

Review of Major Flowgate Constraints and TSR Metrics

Presented By:

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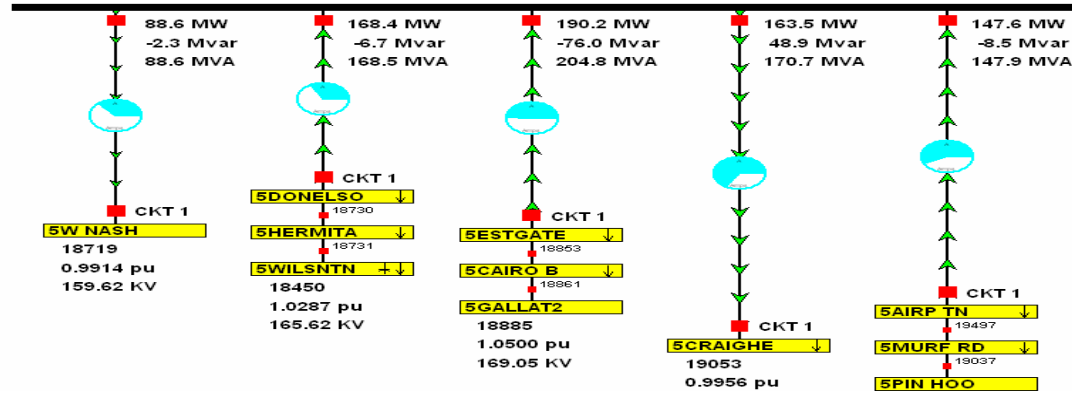


Agenda

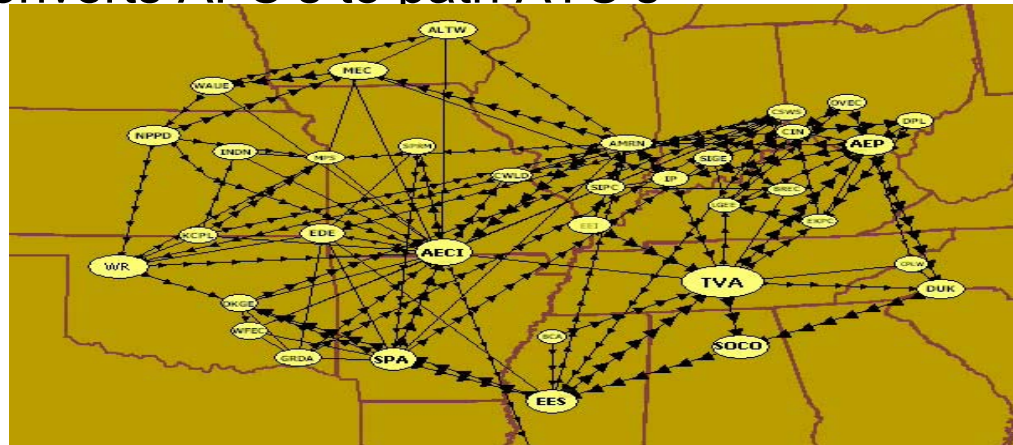
- AFC Process Overview
- Flowgate Overview
- Historical Constraints

AFC Process

- AMB (Automated Model Builder)
 - Creates models and calculates the initial AFC's.



- ATC (Available Transfer Capability)
 - Converts AFC's to path ATC's



Model Inputs

- NERC SDX
 - Generation Outages
 - Transmission Outages
 - Load Forecasts
 - Updated in models hourly
 - MISO, PJM, Entergy, Southern, FPL, SOCO, VACAR
- Generation Dispatch
 - Economic dispatch for all neighboring control areas: PJM, MISO, SOCO, Entergy, Duke, EON, AECI, EKPC, etc...
 - Updated as needed
- Tagdump
 - Schedules used for 48 hourly non-firm cases
 - Updated and modeled in cases hourly
- Path Definitions
 - Source/Sink, POR/POD combinations
- Flowgate Definitions
 - FGs in TVA and neighboring areas



ATC Time Horizons

- ATC values are calculated for each horizon and class as follows:

HORIZON	CLASS	SCHEDULED TIME
Hourly	Non-Firm	Real-time
Daily	Non-Firm	Every 15 minutes
Daily	Firm	Every 15 minutes
Monthly	Non-Firm	Every 15 minutes
Monthly	Firm	Every 15 minutes

Coordination Efforts

- JRCA: Joint Reliability Coordination Agreement
 - Exchange of real-time and forward looking system operating and planning data
 - Coordinated Congestion Management
 - Coordinated System Planning
- CMP: Congestion Management Process
 - Measure and manage untagged market flows
 - Studies emulate current IDC NNL and CA-CA TDF calculations and methodologies using current topology
 - Allows use of temporary flowgates
- ICTE Collaboration
 - Entergy flowgates identified as limiting element 30 times
 - Manual coordination to ensure using most accurate AFC for TSR evaluation



TVA ATC – Since Oct 2007

- 247 AFC Intervals updated every 15 minutes
- 325 flowgates monitored as potential limits
- More than 360000 models generated
- Number of ATC values updated

1.56 Billion

Historical Flowgate Constraints



Flowgates

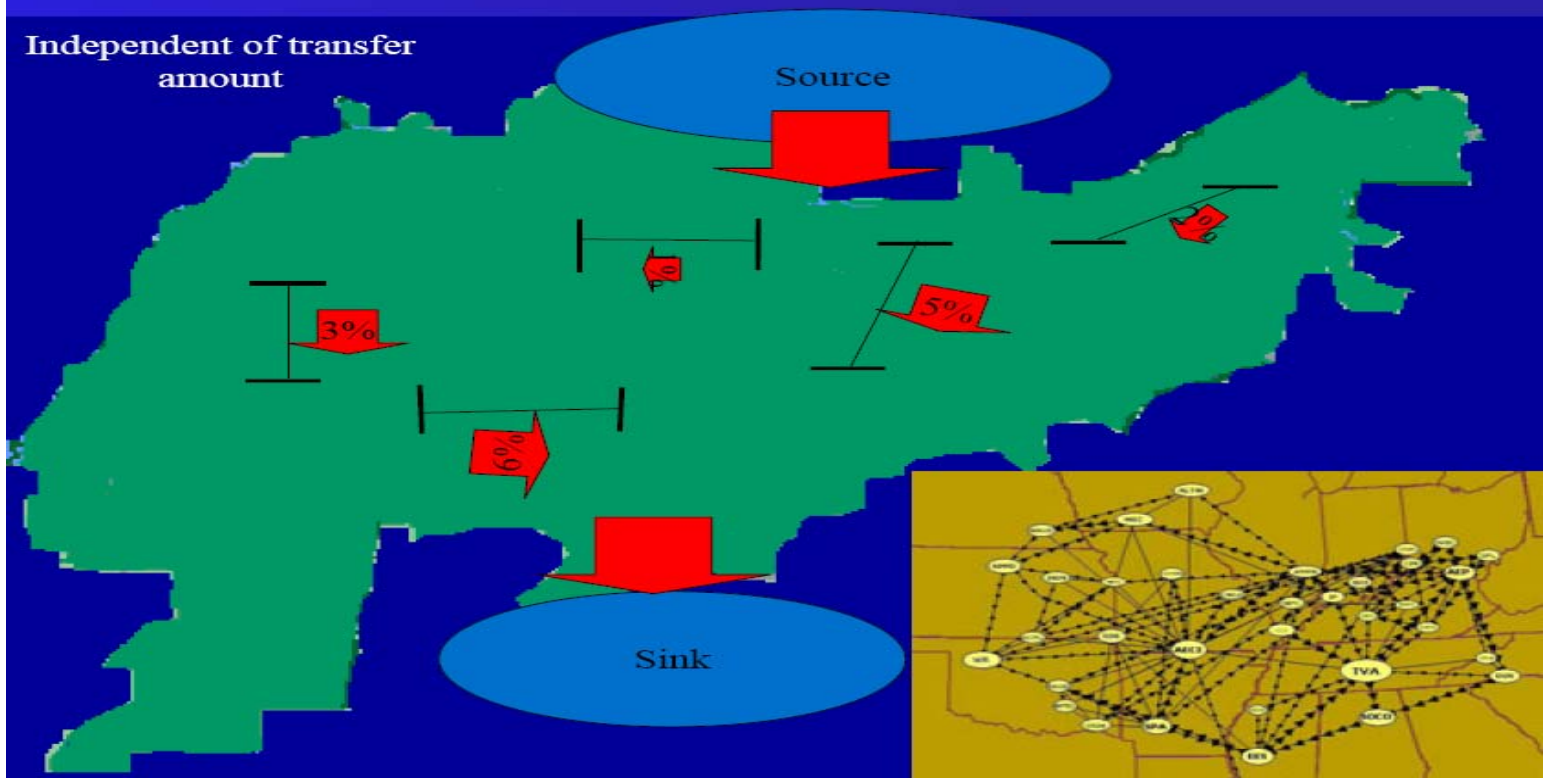
- 325 flowgates in the TVA AFC/ATC process
- 64 Coordinated Flowgates
 - Flowgate impacted by multiple parties
- 261 AFC-only Flowgates
 - Both internal and external flowgates
 - Based on known system constraints

Flowgate Types

- PTDF Flowgate (no outage) $\geq 5\%$ TDF
- OTDF Flowgate (includes outage) $\geq 3\%$ TDF

Transfer Distribution Factors (TDF)

Independent of transfer amount

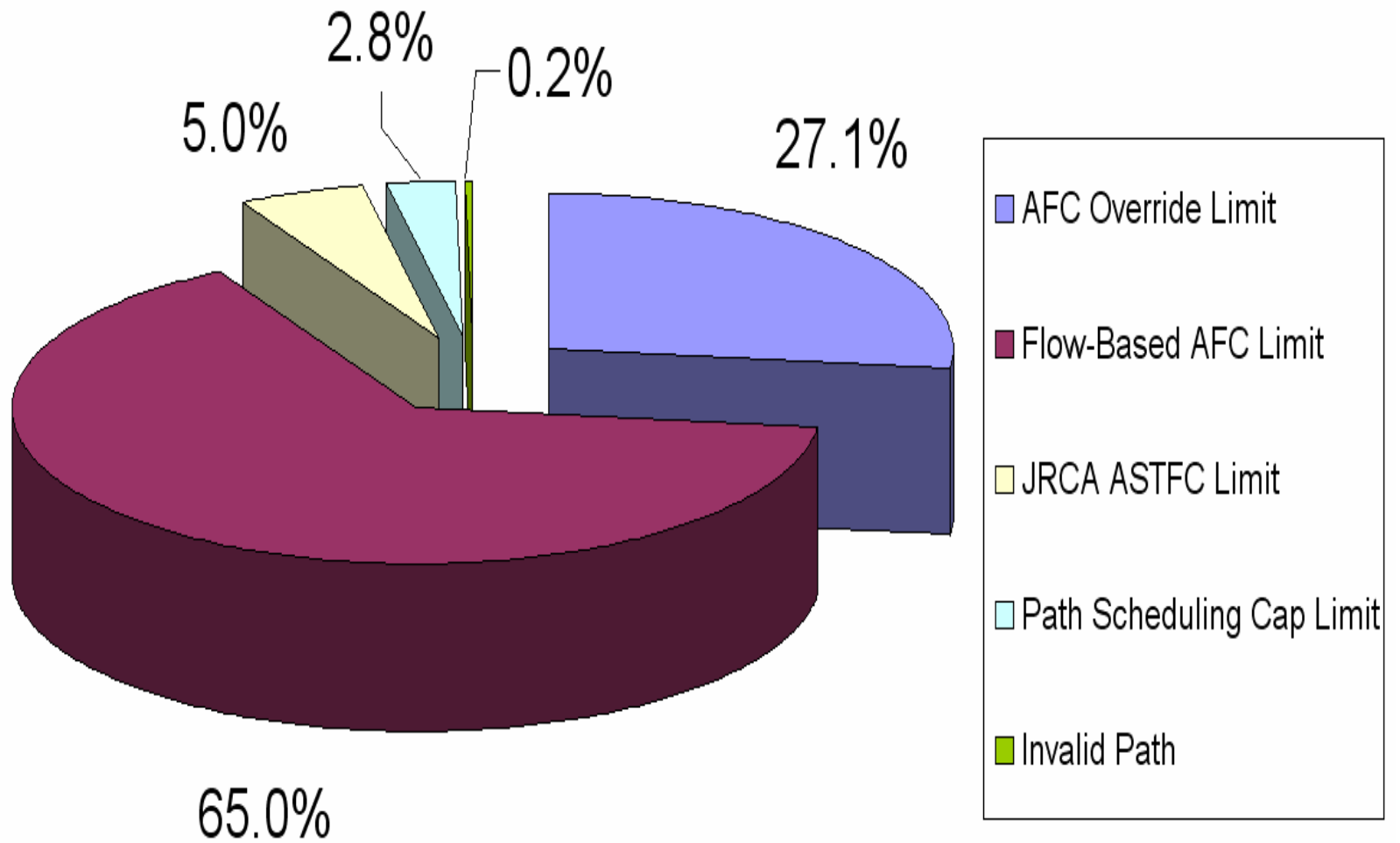


Flowgate Limit Categories

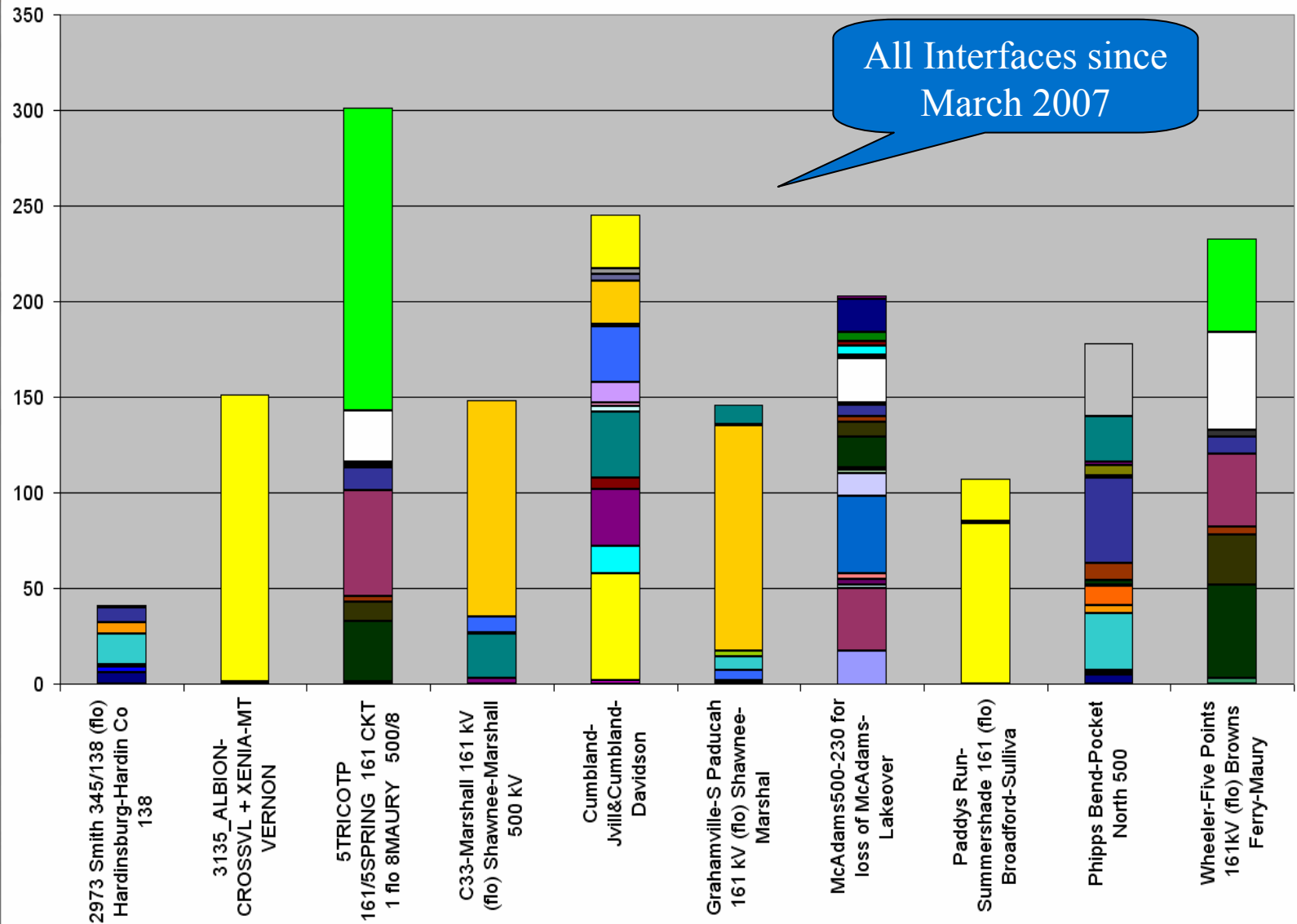
- Flow-based AFC Limit
 - Calculated Available Flowgate Capability
 - Includes TRM, CBM, and ETC (existing impacts)
- JRCA ASTFC Limit
 - Flowgate allocations are honored as specified in the CMP
- AFC Override Limit
 - TVA will use AFC values from other entities where coordination agreements exist
- Path Scheduling Cap Limit

