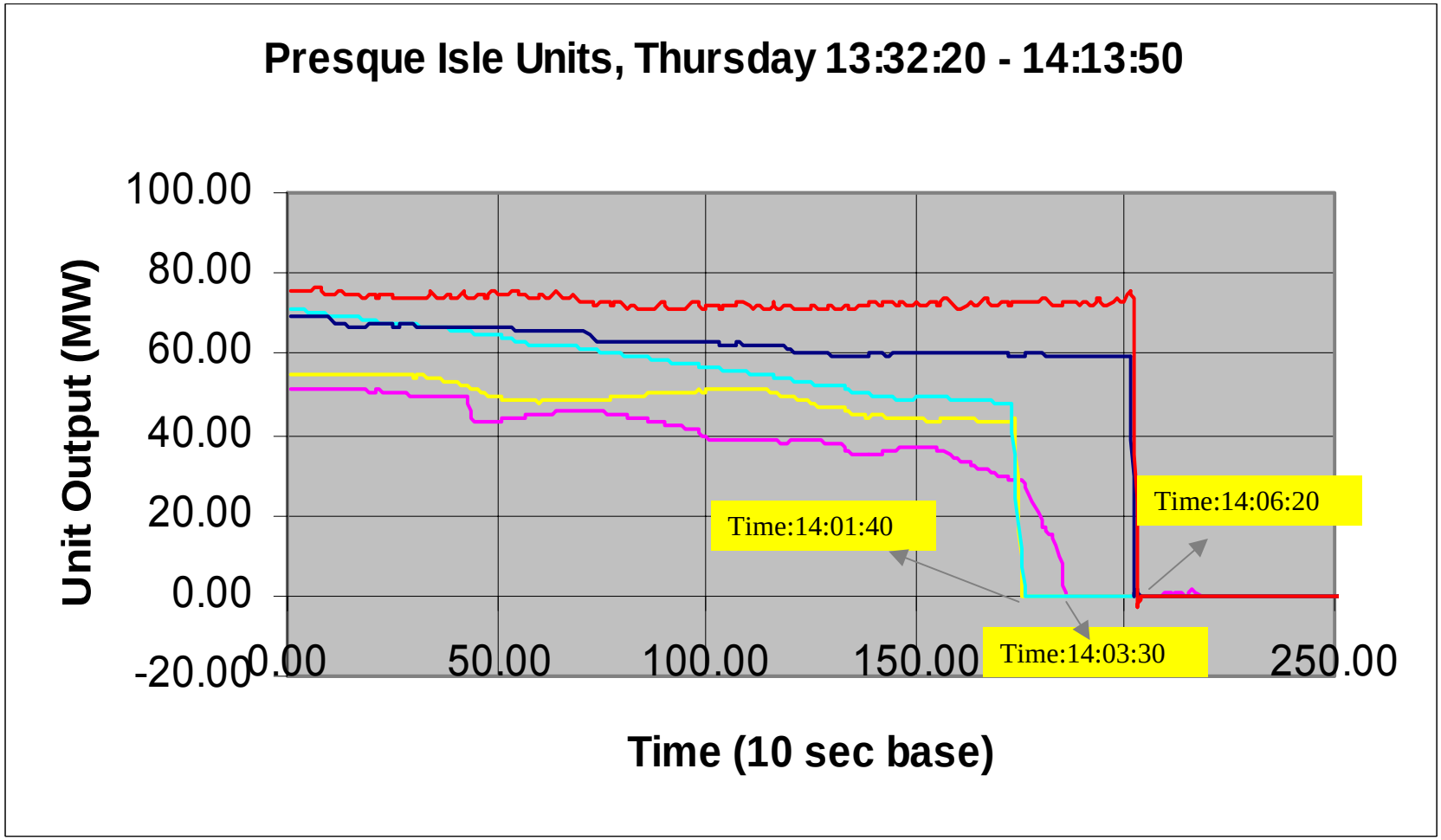
Flow South Flowgate

- During heavy flows from the South into the Wisconsin/Upper Michigan area a combination of thermal and voltage collapse conditions may occur for loss of the Morgan – Plains 345 kV (35321) transmission line.
- Flowgate 3567 Morgan-Plains, Stiles-Amberg & Stiles Crivitz 138kV has been created to monitor the thermal and voltage stability limit.

