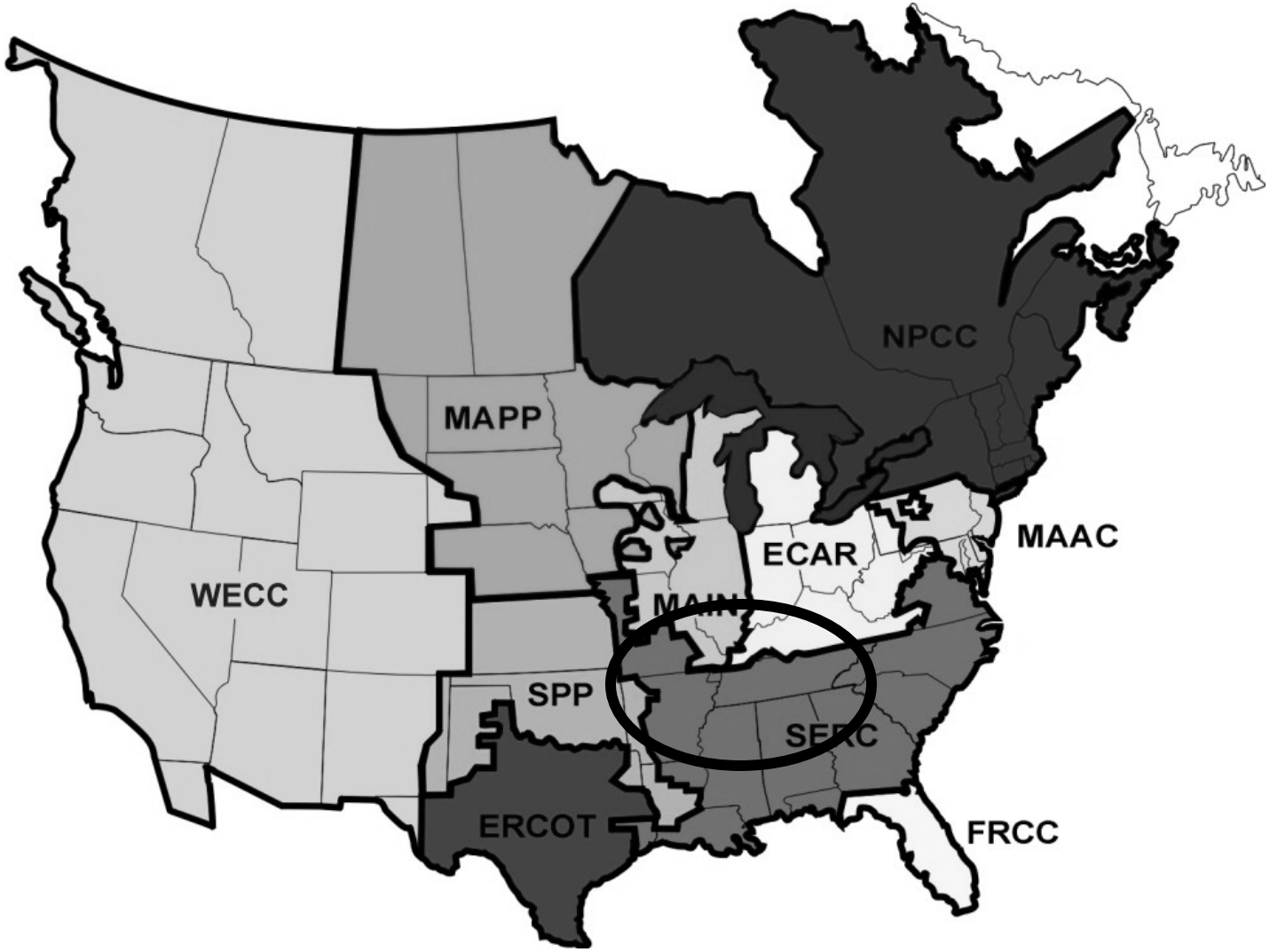
Regional Reliability

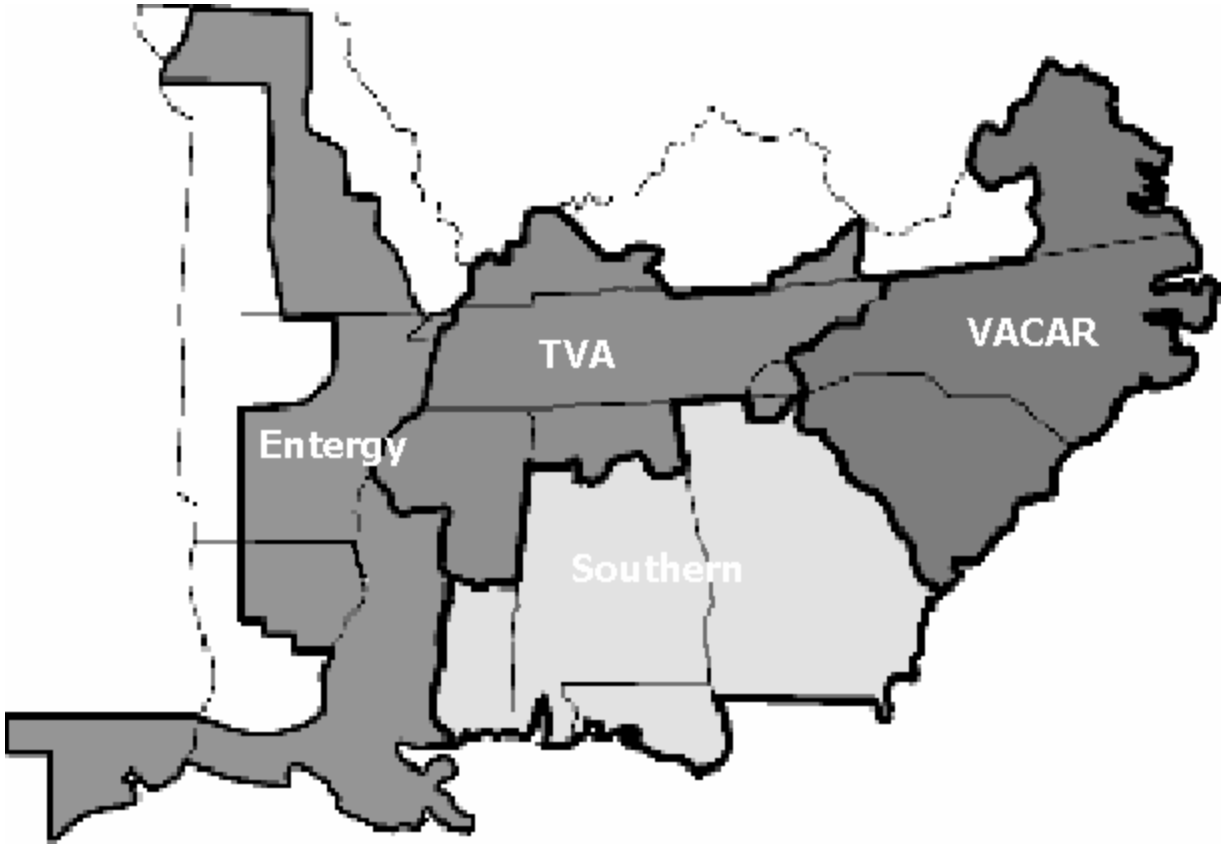
- TVA Reliability Area and Services

- TVA Control Area - Total Transfer Capability process

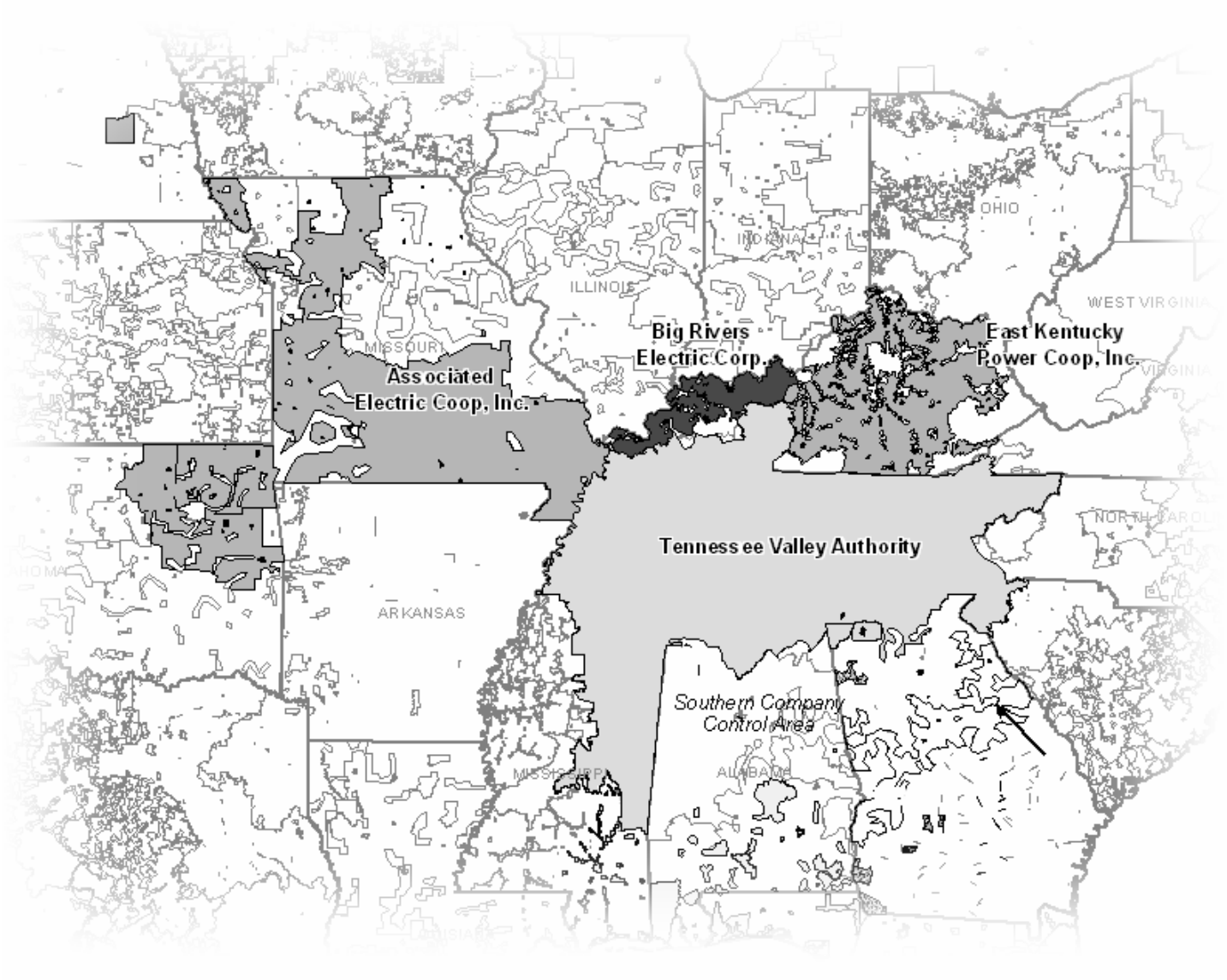
NERC Reliability Regions



SERC Region



Reliability Authority Footprint



TVA Reliability Area

Operating Entities

- Traditional Control Areas
  - AECI
  - BREC
  - EKPC
  - TVA (and 8 IPPs within the TVA Control Area)
- IPP Control Areas
  - Duke
    - New Albany, MS
    - Marshall, KY
  - Allegheny
    - Gleason, TN

System Dimensions

- 191,836 square miles in 10 states
- 4.7 million consumers
- 29,401 miles of transmission line
- 36,789 MW of load
- 45,183 MW of generation

Reliability Services

- Outage analysis
- Outage coordination
- NERC SDX posting
- System status reporting
- Congestion relief
- NERC/SERC representation
- TTC/ATC Calculation
- System monitoring and alarming

Reliability Authority

The TVA Reliability Coordinators derive authority to act from:

- NERC policy
- The Reliability Coordination Agreements
- The System Operator Authorization Letter
- The Reliability Coordinator Job Descriptions
- “Responsibilities and Communications” document reinforce this authority for the Reliability Coordinator System Operator.