Flowgate Limit Categories

Denied TSRs in last six months

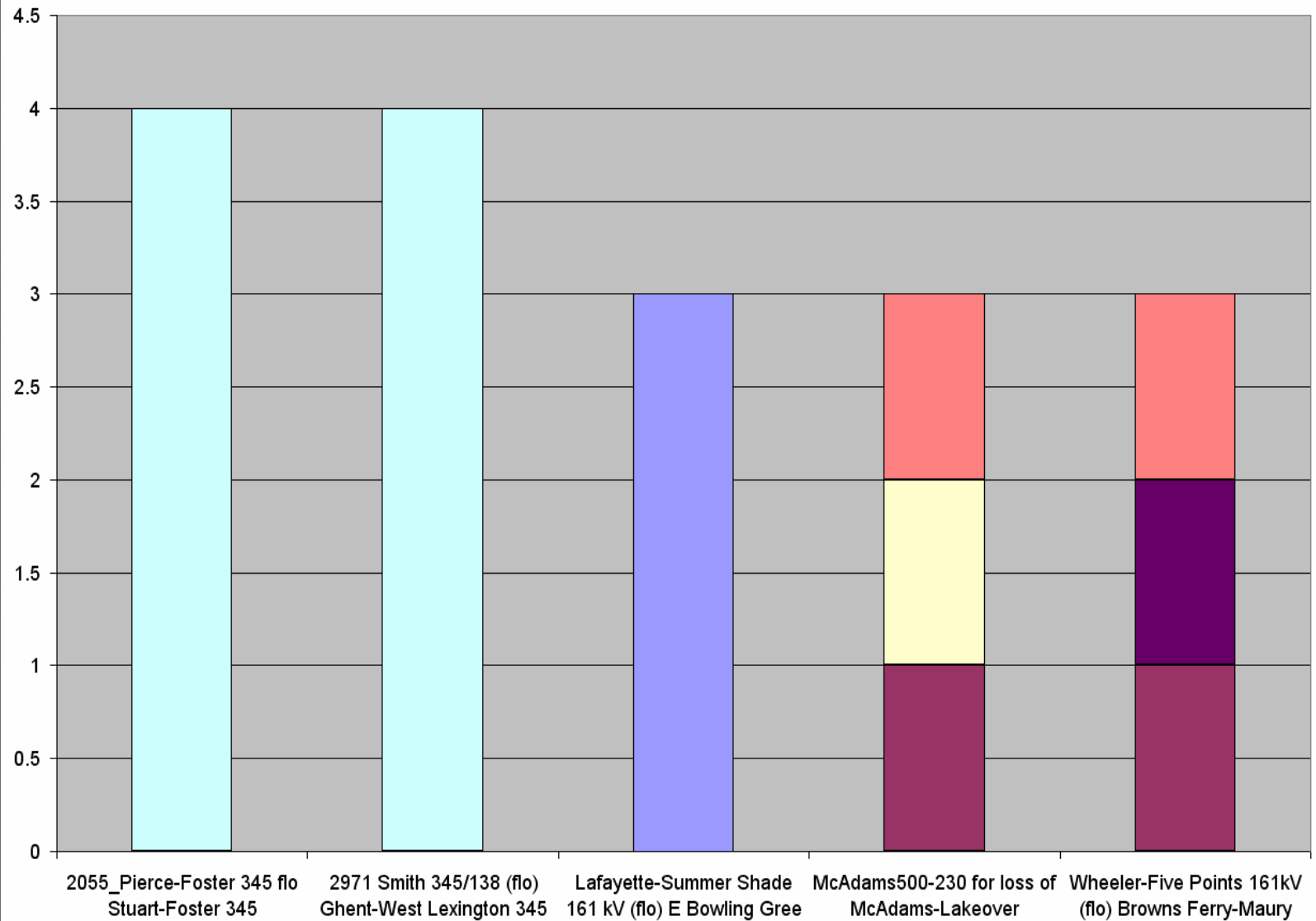


Limiting Elements – Wheels



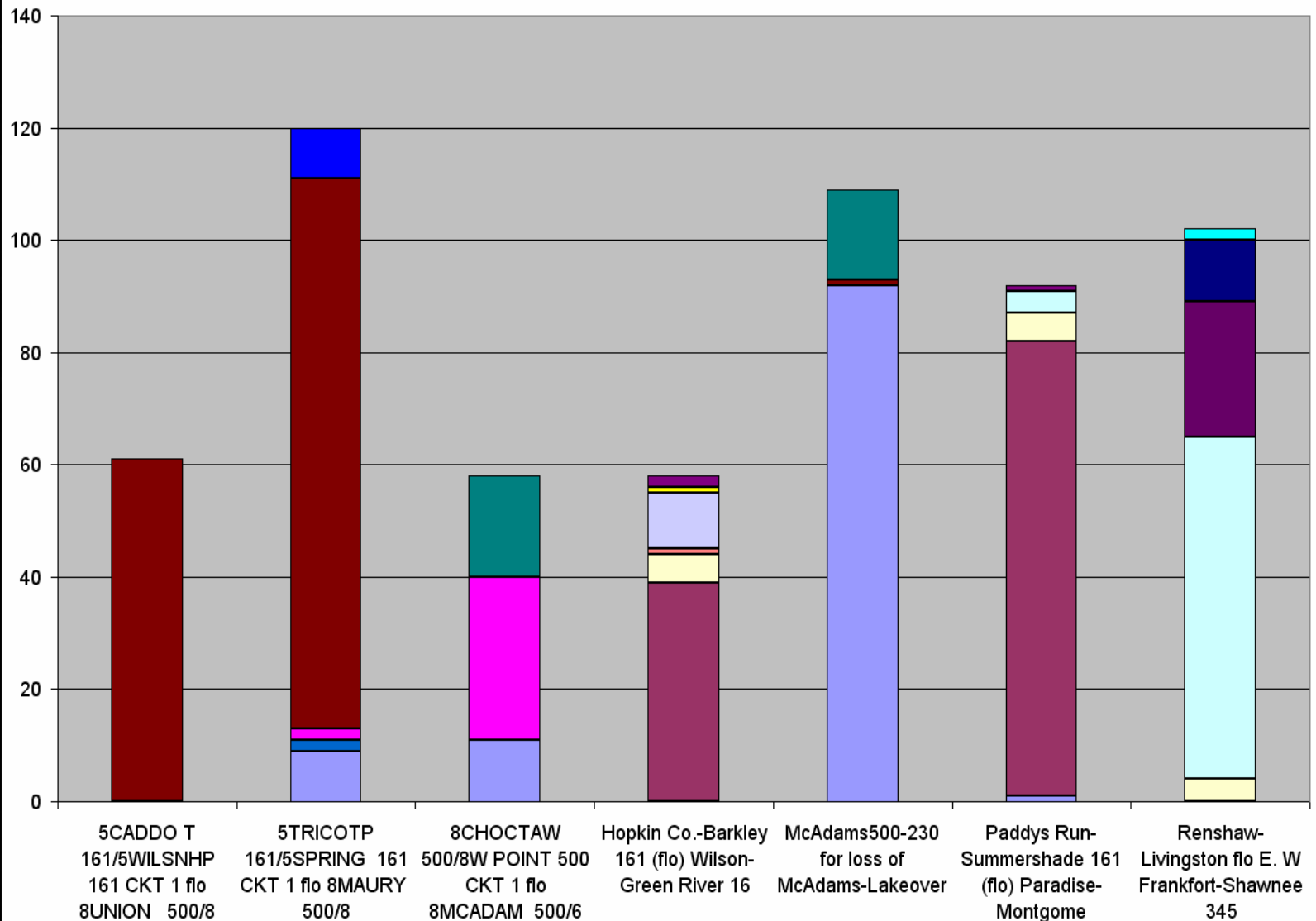


Limiting Elements – Exports

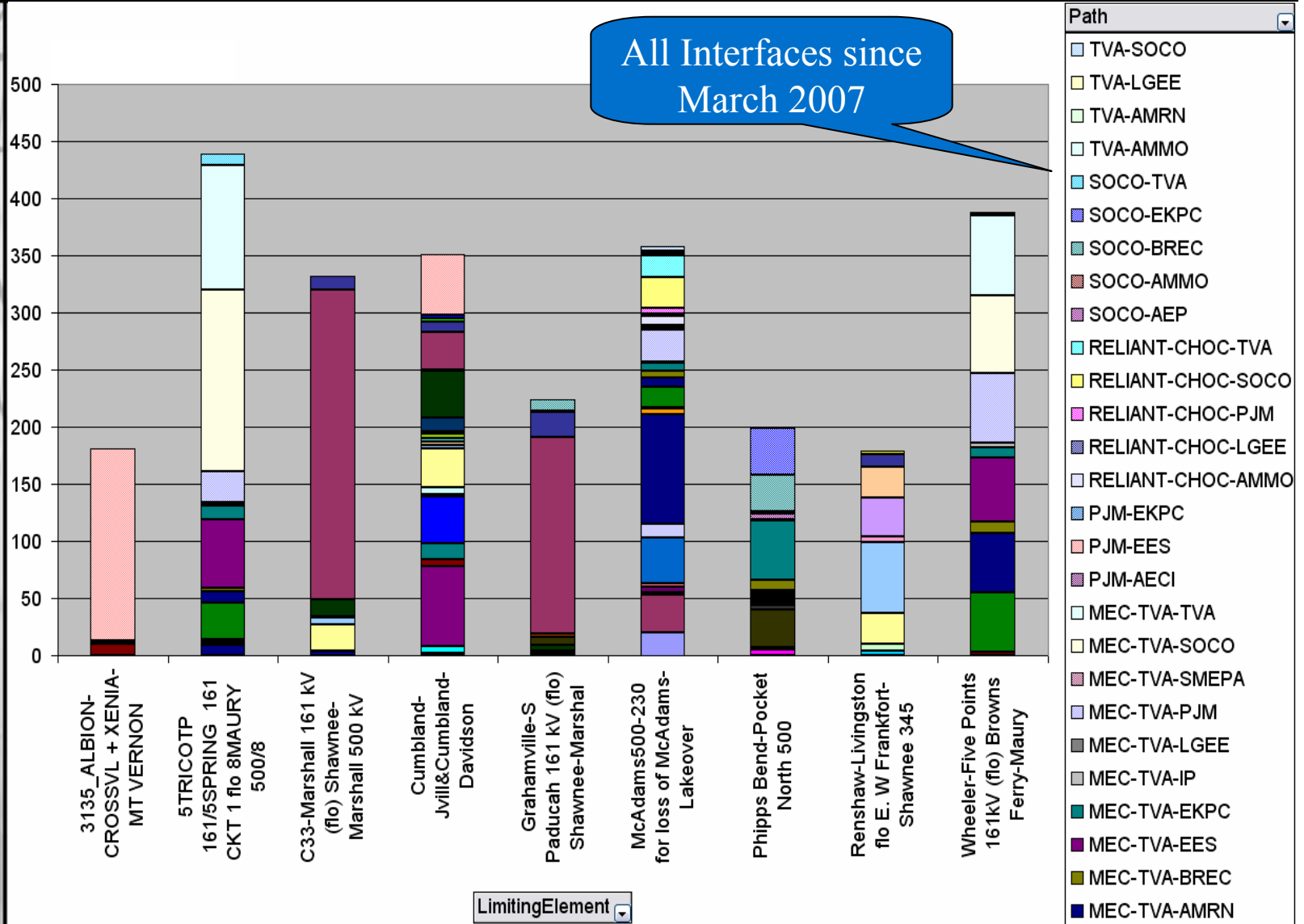




Limiting Elements – Imports



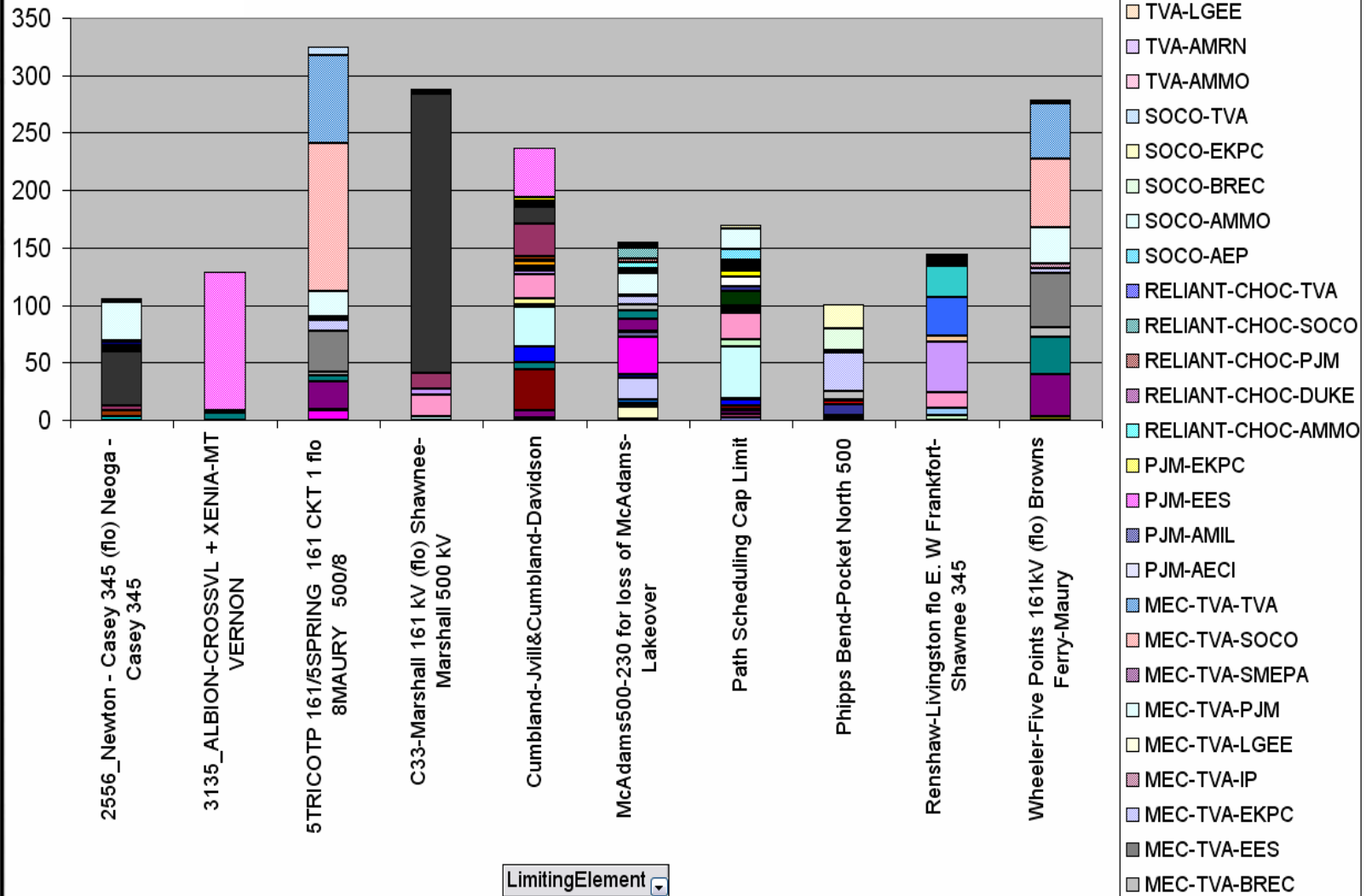
Limiting Elements – All TSRs





Major Constraints – Denied TSRs

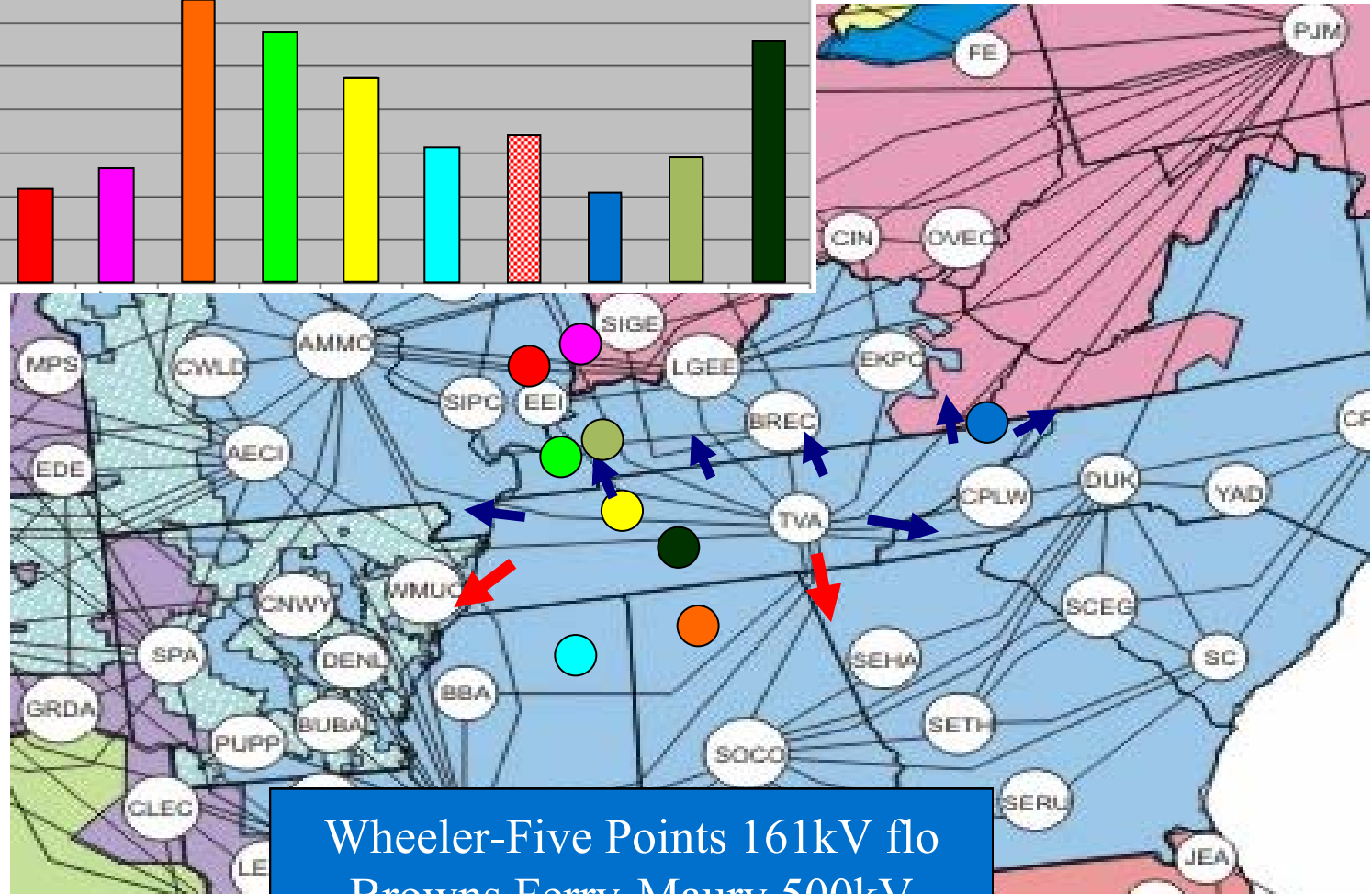
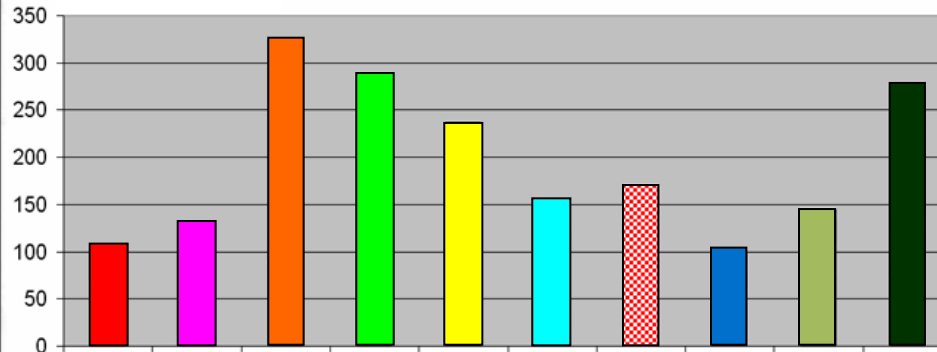
Top 10 Limiting Flowgates