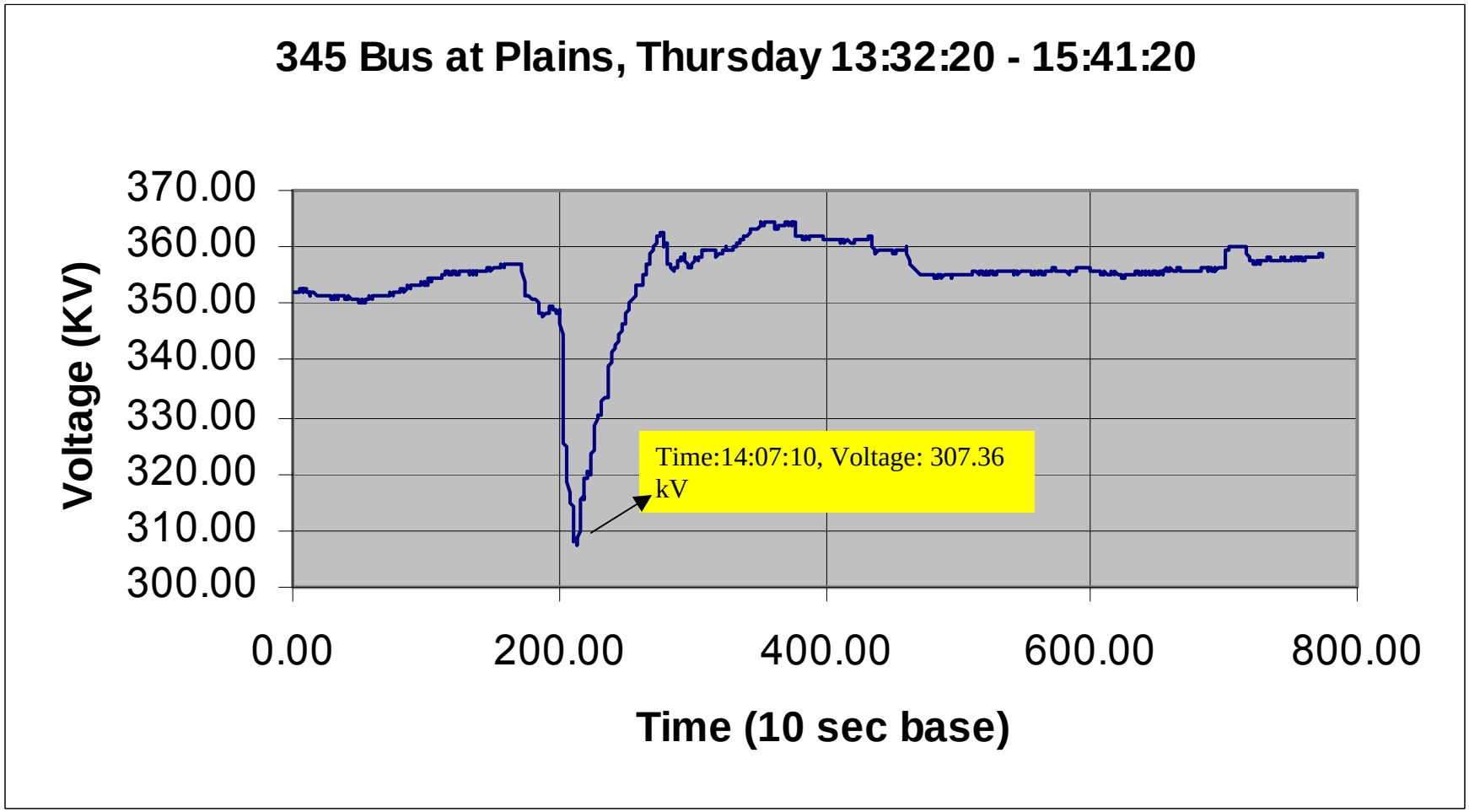
ATC Emergency Event
MAY 15, 2003



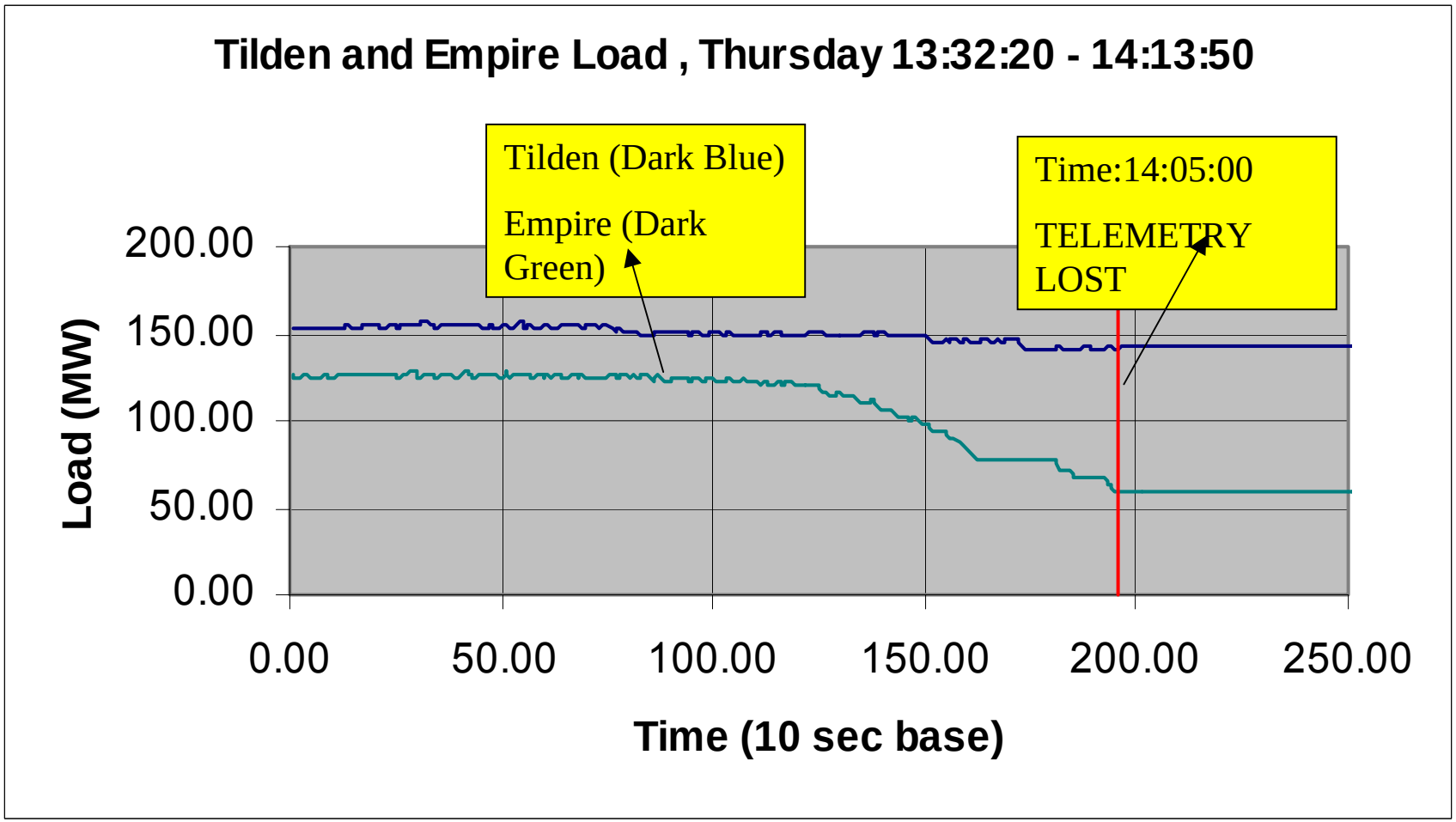
ATC Emergency Event
MAY 15, 2003



ATC Emergency Event