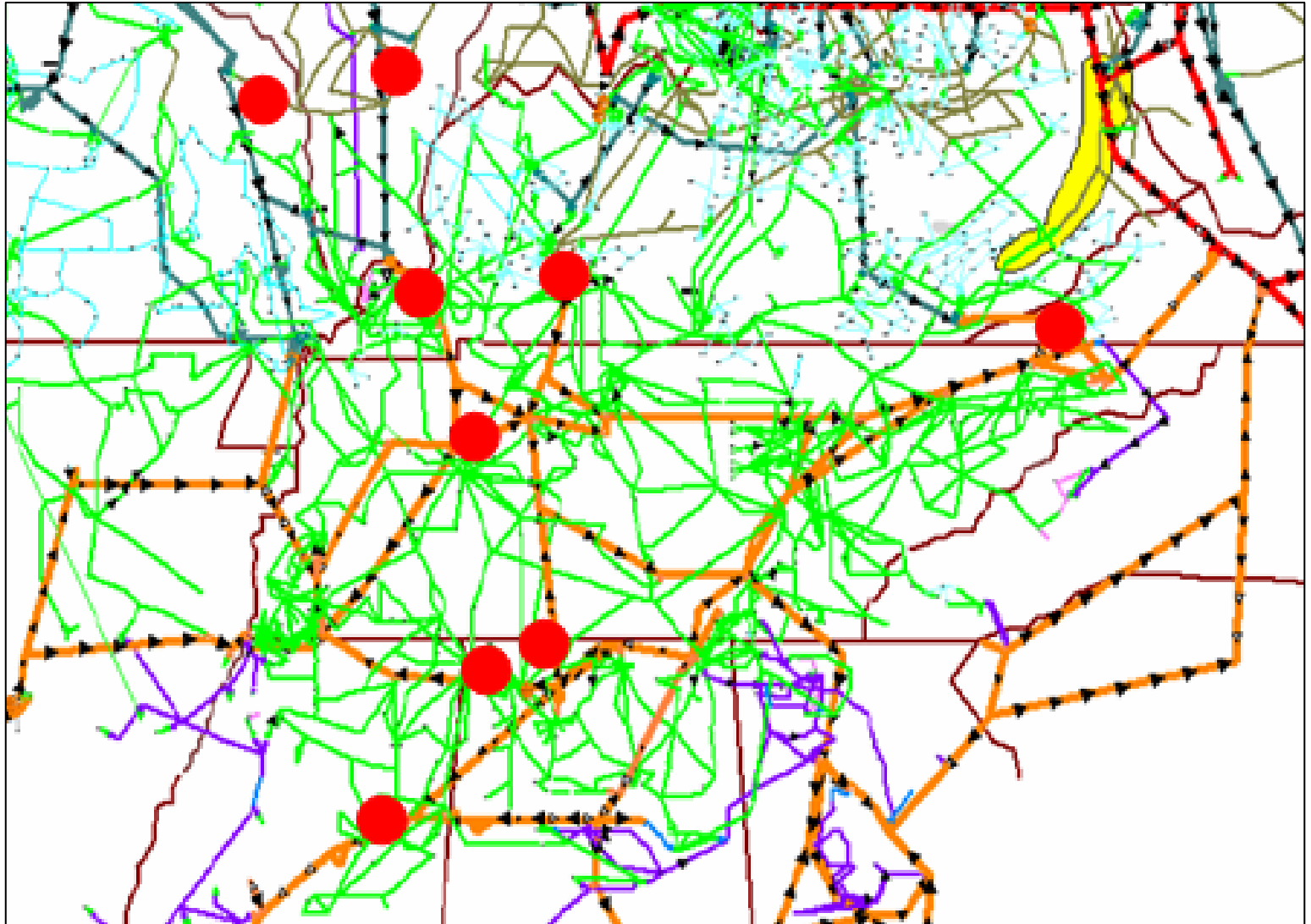
Major Constraint Locations

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Top 10 Limiting Flowgates

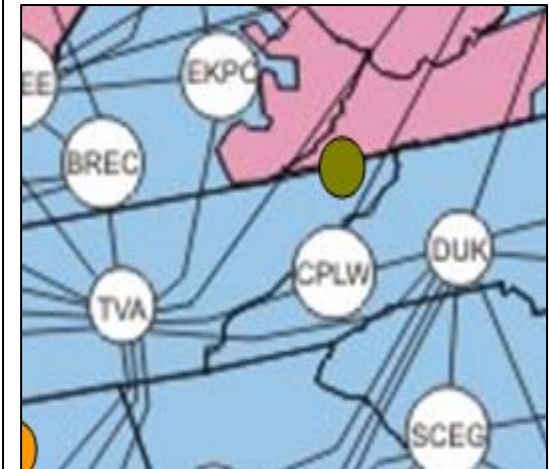
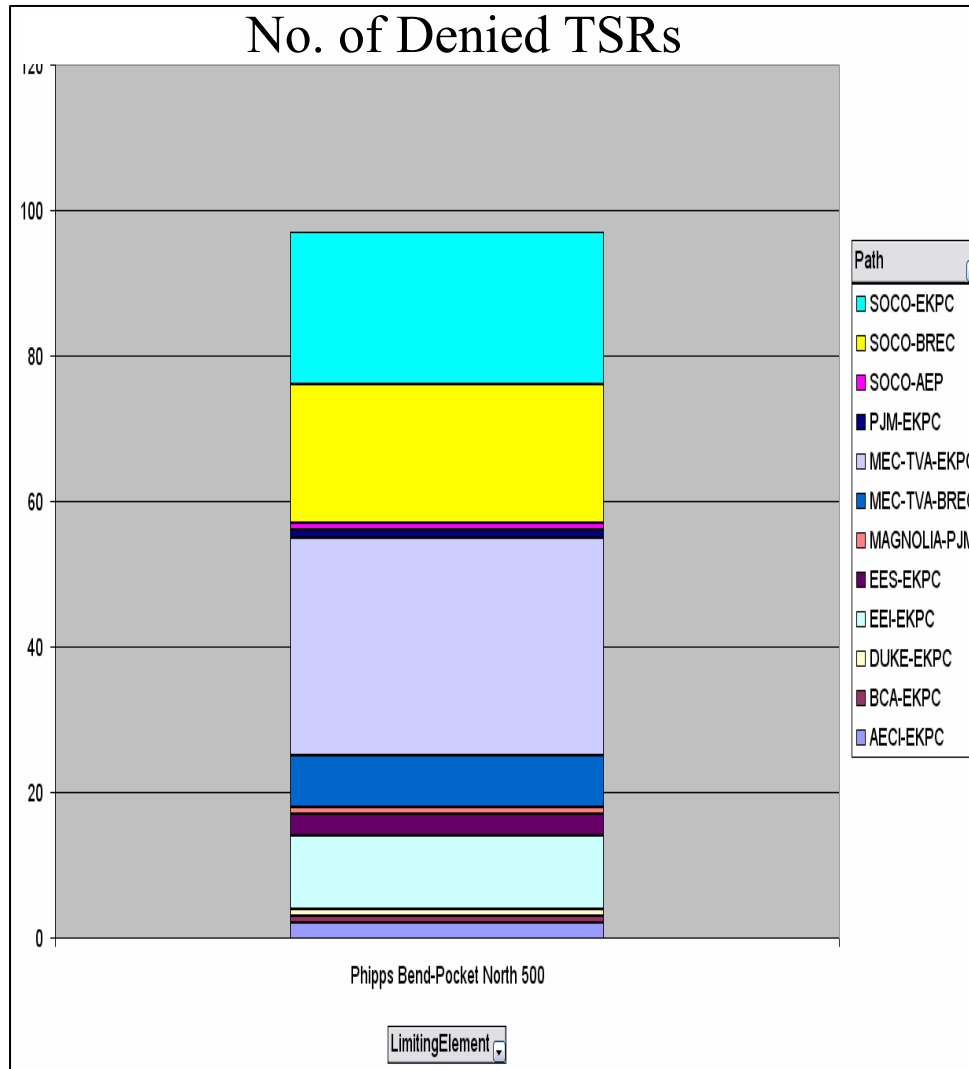


Wheeler-Five Points 161kV flo
 Browns Ferry-Maury 500kV



Phipps Bend – Pocket North 500kV

Since October 2007

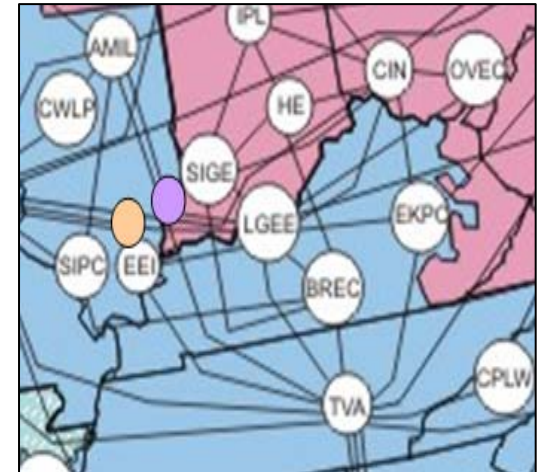
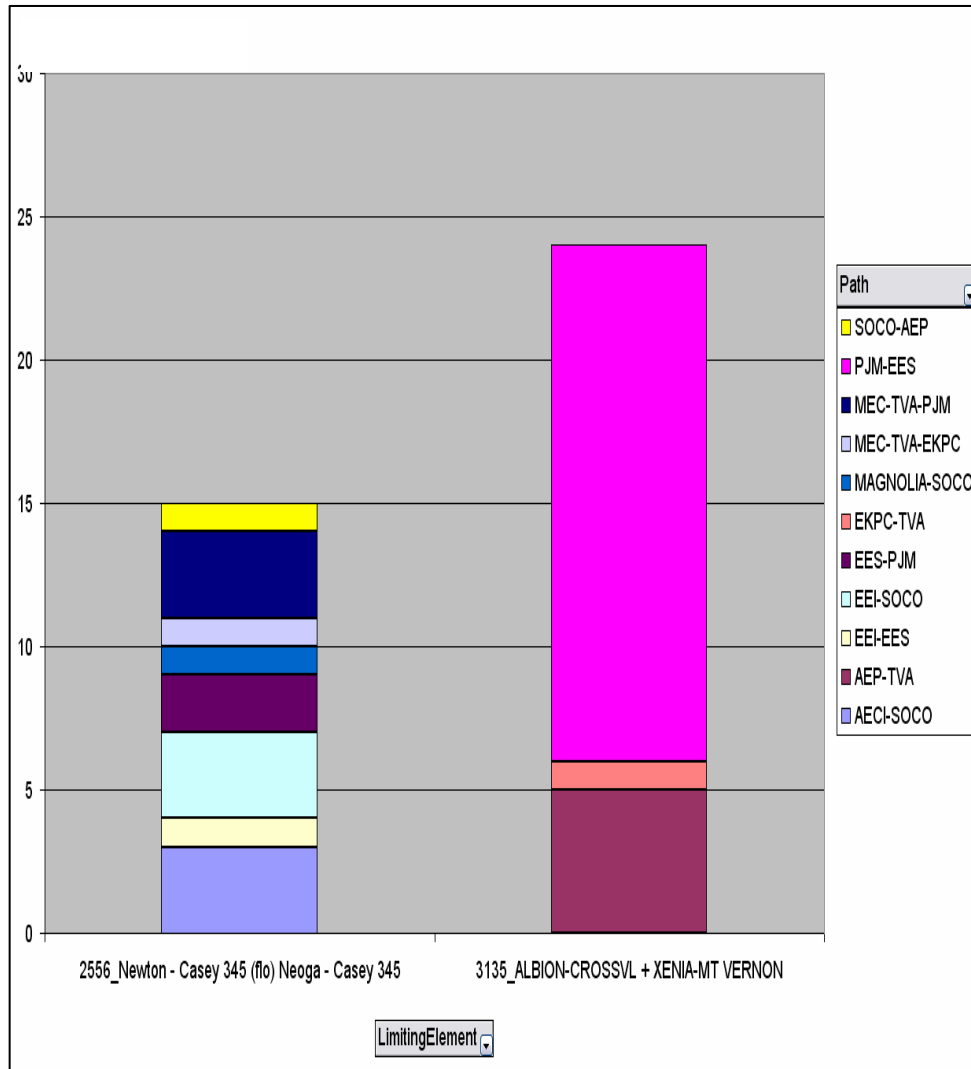


Six 500kV outages during December 2007 – February 2008



Reciprocal Flowgates

Since October 2007

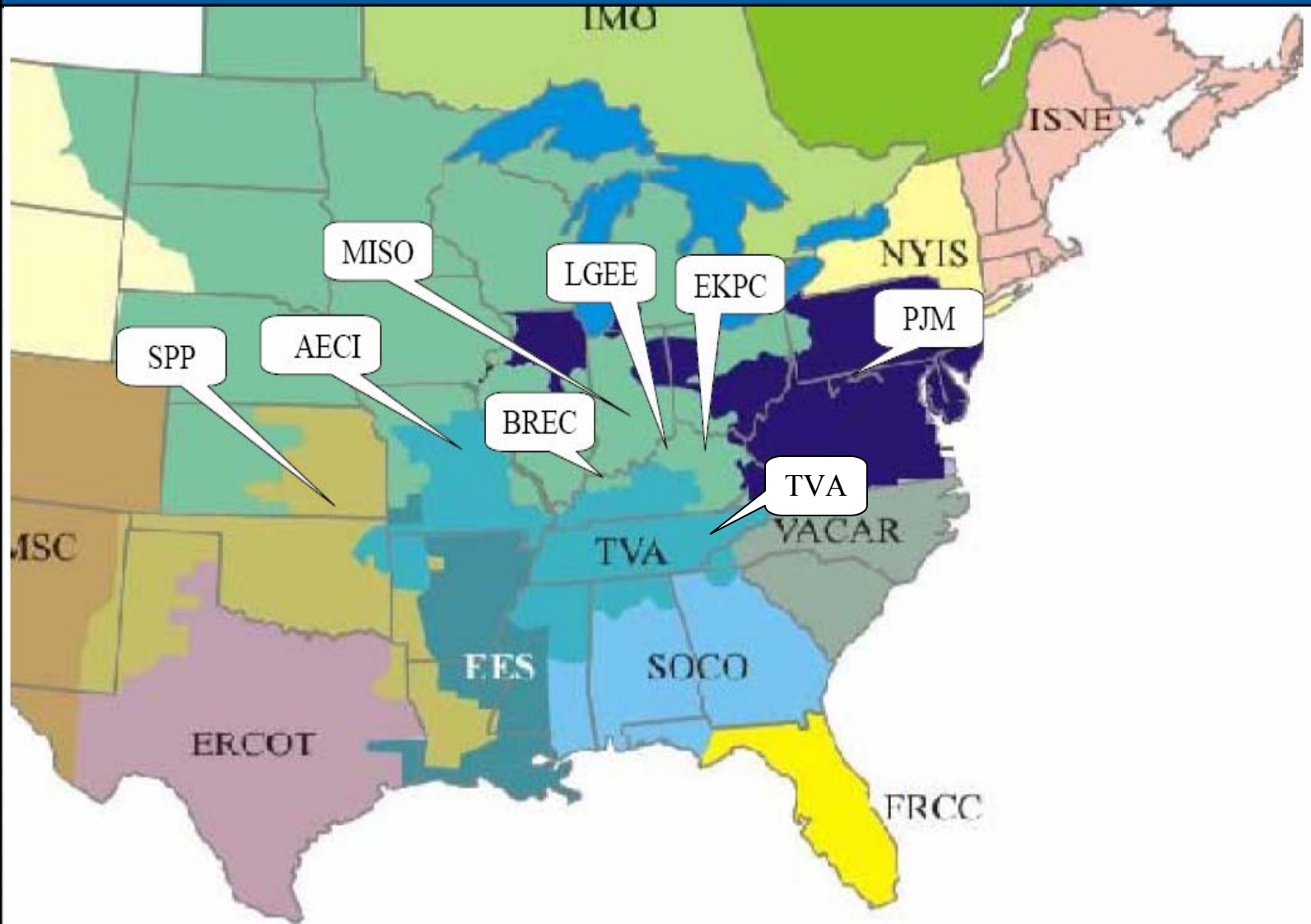


**AFC overrides
applied**

TSR Metrics



TSRs in ATC Process

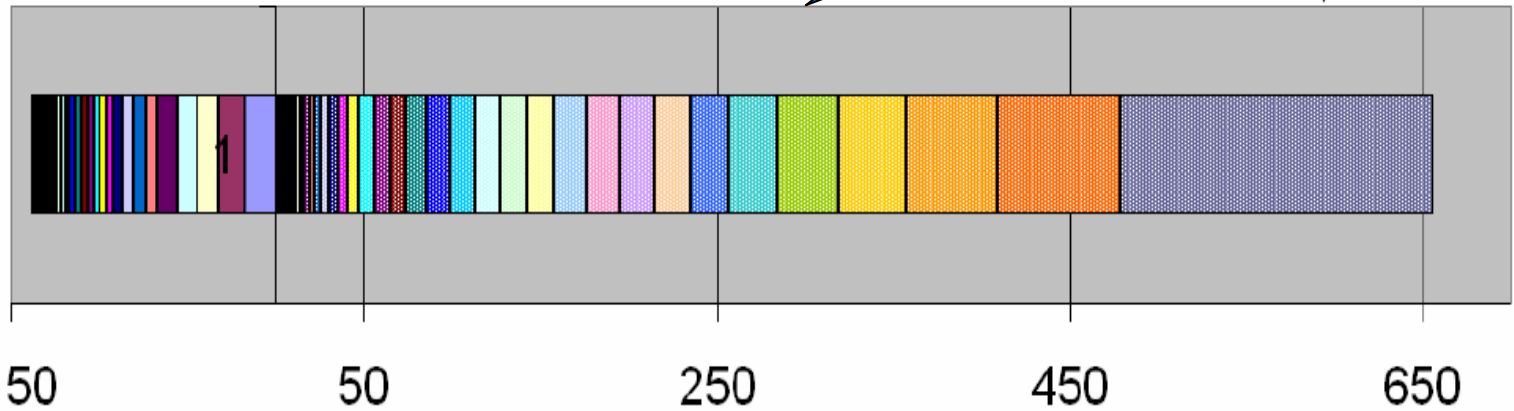




Reservation Impacts

Cumbland-Jvill&Cumbland-Davidson Reservation Impacts

40,000MW+
Reservations

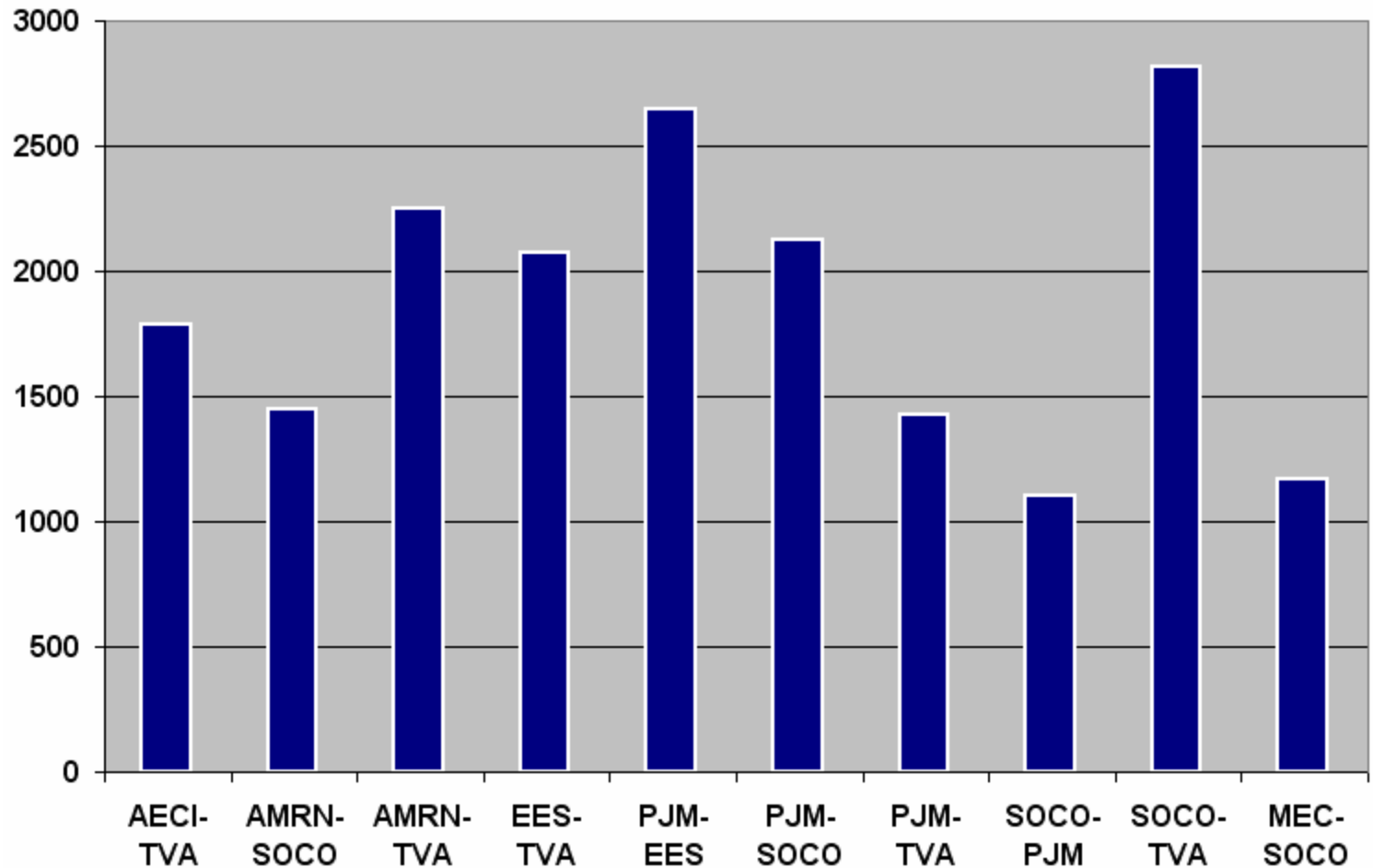


■ MAGNOLIA - TVA = -17.4	■ SPFFREEPORT - TVA = -14.66	□ PJM - CIN = -12.4	□ TVA - BREC = -11.54	■ DEC - TVA = -10.73	■ MEC-TVA - TVA = -7.45	■ EES - AMRN = -6.22
□ EKPC - MISO = -6.07	■ PJM - AMRN = -5.46	■ SOCO - TVA = -3.95	■ TVA - LGEE = -3.76	■ MHEB - NSP = -3.7	■ TVA - EKPC = -3.61	■ EES - TVA = -3.59
■ NYIS - CIN = -3.43	■ SOCO - EKPC = -2.87	■ PJM - ALTW = -2.41	□ PJM - FE = -2.32	□ PJM - MECS = -2.25	■ EKPC - LGEE = -2.1	□ TVA - SOCO = -1.94
□ CPLE - PJM = -1.37	□ WAUE - OTP = -1.32	□ PJM - WEC = -1.25	■ WAUE - OTP = -1.32	■ PJM - MEC = -1.22	■ MHEB - SPC = -0.98	■ OVEC - CIN = -0.88
■ WAUE - GRE = -0.79	■ HE - AMRN = -0.68	■ MHEB - WPS = -0.56	■ WAUE - NSP = -0.54	■ LGEE - MISO = -0.51	■ ALTW - ALTE = 0.56	■ DUKE - TVA = 0.63
■ DUKE - TVA = 0.63	■ OTP - MHEB = 0.64	■ CIN - FE = 0.51	■ NSP - GFE = 0.84	■ AECL - OKGE = 1.08	■ HE - CIN = 1.09	□ OTP - WAUE = 1.26
■ KCPL - OKGE = 1.16	■ HE - NIPS = 1.58	■ LGEE - EKPC = 1.63	□ AMRN - AECL = 1.8	□ AECL - TVA = 2.46	■ MECS - IESO = 2.8	■ AMRN - MEC = 2.93
■ EKPC - TVA = 3.85	□ PJM - DUKE = 4.32	■ OVEC - FE = 5.19	■ CIN - DUKE = 5.46	■ CIN - PJM = 6.68	■ MECS - EES = 8.04	■ PJM - CPLW = 8.79
■ PJM - CPLE = 9.7	■ IP - EES = 11.23	■ BREC - TVA = 13.51	■ LGEE - TVA = 13.93	□ OVEC - PJM = 14.44	□ BREC - MISO = 14.7	■ BREC - SOCO = 15.87
■ AEP - SOCO = 18.08	■ SIFC - AMRN = 18.8	■ HE - EES = 20.06	□ NSP - MHEB = 20.77	■ FE - EES = 21.3	■ AMRN - TVA = 27	■ SIFC - IP = 36.18
■ AMRN - EES = 37.26	■ AEP - TVA = 52.24	■ EEI - SOCO = 69.37	■ EEI - AMRN = 178.11			



Most Active Paths (04/01/2007 – 03/31/2008)

Paths with 1000+ TSRs



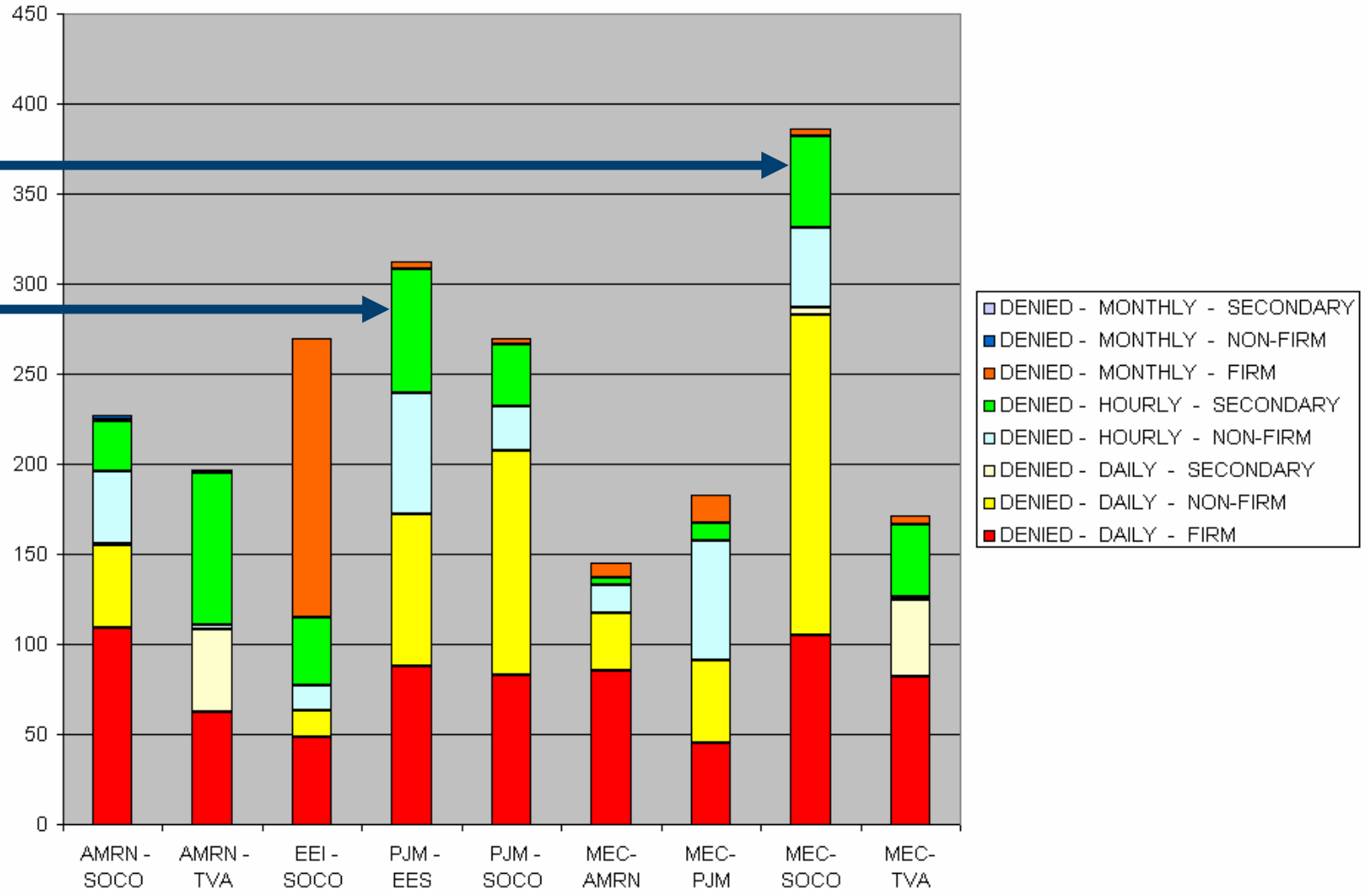
Constrained Paths (04/01/2007 – 03/31/2008)

?

AFC Overrides

68%

No. of Denied TSRs



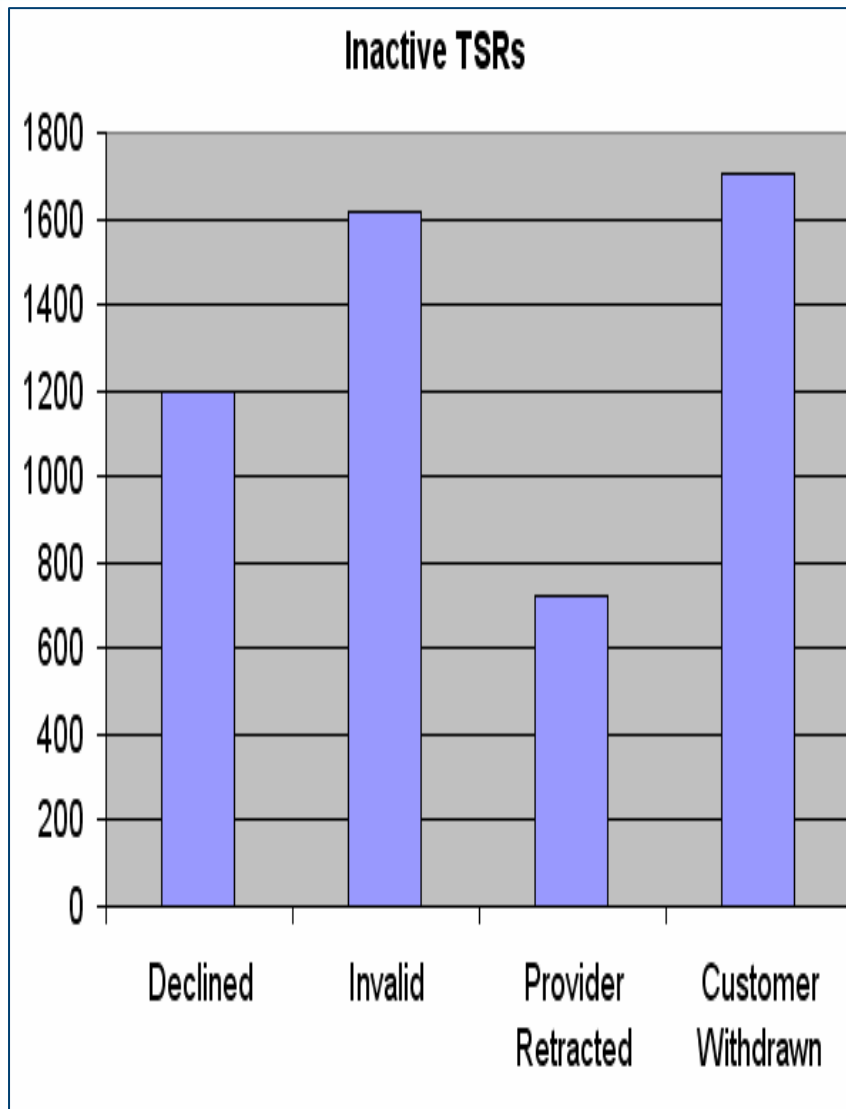
TSR Metrics on OASIS



OASIS TSR Metrics

- Data available on OASIS
- TVA as the Provider
- Date Range: October 1, 2007 – March 31, 2008
- Data available by:
 - Summary
 - Service
 - Path
 - Path and Service
- Customer
 - Affiliate: TVAM and TVAG
 - Non-Affiliates: 92 Transmission Customers

Inactive TSRs (04/01/2007 – 03/31/2008)

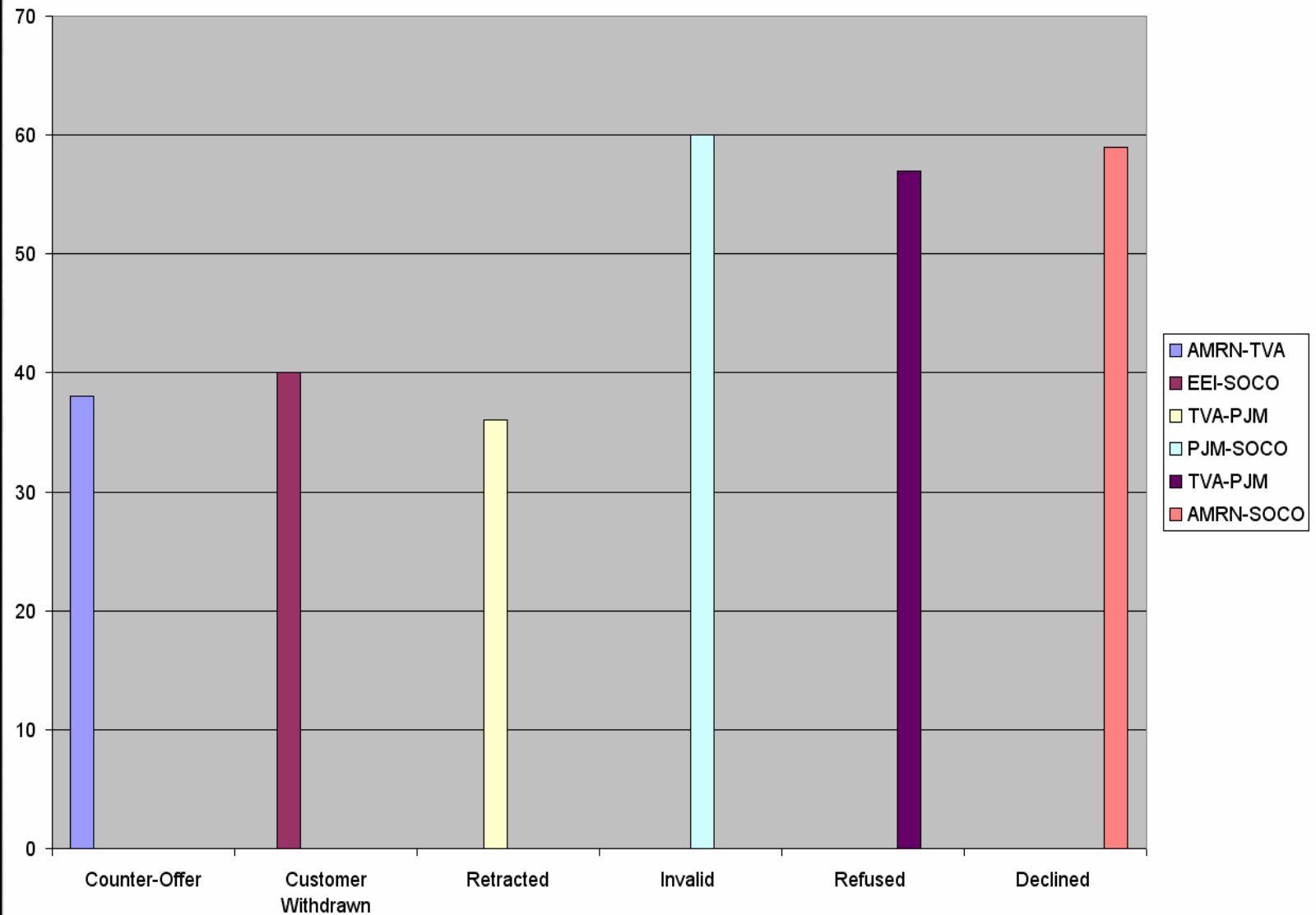


- Withdrawn
 - Customer withdrawal prior to confirmation
- Retracted
 - Customer time limit has expired
- Invalid
 - Improper request
- Declined
 - Proposed price is unacceptable