MAY 15, 2003

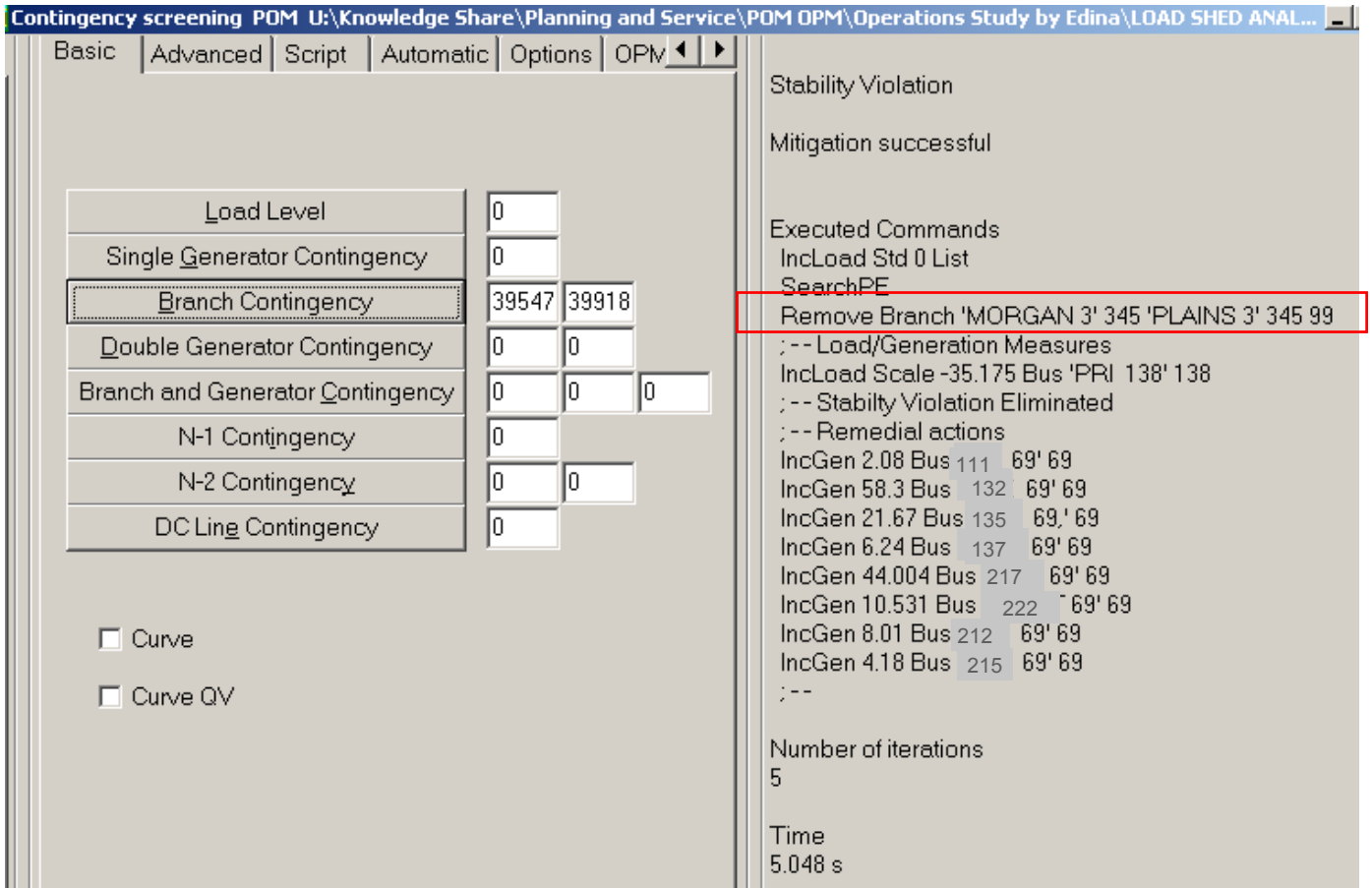


ATC Emergency Event
MAY 15, 2003



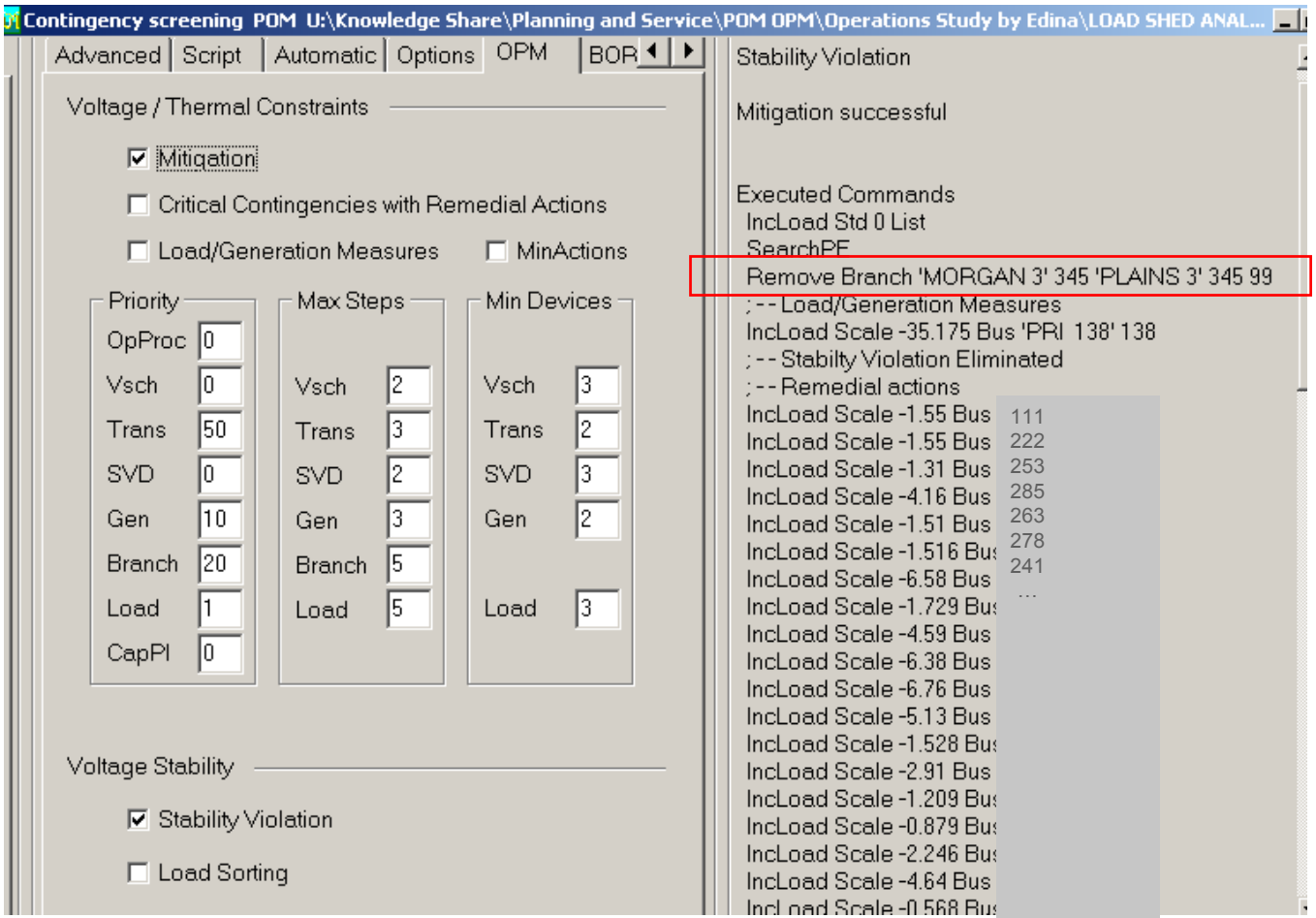
OPM Mitigation Plan For Flow South. Case 1

- Problem Definition: Trip of Presque Isle Units
- Remedial Action Scheme for Flow South consists of Load Curtailment and Generation Redispatch.