~ 13% of TSR Activity



Inactive TSRs - Associated Paths

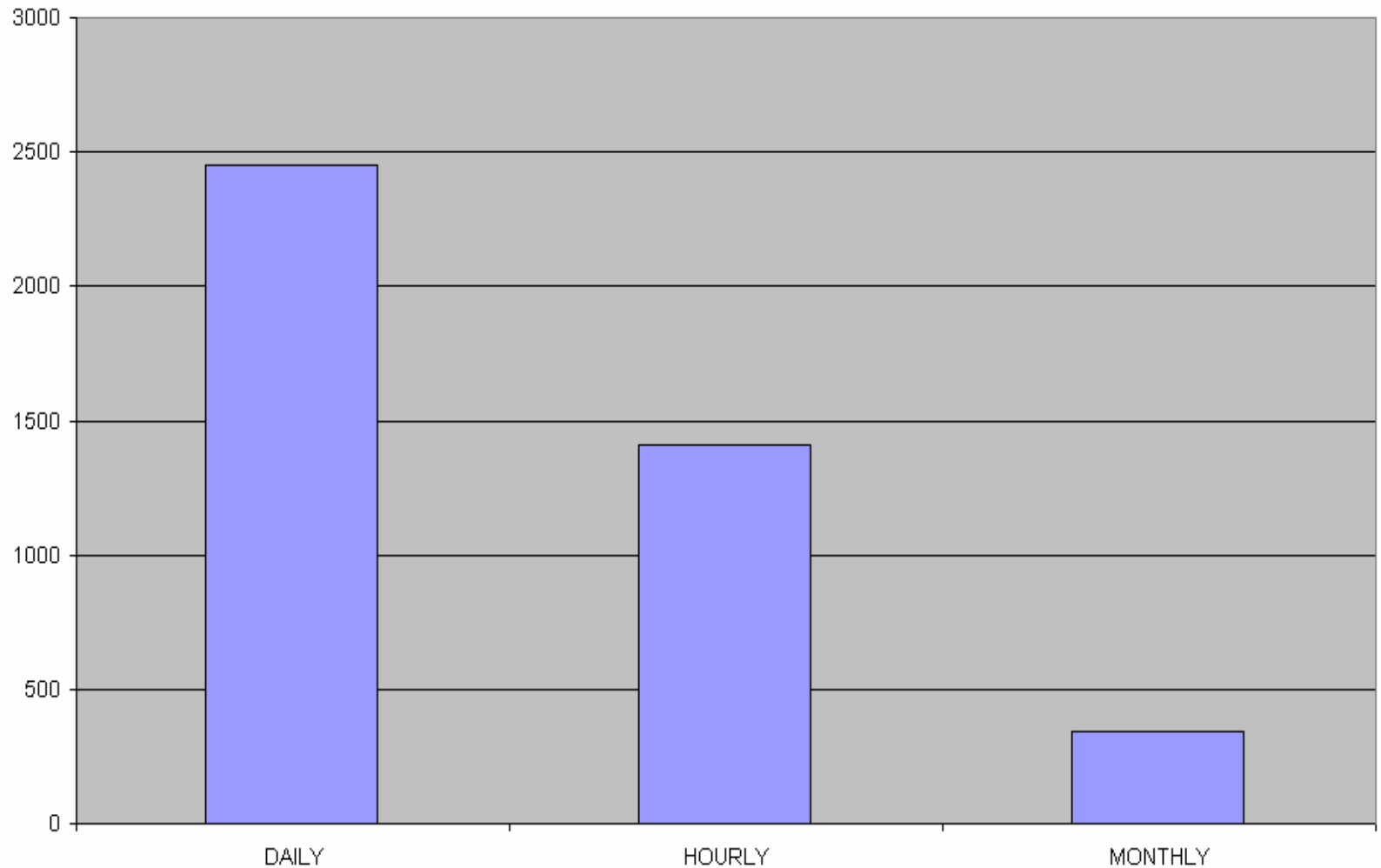




TSR Activity

(04/01/2007 – 03/31/2008)

DENIED

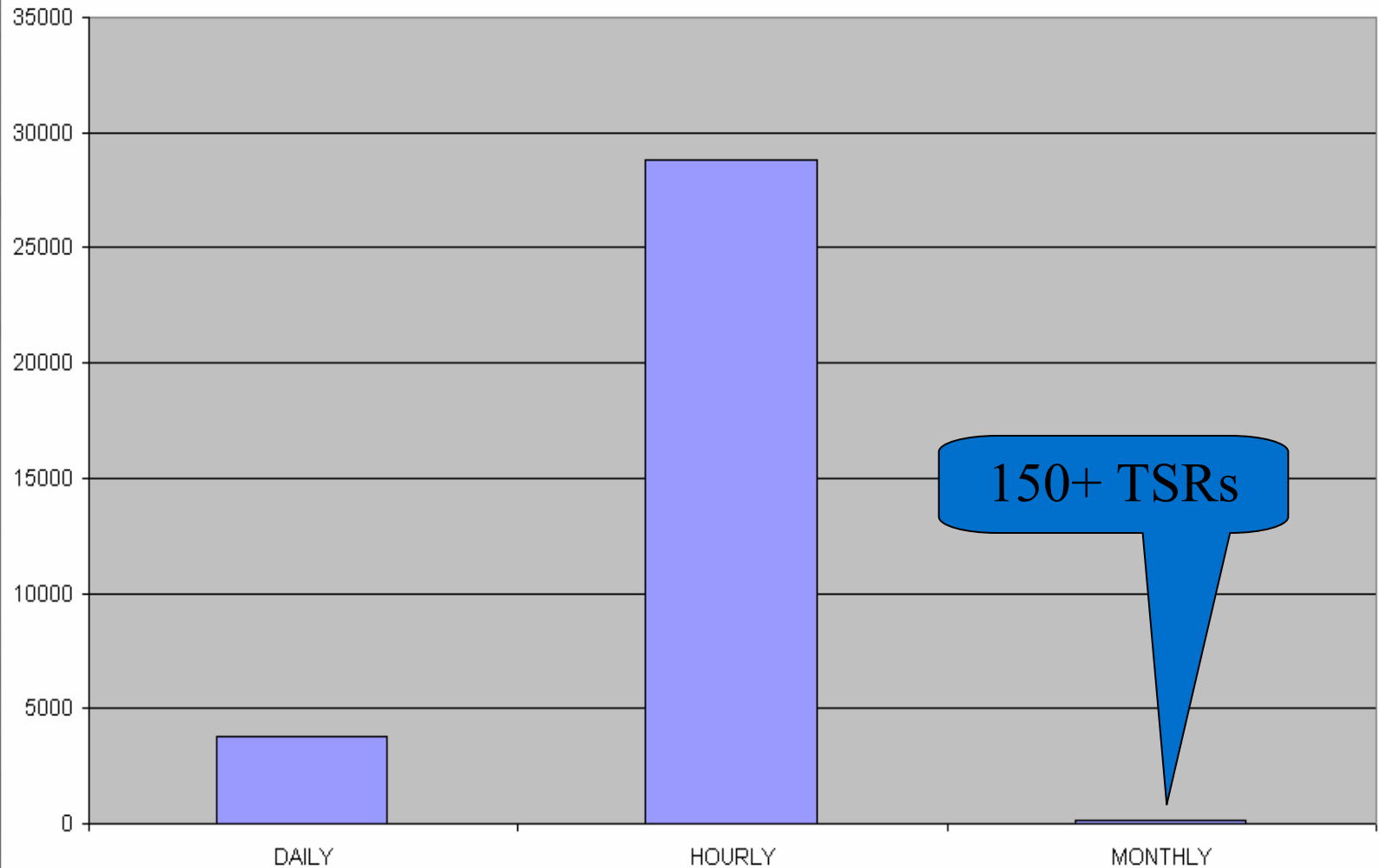




TSR Activity

(04/01/2007 – 03/31/2008)

CONFIRMED





TSR Activity

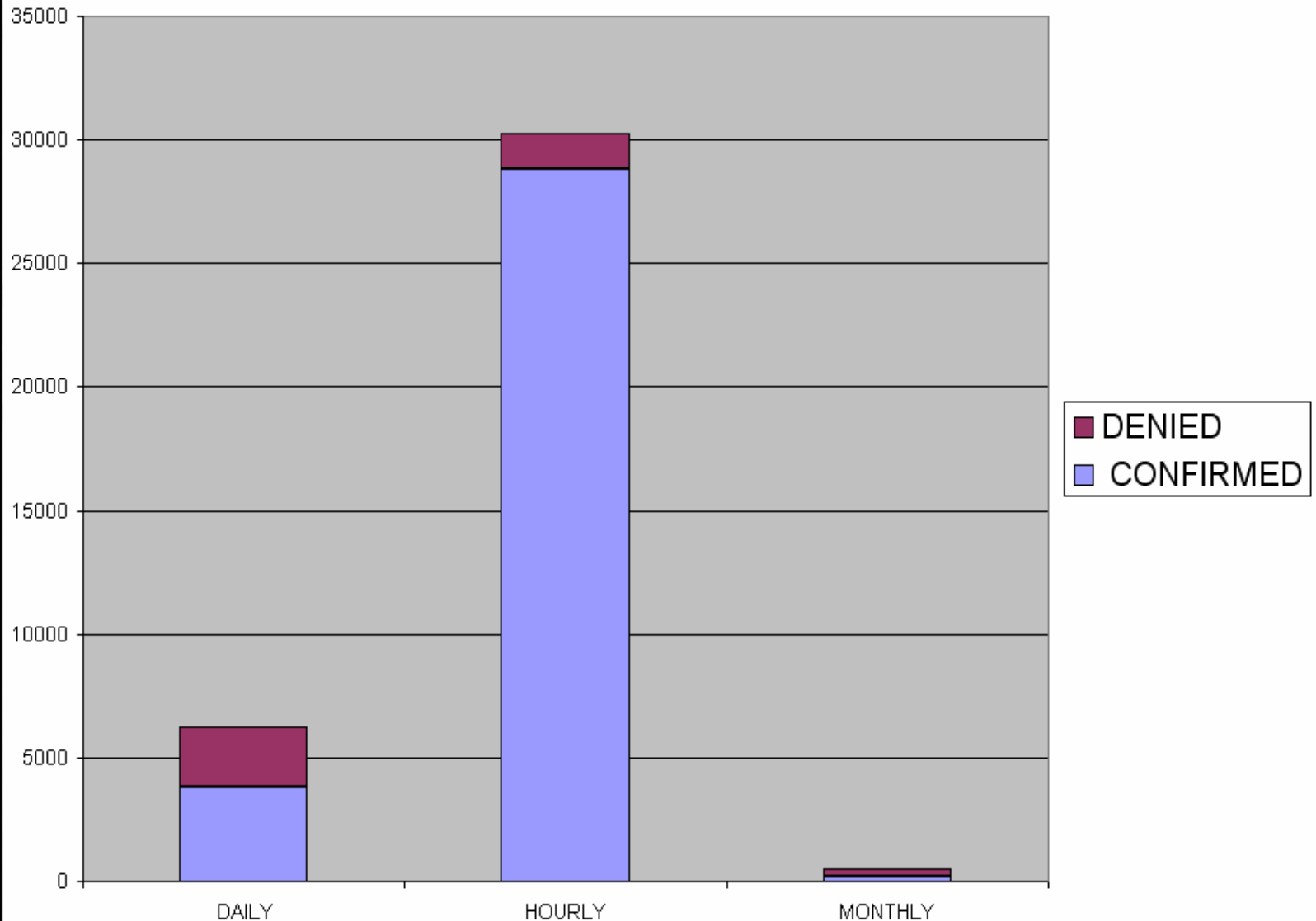
(04/01/2007 – 03/31/2008)

%

Monthly
1.4%

Daily
16.8%

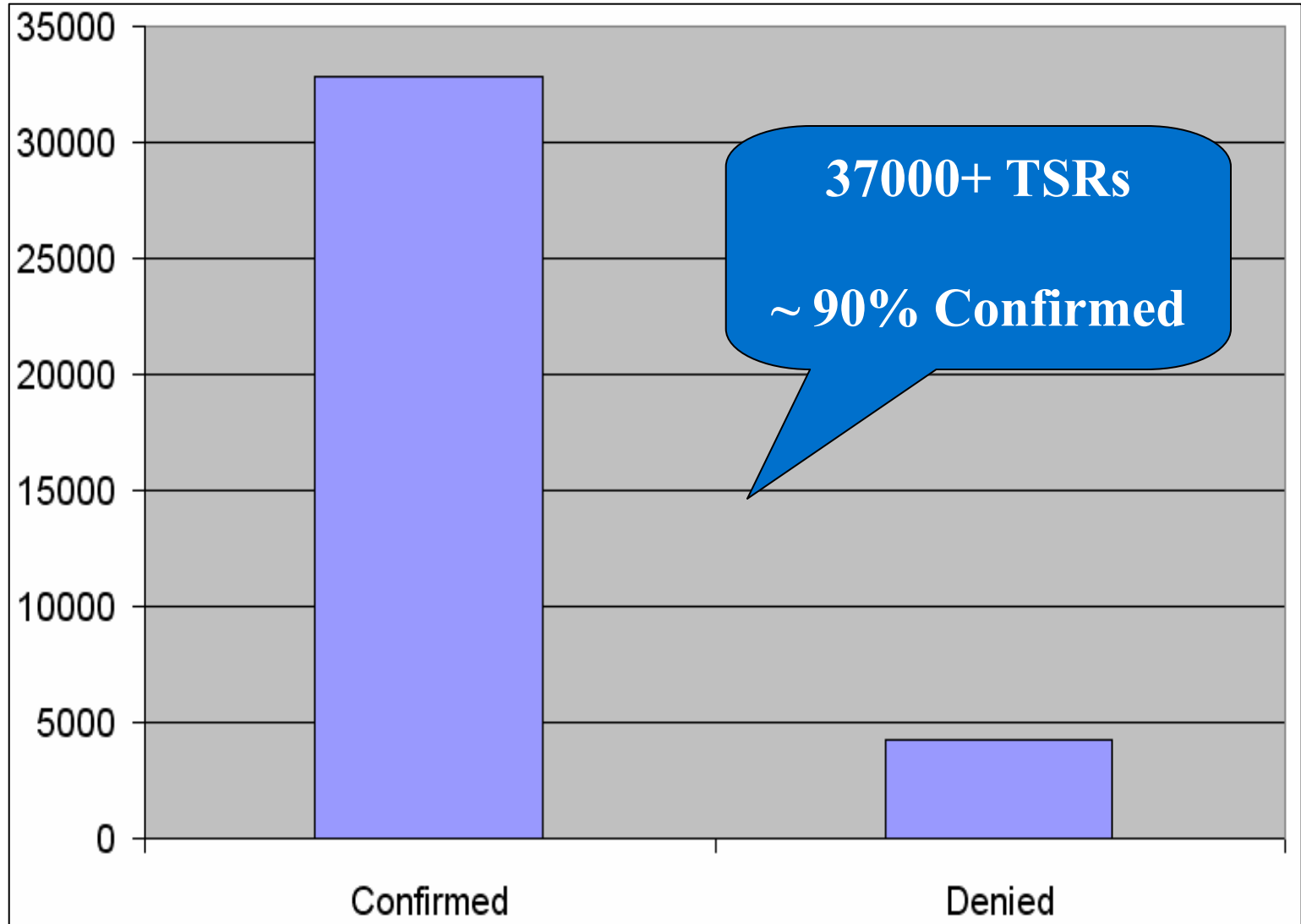
Hourly
80.5%





TSR Activity

(04/01/2007 – 03/31/2008)



Questions



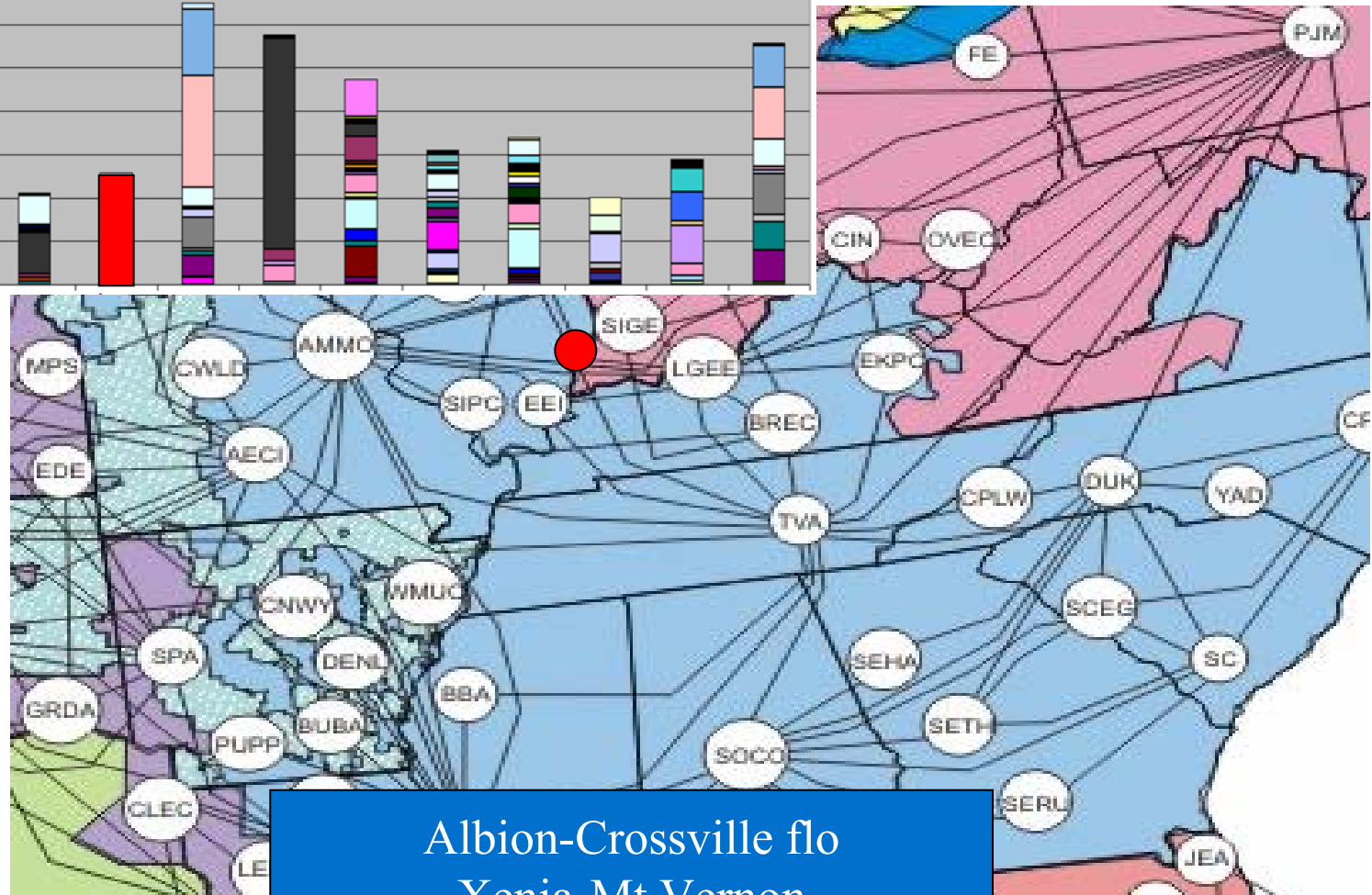
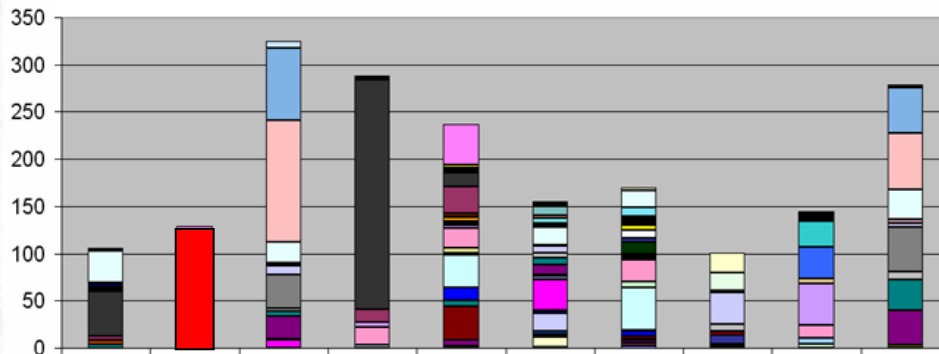
Appendix