OPM Mitigation Plan For Flow South. Case 1

- Problem Definition: Trip of Presque Isle Units
- Remedial Action Scheme for Flow South consists of Load Curtailment in UP



OPM Mitigation Plan For Flow South. Case 2

- Problem Definition: Trip of one unit at Presque Isle
- Proposed Operating Procedure consists of redispatch of 5 MW

1 Op 1 39547 MORGAN 3 345.00 - 2026 PLA 345 345.00 99

Pre-Mitigation

Thermal Constraints
1748 CRI 138 138.00 1621 STI 138 138.00 60
Limit - 135.00 MVA Actual - 138.08 MVA (From)
Overload - 102.3%

Post-Mitigation

Thermal Constraints
1748 CRI 138 138.00 1621 STI 138 138.00 60
Limit - 135.00 MVA Actual - 135.31 MVA (From)
Overload - 100.2%

Commands

; Predefined Operating Procedure 1
IncGen 5 Generator 298 44
IncGen -5 Generator 1945 26

Operating Procedure:

If Branch 1748 1621 60 is Thermal then

IncGen 5 Generator 298 44

IncGen -5 Generator 1945 26

end

OPM Mitigation Plan For Flow South. Case 2

- Problem Definition: Trip of one unit at Presque Isle
- Proposed Operating Procedure consists of redispatch of 7 MW

1 Op 1 39547 MORGAN 3 345.00 - 2026 PLA 345 345.00 99

Pre-Mitigation

Thermal Constraints
1748 CRI 138 138.00 1621 STI 138 138.00 60
Limit - 135.00 MVA Actual - 138.08 MVA (From)
Overload - 102.3%

Post-Mitigation

Thermal Constraints
1748 CRI 138 138.00 1621 STI 138 138.00 60
Limit - 135.00 MVA Actual - 134.76 MVA (From)
Overload - 99.8%

Commands

; Predefined Operating Procedure 1
IncGen 7 Generator 298 44
IncGen -7 Generator 1945 26

Operating Procedure:

If Branch 1748 1621 60 is Thermal then

IncGen 7 Generator 298 44

IncGen -7 Generator 1945 26

end

POM-OPM Reliability Software Comparison

Features		POM - OPM 2.2	POM - OPM 2.4	Comment
Power Flow Solutions		AC/ DC	AC/DC	The POM - OPM incorporates a full Newton method that is used to solve nonlinear power flow equations. The contingency screening technique uses the full AC analysis. OPM uses a fast optimal power flow solution algorithm. In addition, the POM - OPM version 3.0 will incorporate general solutions method, and non-iterative solution (with the objective to minimize bus mismatches by solving power flow)
POM Functionality	POM General Overview	✓	✓✓	The POM 2.4 has two new features: "QV curve" and "Thermal Constraint" per branch limit". The POM program performs massive contingency analysis for large power systems. It has ability to identify critical contingencies while monitoring thermal and voltage constraints, and voltage stability violations; it computes voltage stability margins, monitors flowgates, simulates power transfers, and has ability to draw voltage (PV), thermal, flowgate, and stability violation curves.
	Contingency Analysis	✓	✓	Both versions of the POM - OPM, 2.2 and 2.4, automatically generate N-1 and N-2 contingency lists; have capabilities to analyze user defined "complex" contingencies (that may consist of one or more power system elements to be taken out of service simultaneously). In addition, the POM - OPM version 3.0 has ability to automatically generate N-3 contingencies. Also, the POM-OPM version 3.0 will have ability to combine two lists on N-1 contingencies into a list of N-2 contingencies, and to run partial contingency lists.

POM-OPM Reliability Software Comparison Cont.

	Flowgates	✓	✓	Both versions of the POM - OPM, 2.2 and 2.4, have ability to monitor flowgates.
	Monitoring of constraints	✓	✓✓	Both versions of the POM - OPM, 2.2 and 2.4, monitor thermal and voltage constraints, and voltage stability violations independently. The POM 2.4 has new feature of monitoring thermal constraint simultaneously with the voltage stability constraint. In addition, thermal constraint.txt file in the POM 2.4 has a new feature of monitoring different percent loading per branch limit (either branch Amps loading or branch MVA loading is checked against designated branch rating).
	Power transfers	✓	✓	Both versions 2.2 and 2.4 of the POM - OPM have ability to simulate power transfers.
	Graphical Pane (curves tab and on-line diagram)	✓	✓✓	Both versions 2.2 and 2.4 of the POM - OPM have ability to draw voltage (PV), thermal, flowgate, and stability violation curves. In addition, the POM 2.4 has a new feature of plotting QV curve.
	OPM Rating	✓	✓✓	The OPM 2.4 has two new features: "Switching not affected lines" and "MinActions". The OPM program can alleviate or reduce thermal, voltage violations, and voltage stability violations that are detected in the POM, after a contingency is applied or load is scaled. Mitigation measures include: Capacitor or reactor switching, transformer tap change, MW and MVAR dispatch, line switching (in and out), optimal capacitor placement for planning studies, and load curtailment.