Major Constraint Locations

[View FG](#)

Top 10 Limiting Flowgates

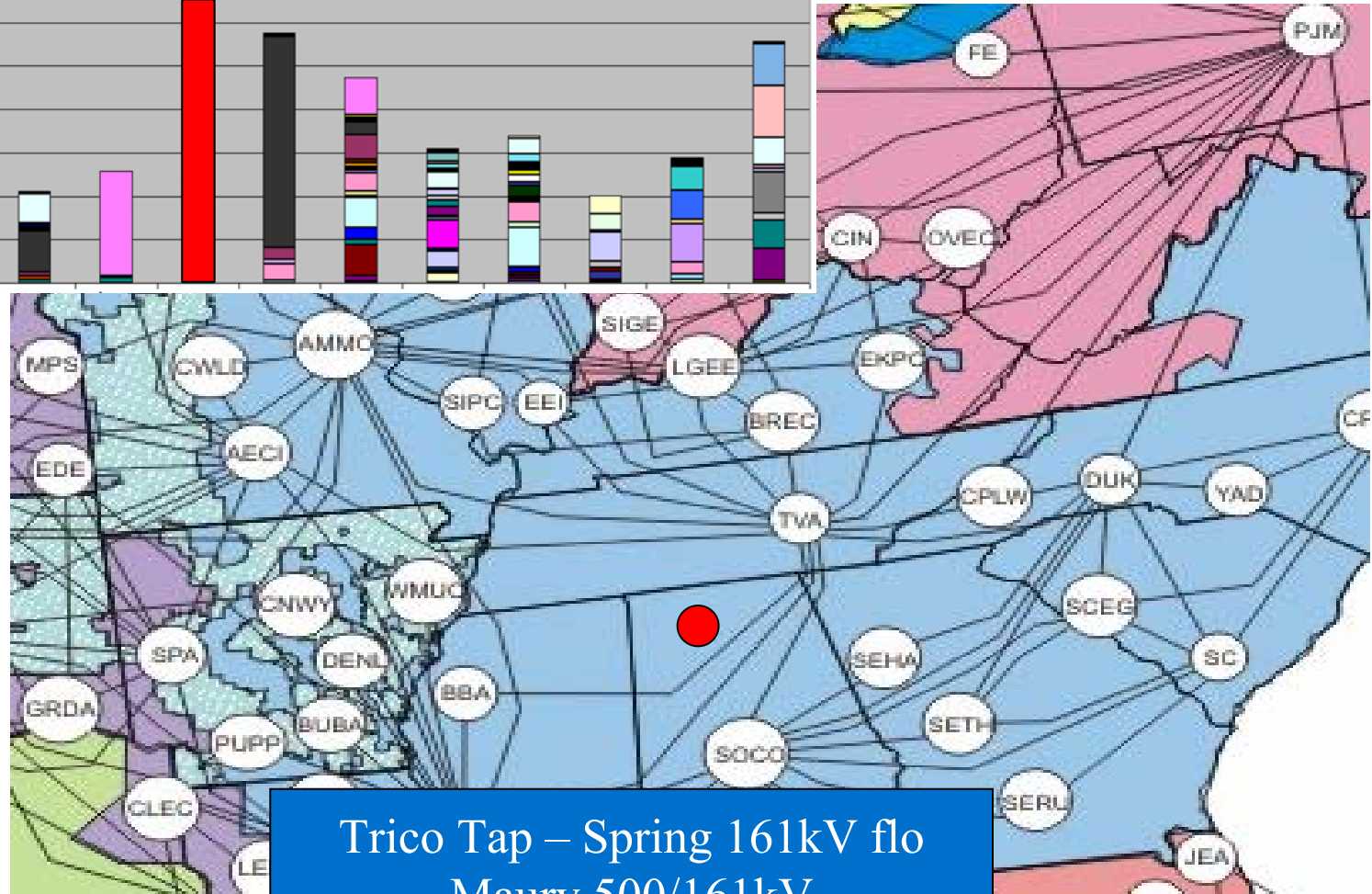
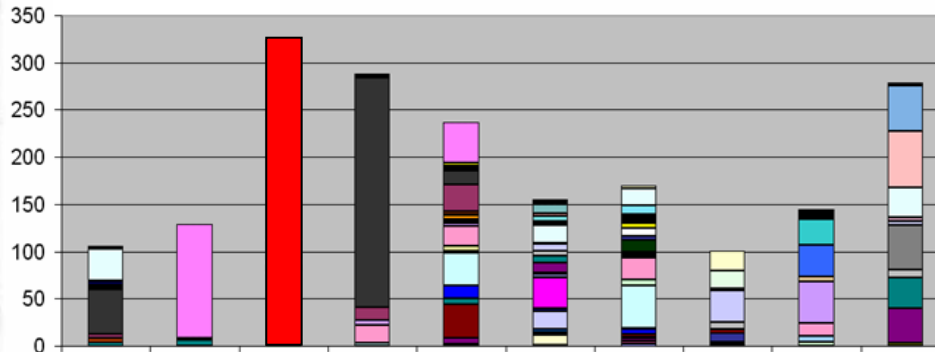


Albion-Crossville flo
Xenia-Mt Vernon

Major Constraint Locations

[View FG](#)

Top 10 Limiting Flowgates

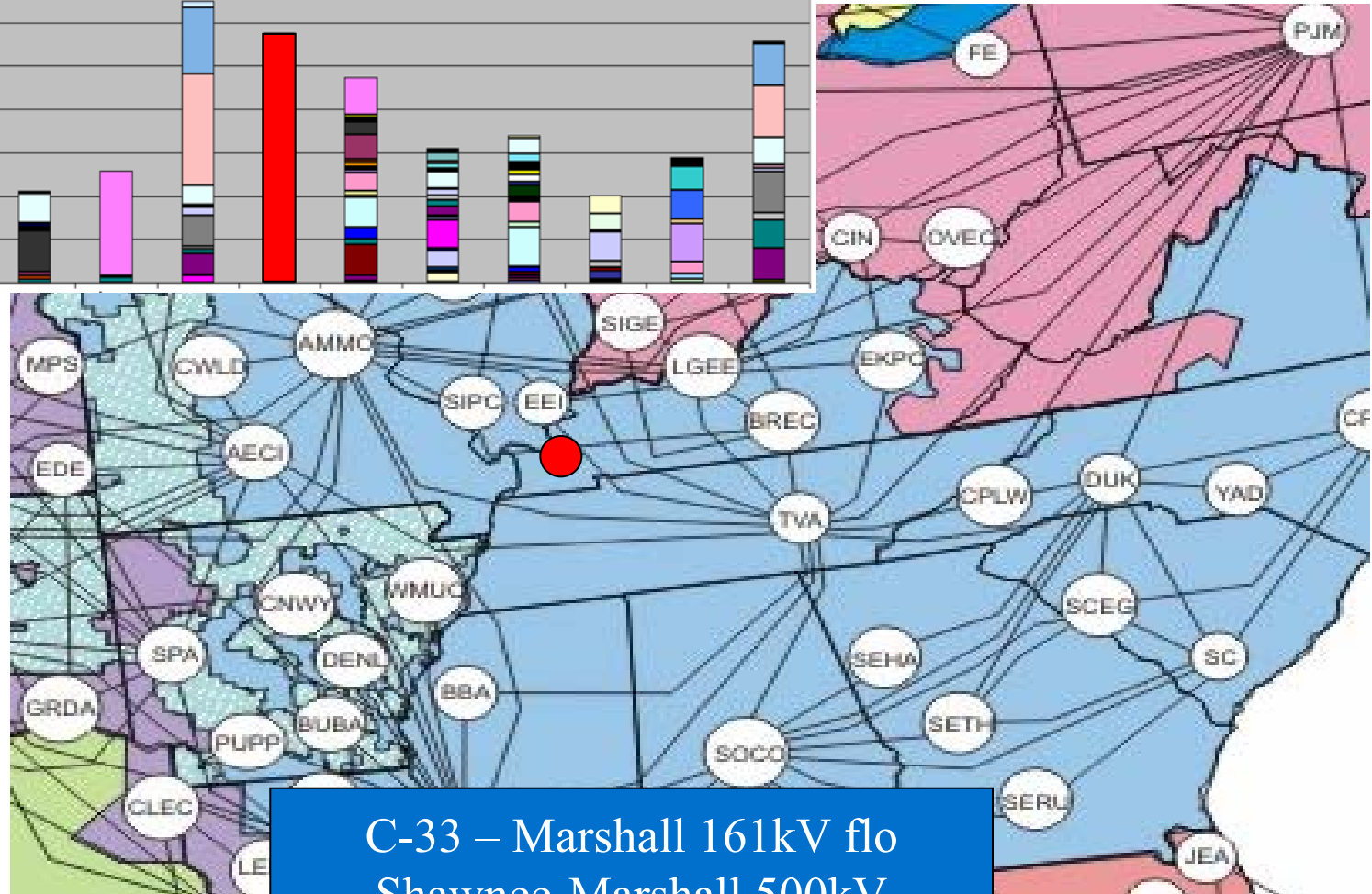
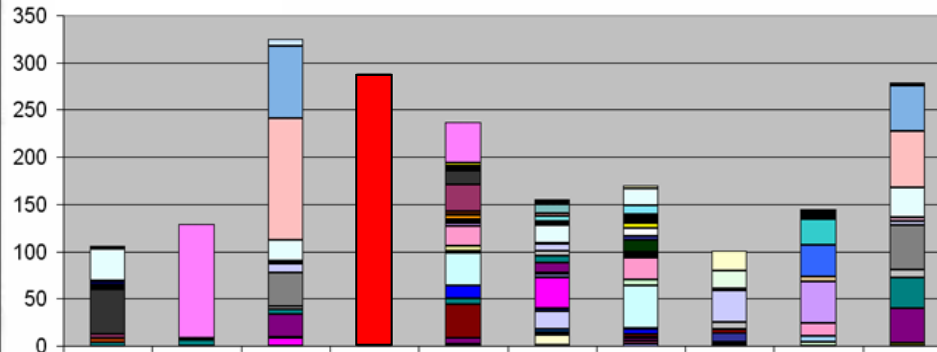


Trico Tap – Spring 161kV flo
Maury 500/161kV

Major Constraint Locations

View FG

Top 10 Limiting Flowgates

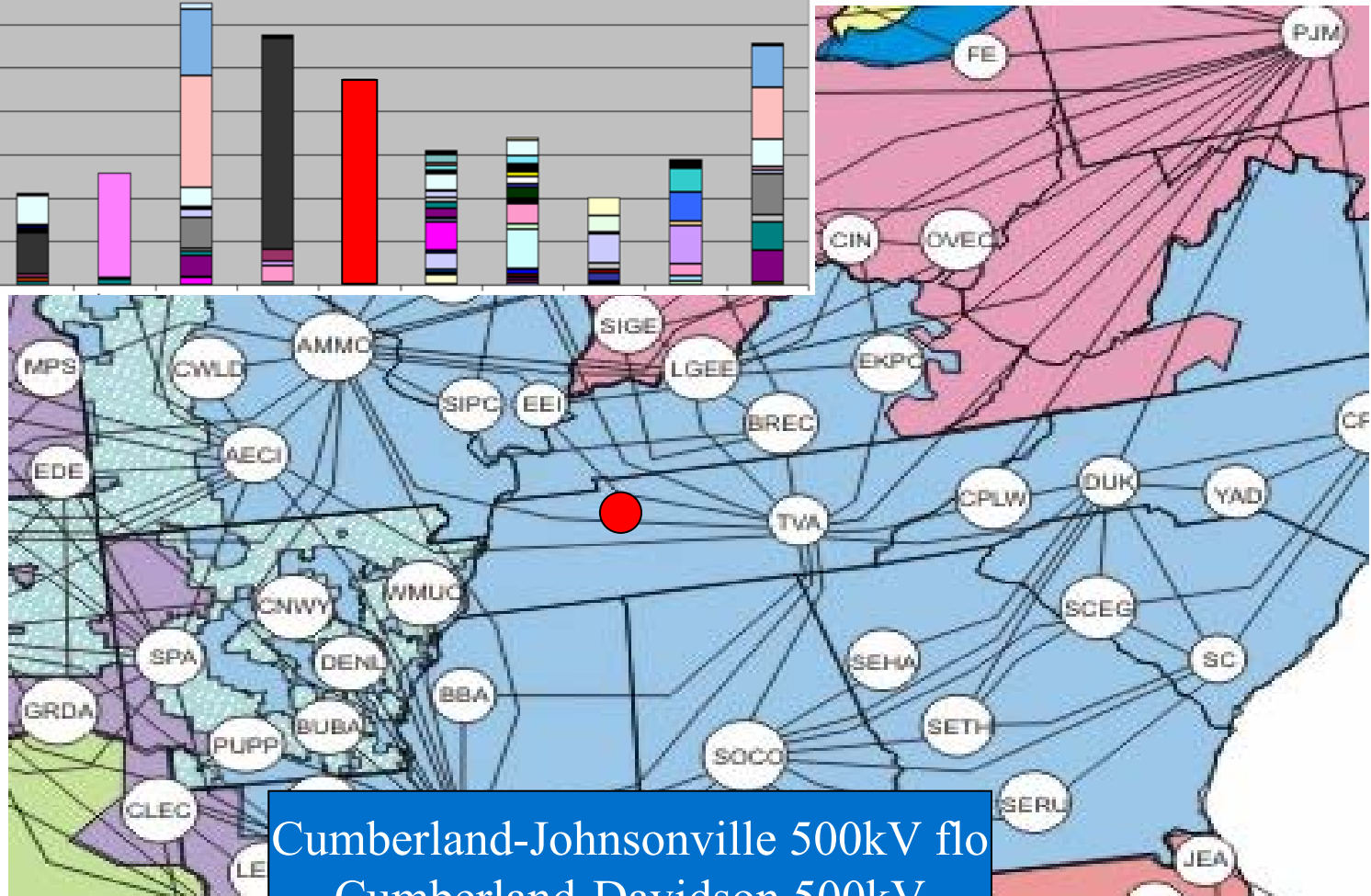
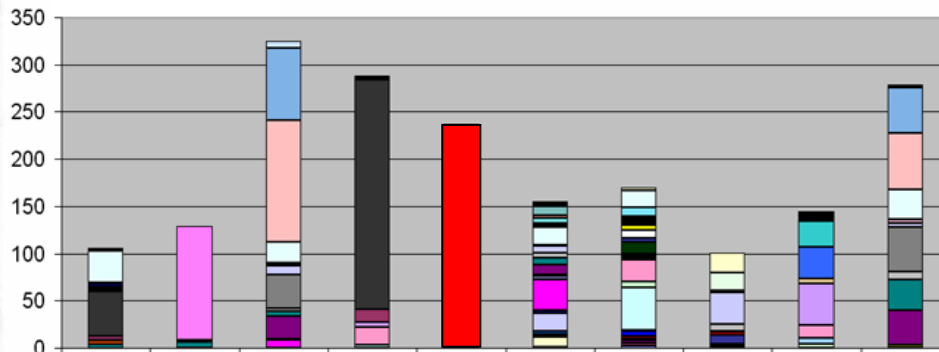


C-33 – Marshall 161kV flo
Shawnee-Marshall 500kV

Major Constraint Locations

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Top 10 Limiting Flowgates

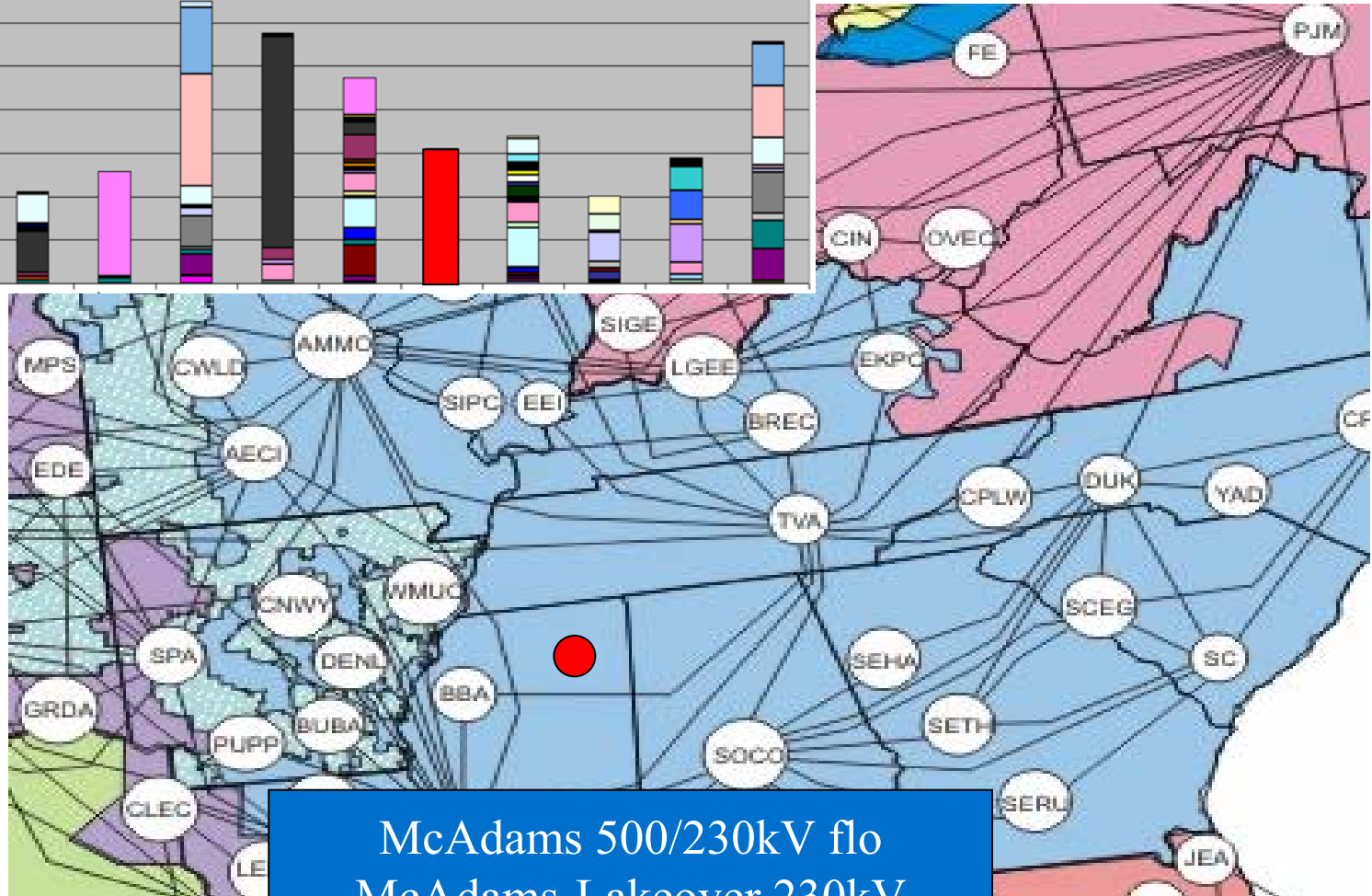
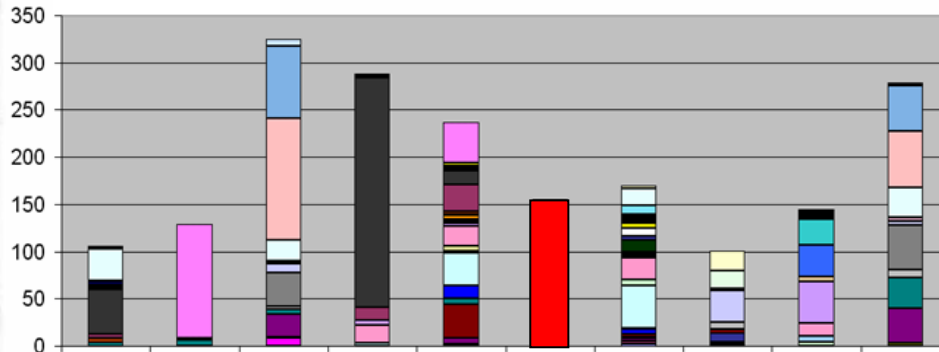