POM-OPM Reliability Software Comparison Cont.

OPM Functionality	New OPM feature of "Switching Not Affected Lines"	O	✓	The OPM 2.4 new feature can completely or partially alleviate thermal overloads by opening not overloaded lines. This option is tested on two different cases: Oak Creek and Ellinwood Transformers overloads. The testing was successful; furthermore, this option proved to be useful in developing plans for operating transmission power system and for protecting the system against N-1 contingencies. The measure reduces or alleviates contingency overloads without causing new thermal, voltage and voltages stability violations. It is limited to opening two lines -- maximum.
	Operating Procedure	X	✓	Both versions of the POM - OPM, 2.2 and 2.4, have "Operating Procedure" implemented as part of the OPM Mitigation Measure. This feature was tested in 2.2 with the ATC EMS raw file data; the application recognized the code; however, run was not successful. V&R group advised to uncheck Bus Name Referencing as Options in POM – and then to run Operating Procedure as part of the mitigation. The Operating Procedure, as advised, was tested on POM-OPM 2.4 and is working fine.
	New OPM feature of using "MinActions Option" in OPM	O	✓	The OPM 2.4 new feature further minimizes the amount of control actions used to alleviate violations. Please note that this option was tested on two different cases: Weston stability, and North Appleton – Rocky Run N-1 thermal and voltage violations with Arpin – Eau Claire out of service in base case. The "MinActions" feature minimized mitigation measures that are used to alleviate voltage and thermal violations for North Appleton – Rocky Run N-1 case. This feature did not work for Weston stability problem. This addition of implementing "MinActions" that will minimize mitigation measure during voltage stability problem will be implemented in the POM - OPM version 3.0 as per V&R.

POM-OPM Reliability Software Comparison Cont.

Solution parameters (Maximum step/Minimum devices)	✓	✓	Both versions 2.2 and 2.4 of the POM - OPM have ability to simulate power transfers. By selecting bigger maximum step, simulation time is longer, however, results tend to be more accurate.
Maintenance and Customer Support	✓	✓	V&R group is very responsive in providing support to ATC. In numerous instances EMS PSSe or planning PSSe cases with identified thermal, voltage, and voltage stability violations have been sent to V&R; solutions are delivered in a short time. In addition, the team is responsive to implement any new suggestions and improvements to the future versions of the POM - OPM.
Simulation time (POM-contingency analysis plus OPM-remedial action scheme)	✓	✓	Simulation is relatively fast when it comes to the case of EMS 3000 bus numbers. However by using 50000 bus model with modeling one complex contingency, it took software 554 seconds "with MinActions" in OPM, and 542 seconds "without MinActions" in OPM to perform one complex contingency run (Weston 1266 West Breaker failure). Generally, simulation time depends on how many violations the system has and what computational effort for mitigation measures needs to be done to remove violations.
Compatibility with PSS/E Data	✓	✓✓	The POM - OPM can read PSS/E version from 23 to 28. In addition, the POM - OPM 2.4 can read PSS/E version 29.
User friendly	✓	✓	
50,000 buses	No limit	No limit	These numbers can be increased as needed.
700,000 contingencies	No limit	No limit	

Future Work

- Expand the use of POM-OPM in both Planning and System Operations. ATC committed purchase of 4 licenses of POM-OPM 3.0.
- Continue use in System Operations in evaluating the benefits of alternate mitigation plans while studying transmission outages.
- Analyze off-line impact of OPM Load Curtailment recommendations on N-1 contingencies. Pass the user - specified input load list to the Software.

Ideas for Improvements

(V&R Group is presently addressing these needs)

- User-specified Load List in OPM

  The ATC System Operations sees a need to have this option available, because this will help us evaluate effectiveness of the selected load points on the contingencies in our system. This will be very useful in System Emergency Conditions. This will prove to be a good research for off-line OPM Load Shed studies.

- Monitor generator MVAR reserves

  One of the NERC recommendations in Northeast Blackout Report - August 2003 is to have VAR-Management process in the place. Having ability to monitor generator MVAR reserves with respect to changes in Net Load (it could be system load or specifically defined zone in the system) would improve the ability to monitor the system changes. It would be preferable to have this monitoring system defined for Base Case and for Contingencies

Ideas for Improvements

(V&R Group is presently addressing these needs)

- OPM Generation Redispatch and Unit Commitment List in addition to Load Curtailment List

  If OPM is recommending load curtailment as a solution, is it possible to have ability to see also list of generators that are redispatch so that the balance is achieved after load curtailment; possibly to provide additional list that shows which generators have actually moved.

- Optimize redispatch of generation as Mitigation Option.