Cumberland-Johnsonville 500kV flowgate
 Cumberland-Davidson 500kV

Major Constraint Locations

[View FG](#)

Top 10 Limiting Flowgates

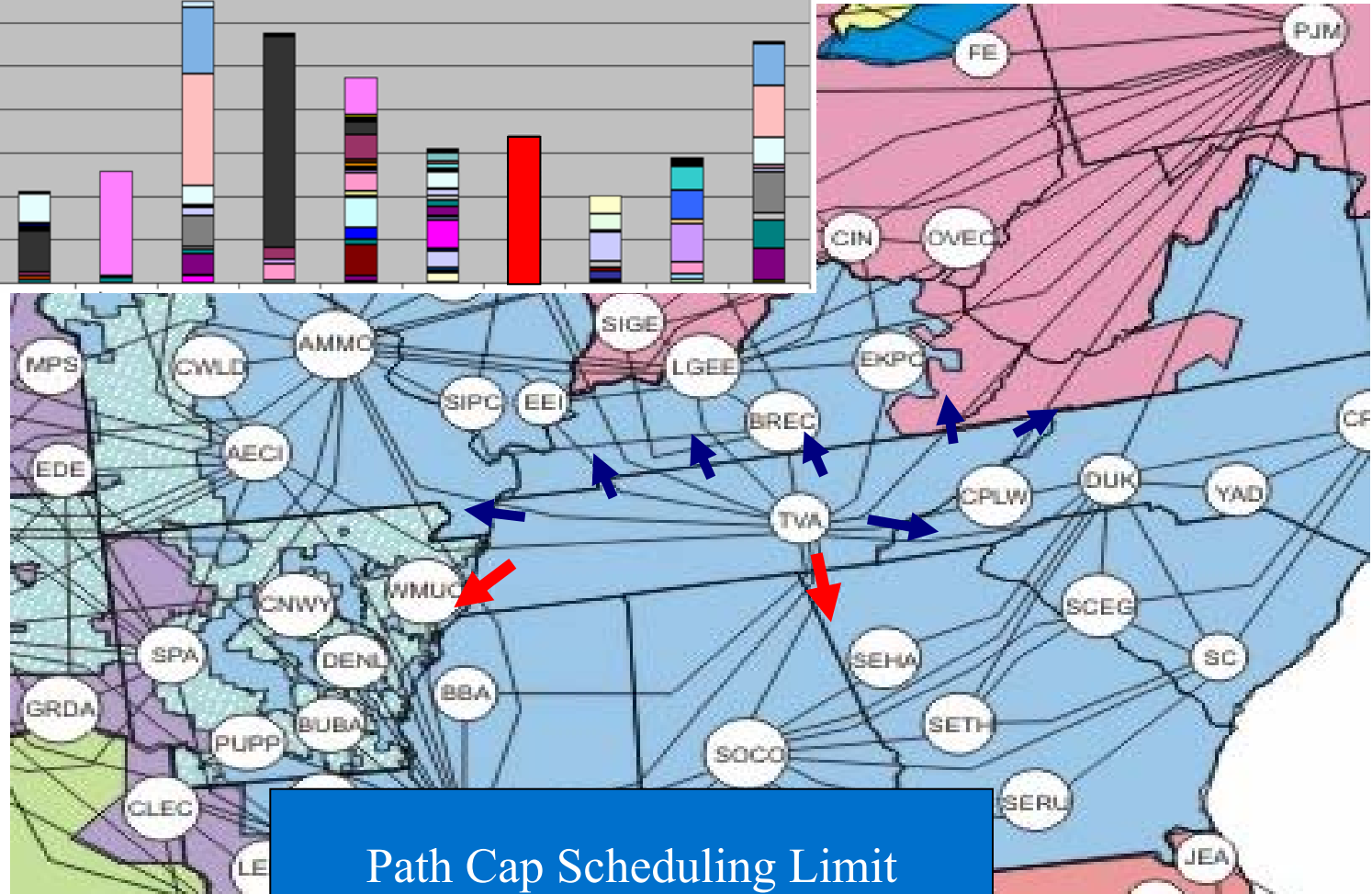
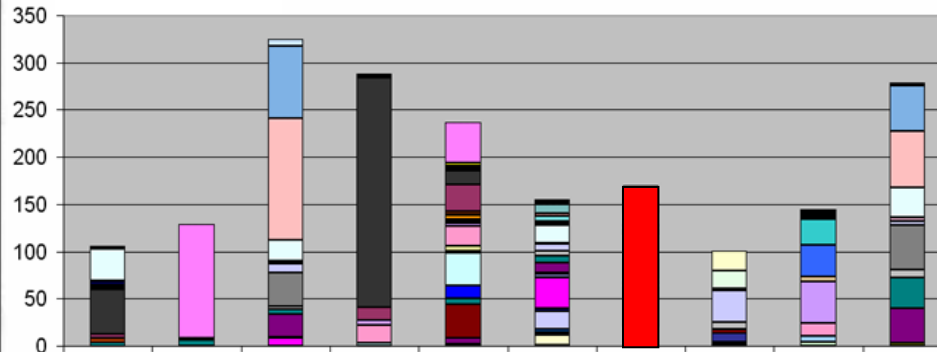


McAdams 500/230kV flo
McAdams-Lakeover 230kV

Major Constraint Locations

[View FG](#)

Top 10 Limiting Flowgates

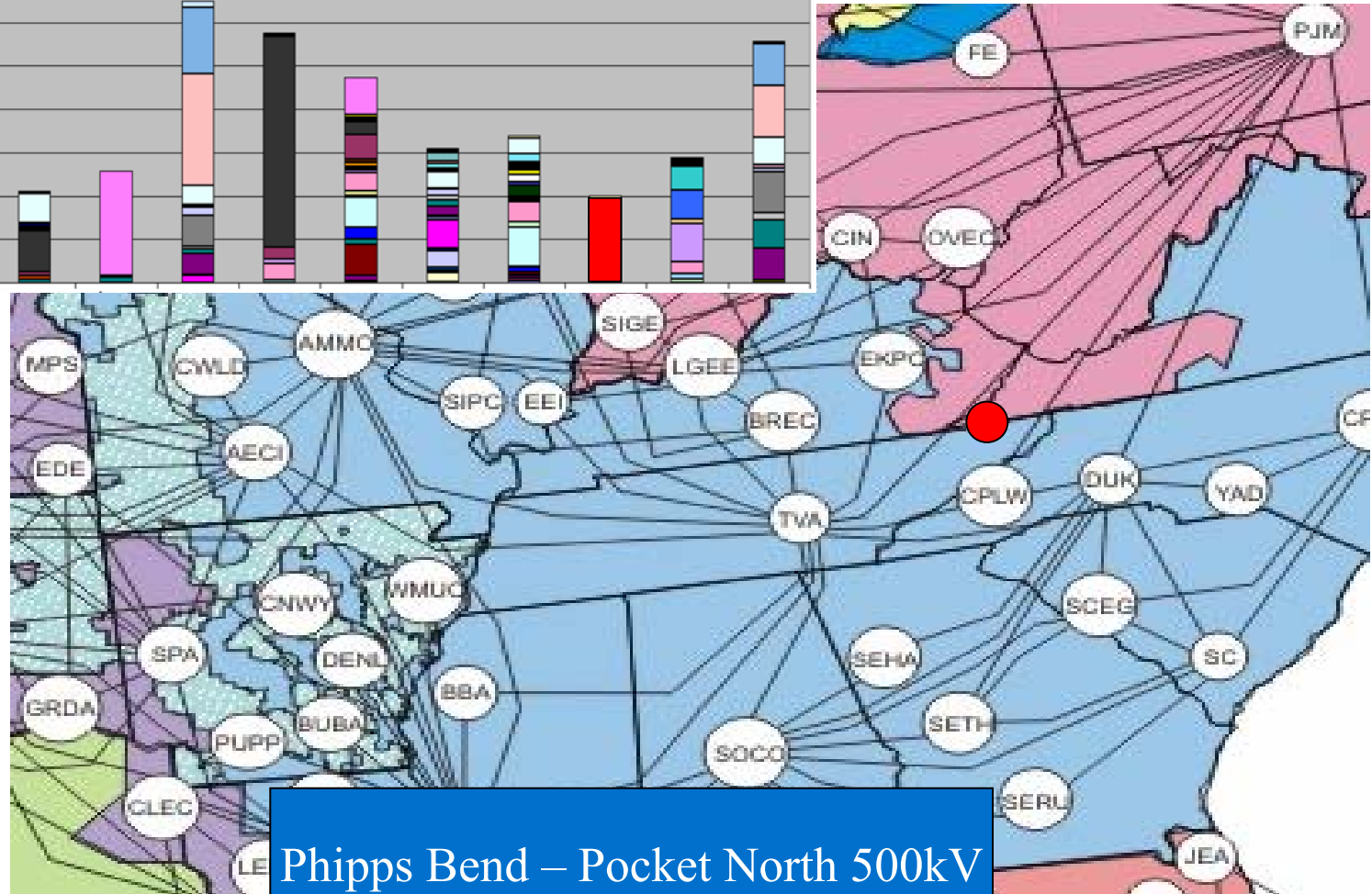
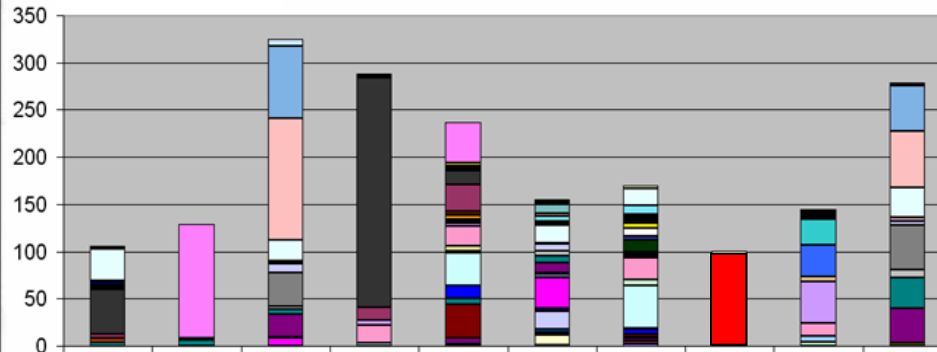


Path Cap Scheduling Limit

Major Constraint Locations

[View FG](#)

Top 10 Limiting Flowgates

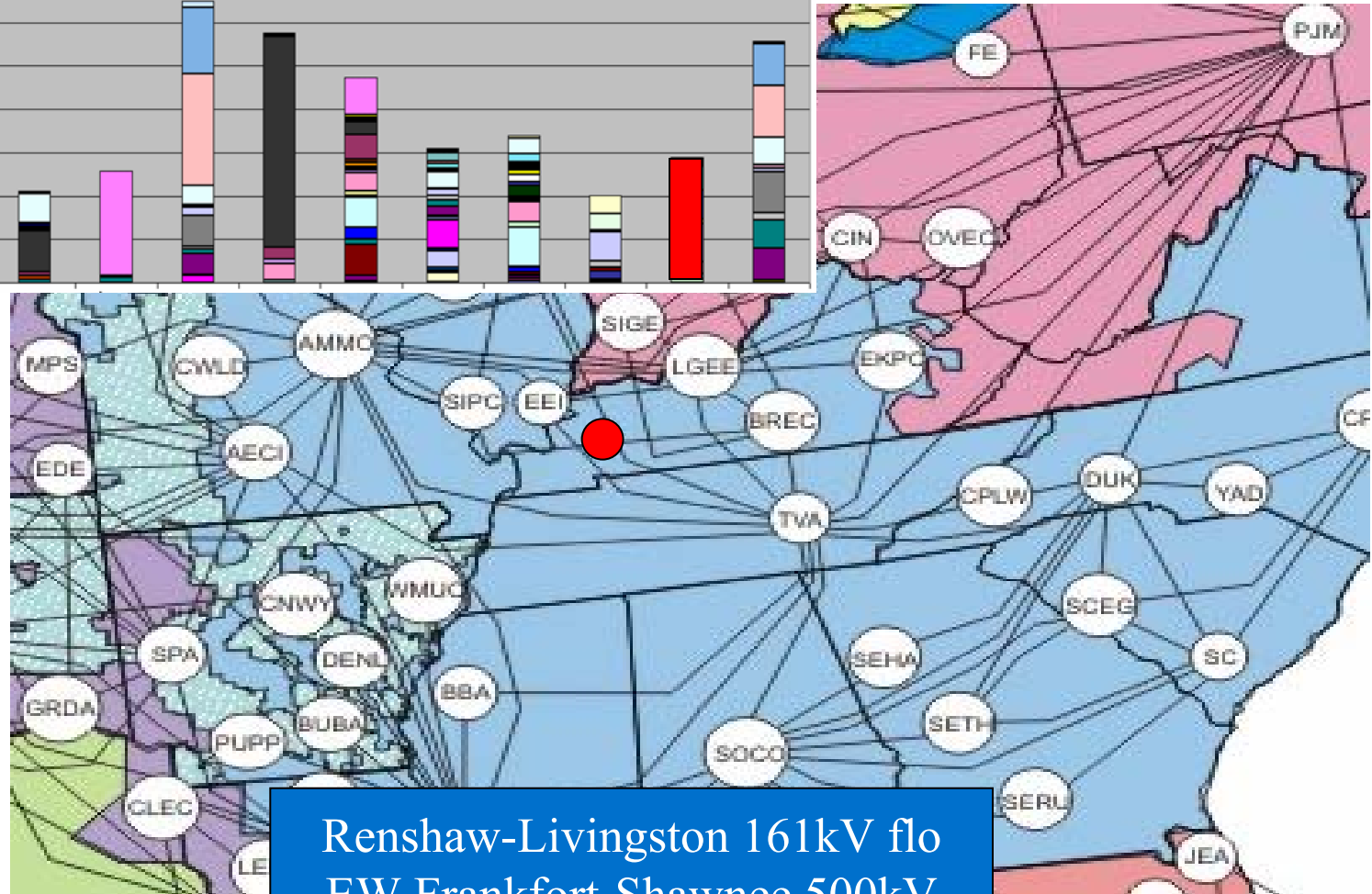
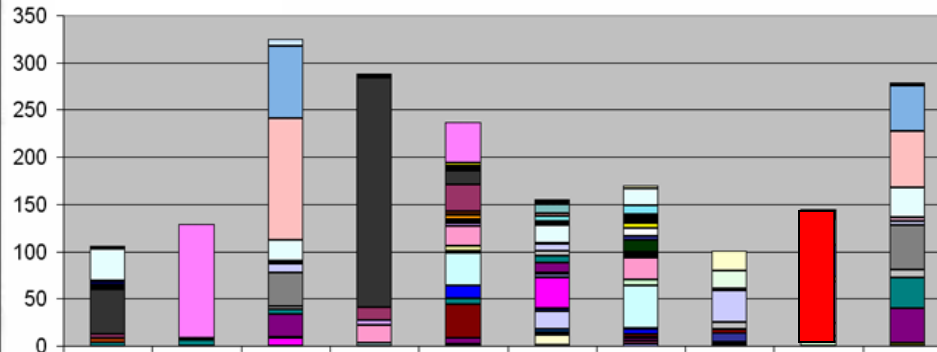


Phipps Bend – Pocket North 500kV

Major Constraint Locations

[View FG](#)