  In most of the scenarios OPM provided very good locations for redispatch and amount of redispatch. However, in several instances over-estimated redispatch was identified (too much of generation was redispatch to resolve the problem).

Ideas for Improvements

(V&R Group is presently addressing these needs)

- Optimize Load Curtailment as Mitigation Option.

  OPM provides very good locations for load curtailment. However, in several instances over-estimated load curtailment was identified (while OPM attempted to resolve thermal, voltage, and stability problems)

- Have ability to calculate LSF's and GSF's for selected flowgate

- Power Flow Comparison between Base Case and Working Case

  It would be very beneficial to have ability to select one case as your reference, and the following case as working case – in order to capture changes in the system power flow (unit, bus, line, area summaries, transformer summary, company summary, etc). This is a great feature when study maintenance outages -- that is presently available in EMS and PSSE.

Ideas for Improvements

(V&R Group is presently addressing these needs)

- Visualize the Output for System Operators.

  Show (N-1) thermal overload in the form of a horizontal bars, and also show (N-1) voltage violations in the form of horizontal bars.

- Compatibility with Real Time Energy Management System.

Fast Load Shed Selection

- POM-OPM Remedial Action Result

Number of Checked Contingencies: 3

[RESULTS]

Load Level 0 MW

1 Op 3 39547 MORGAN 3 345.00 - 39918 PLAINS 3 345.00 1

Pre-Mitigation

Voltage Constraints

250 RUW 288 69.00 0.902 (< 0.920)

39127 TID 69.00 0.890 (< 0.920)

39129 TOD NA 69.00 0.894 (< 0.920)

Post-Mitigation

Commands

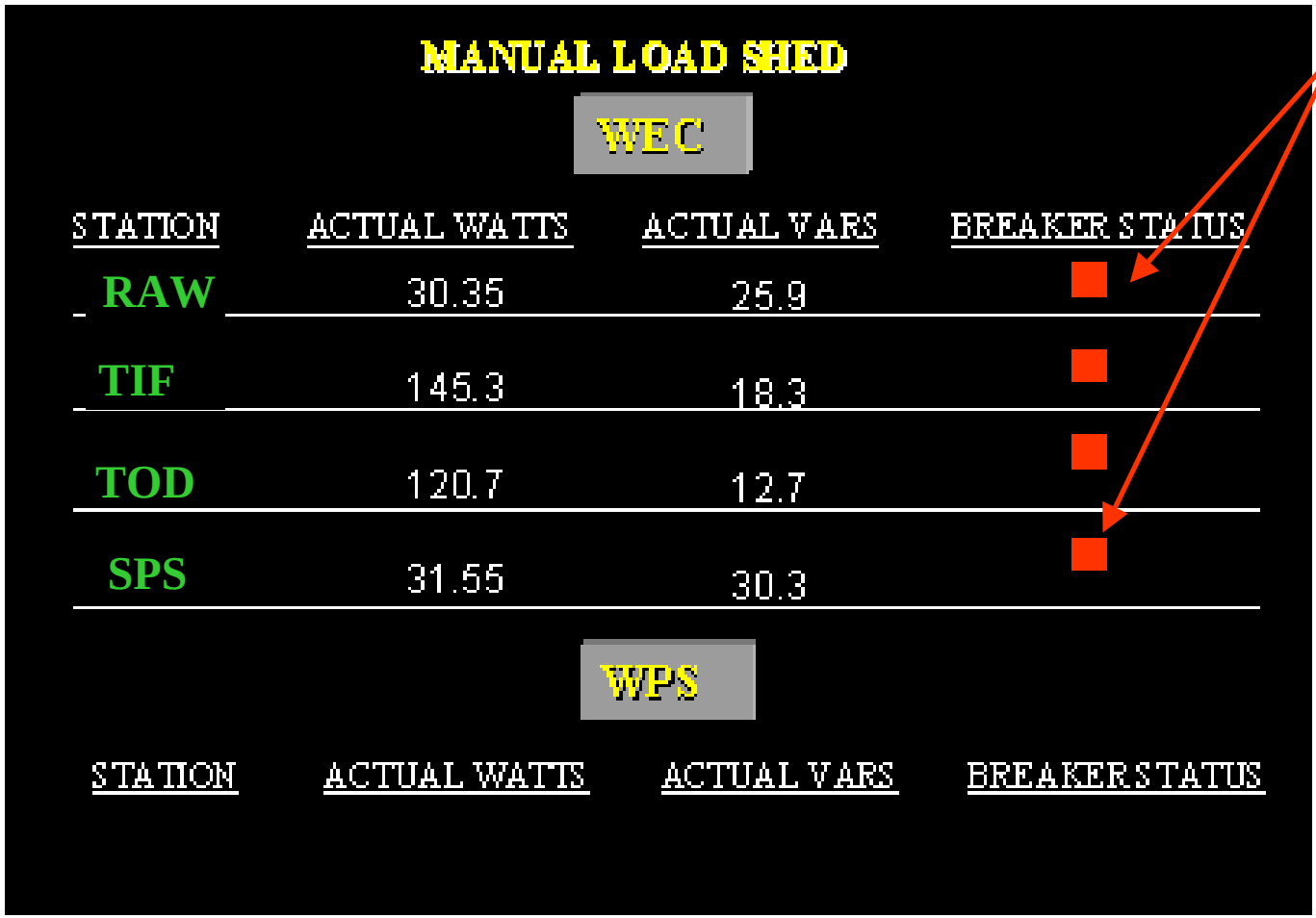
IncLoad Scale –31.5 Bus 39904

IncLoad Scale –30.3 Bus 39526

How can Operator interpret this output?