Top 10 Limiting Flowgates

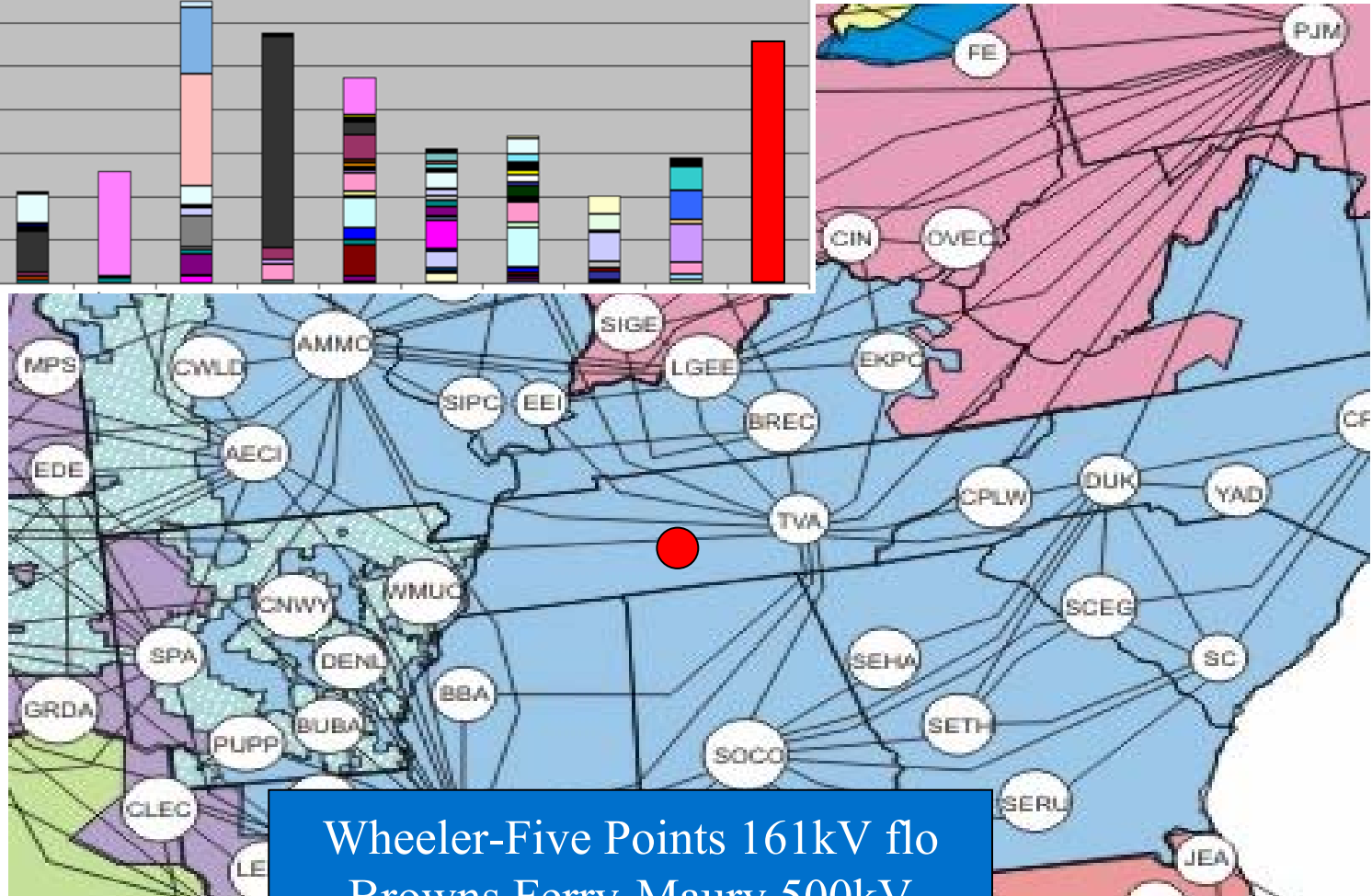
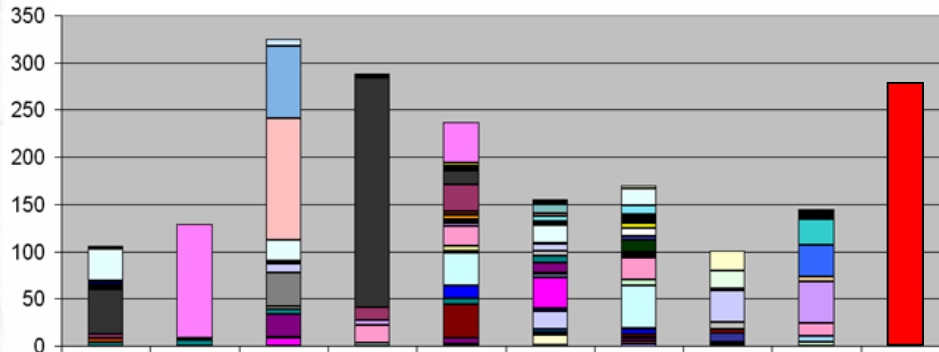


Renshaw-Livingston 161kV flo
EW Frankfort-Shawnee 500kV

Major Constraint Locations

[View FG](#)

Top 10 Limiting Flowgates

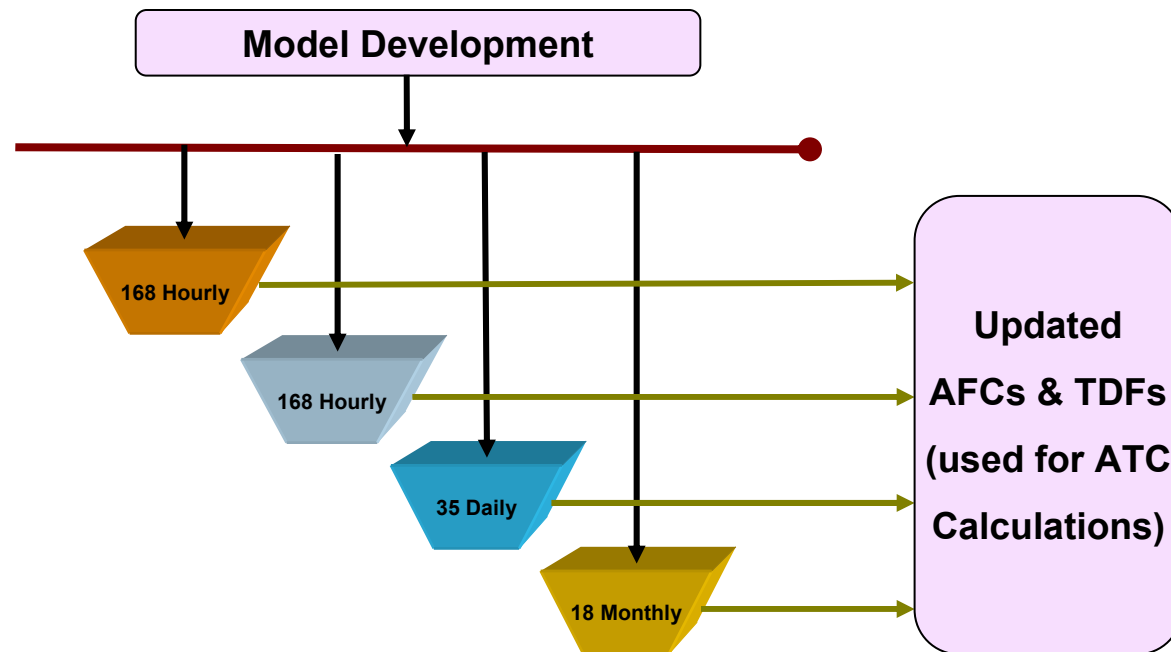


Wheeler-Five Points 161kV flo
 Browns Ferry-Maury 500kV

- Manual AFC coordination to address constrained flowgates
- Benefits
 - Entergy flowgates identified as limiting element 30 times
 - Capable of ensuring most accurate AFC utilized for TSR approvals
- Automated AFC Coordination
 - JRCA-like sharing of AFCs for TSR studies
 - More frequent access to updated AFCs
 - Currently in development

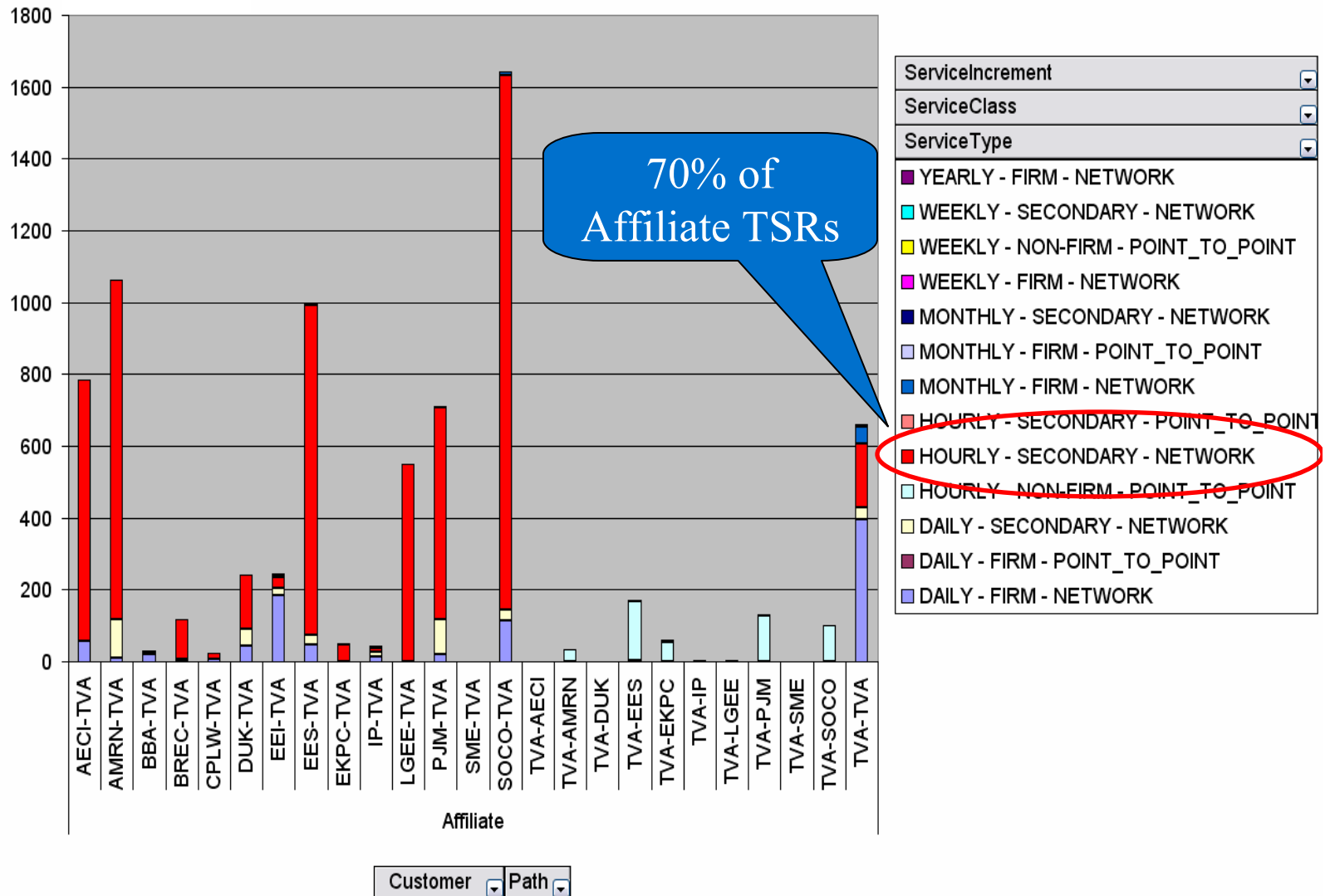
Model Development

- Load Flow models (frequency)
 - 48 hourly (hourly)
 - 168 hourly (1x daily)
 - 35 daily (2x daily)
 - 18 monthly (1x monthly)



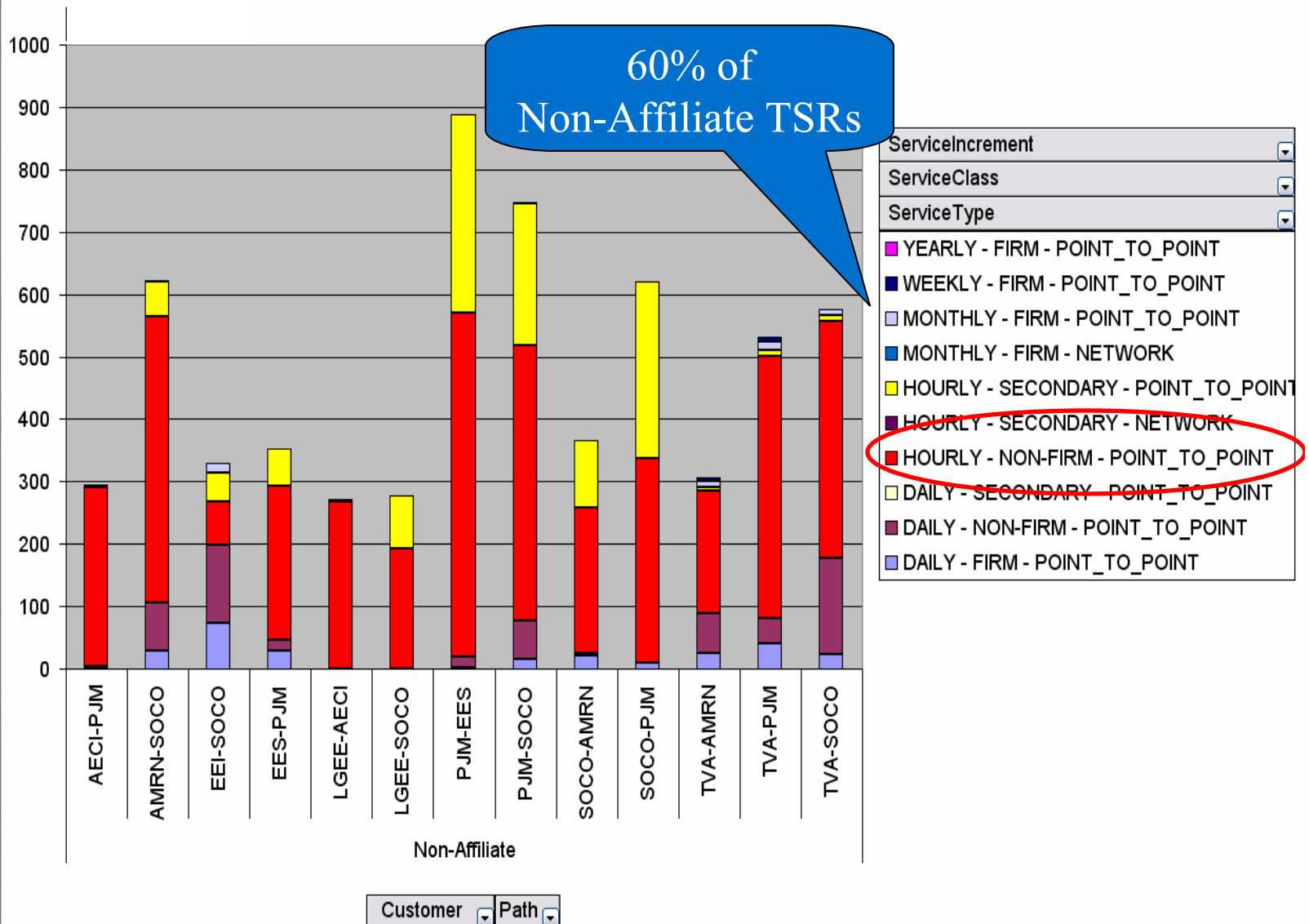


Affiliate TSRs



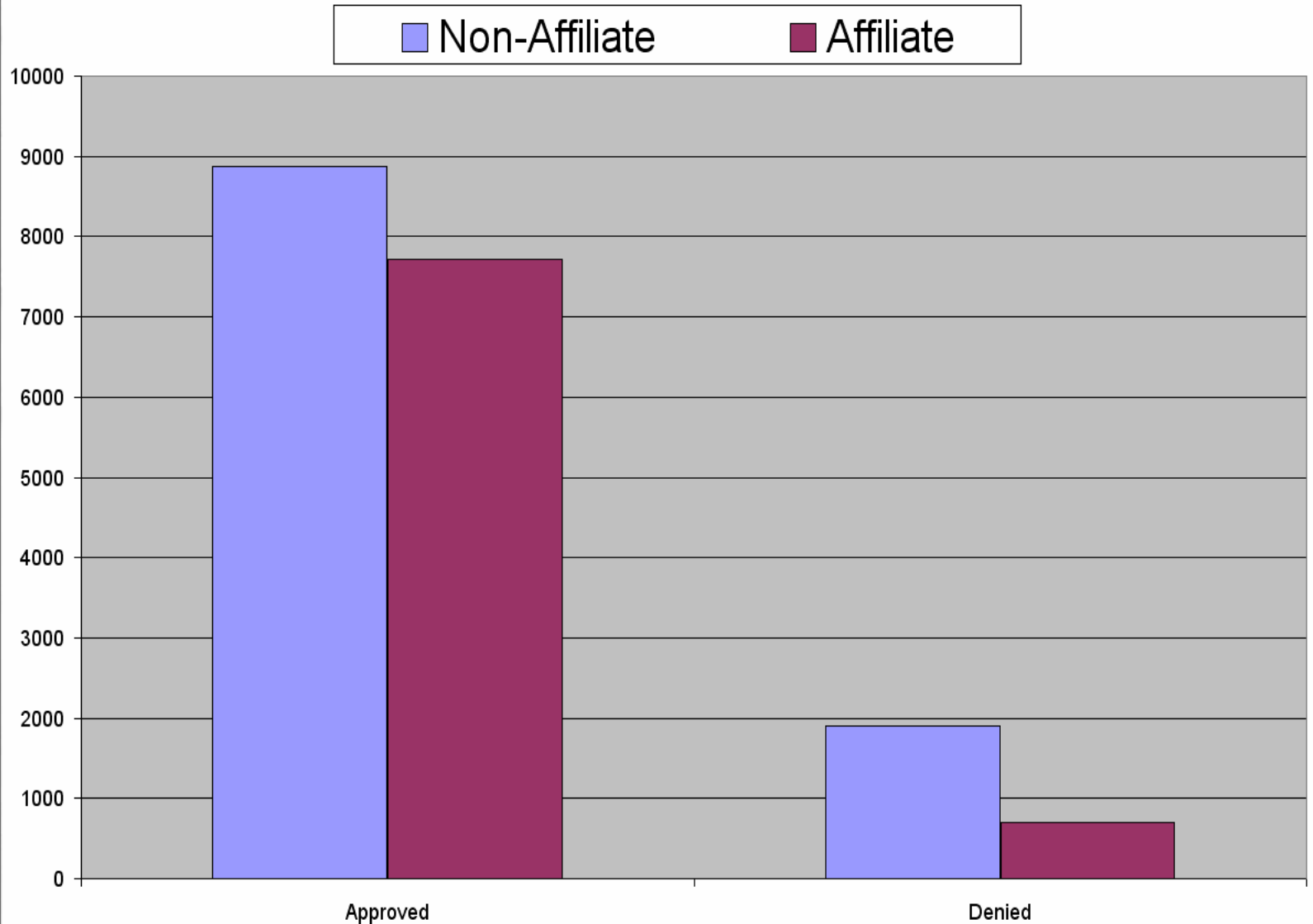


Non-Affiliate TSRs





TSR Summary



Most Active Paths (04/01/2007 – 03/31/2008)

Paths with 1000+ TSRs