Fast Load Shed Selection

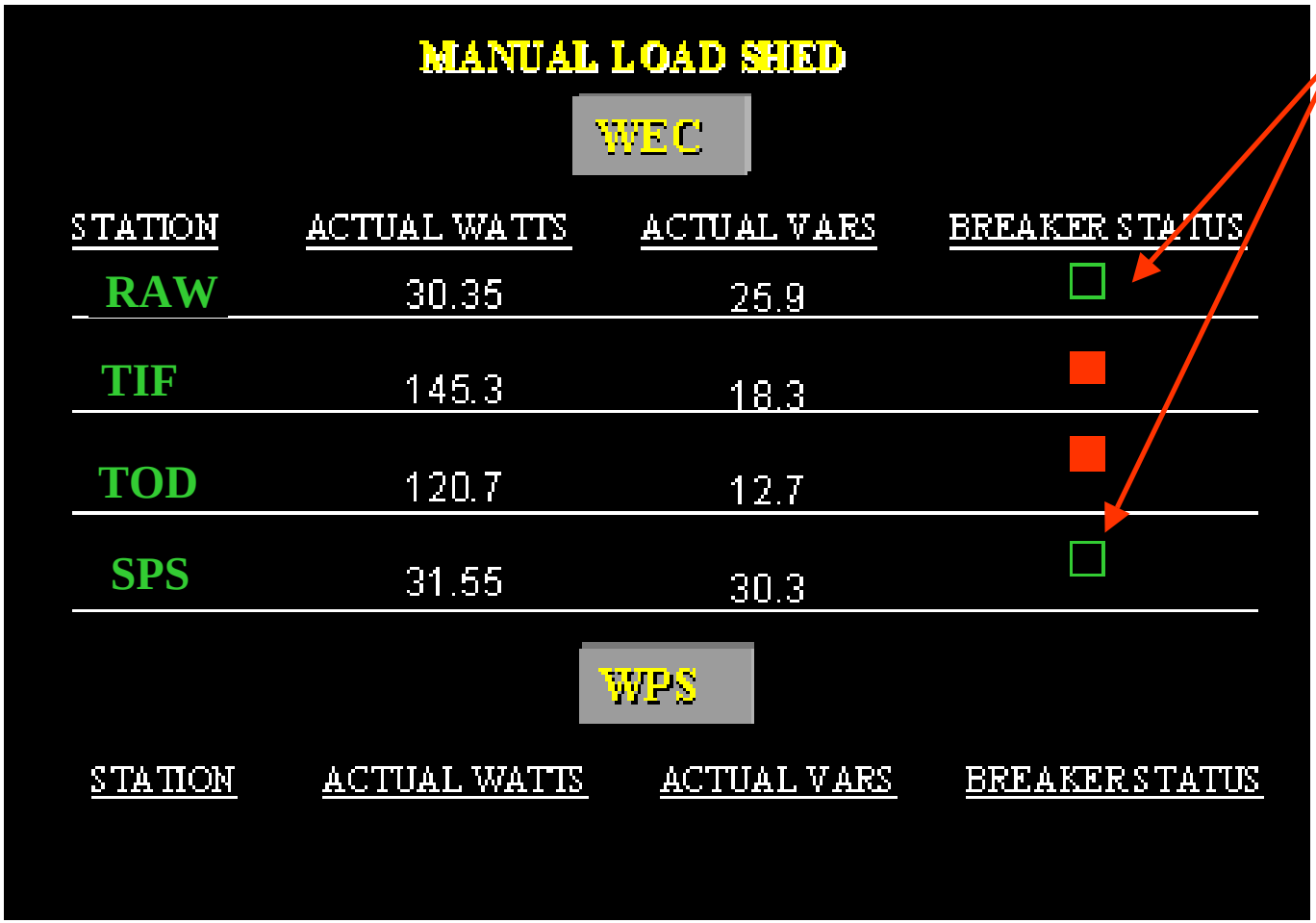
- How Load Shed Application Shed and Restore Load?



- Use Load Shed to shed and restore load simply by pressing a button for the desired loads, and confirming the selection
- Before any load can be shed, Load Shed must be armed by the Operator
- Load Shed will perform an important bookkeeping function by recording its actions. Future Development for EMS Group.

Fast Load Shed Selection

- How Load Shed Application Shed and Restore Load



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