Transmission Service Provider

- Ensure Transmission Service Guidelines in conformance with FERC policy
- Maintain “Formula” transmission and ancillary services rates
- Maintain “OASIS”
- Ensure non-discriminatory transmission service consistent with “Guidelines”
- Generation Interconnection (Including IPPs)
- NERC/SERC representation
- TTC/ATC Calculation

ATC/TTC Calculation/Definition

- ATC = TTC – TRM – CBM – Transmission Commitments
- Available Transmission Capacity (ATC)
  - A measure of the transfer capability remaining in the physical transmission network for further commercial activity over and above already committed uses.

- Total Transfer Capacity (TTC)
  - The amount of electric power that can be moved or transferred reliably from one area to another area by way of all transmission lines between those areas under specified system conditions

ATC/TTC Calculation

- Transmission Reliability Margin (TRM)
  - The amount of transmission transfer capability necessary to provide reasonable assurance that the interconnected transmission network will be secure
- Capacity Benefit Margin (CBM)
  - The amount of firm transmission transfer capability preserved by the transmission provider for load-serving entities, to enable access to generation from interconnected systems to meet generation reliability requirements
- Transmission Commitments
  - All firm commitments for TVA transmission capacity

TTC

- TTC is calculated using PSS/E and MUST software packages by Power Technologies Inc (PTI)
  - PSS/E = Power System Simulator for Engineering
    - Transmission System Model Building
  - MUST = Managing and Utilizing System Transmission
    - Transfer Studies and Establish Transfer Capability

MUST Output (1st Contingency)

FCITC MULTIPLE TRANSFER REPORT

MUST Title: *** MUST 5.0 *** FRI, OCT 03 2003 10:16 ***
Title1: SEAMS BASE CASE DEVELOPED IN JUNE 2003
Title2: SHELL: VAST OASIS CASES RELEASED MAY 2003
Monitor File: C:\Mustfiles\TVA_ONLY.mon
Contingency FilC:\Mustfiles\TVA_contingency.con
Subsystem File:C:\Mustfiles\TVA_subsystem.sub
Exclude File: none

Reporting the first 20 violations per transfer

From	To	Transfer Level	N	FCITC	Flag	Limiting Constraint	Contingency
TVA	AEP	3000	1	1093.4		L:18464 8BULL RU 500 18468 8VOLUNTE 500 1	
							C:18457 8WBNP 1 500 18468 8VOLUNTE 500 1
							Open 18457 8WBNP 1 500 18468 8VOLUNTE 500
			2	1701.4		L:18808 5LAFOLLE 161 18810 5NORRIS 161 1	
							C:18018 8PHIPP B 500 18468 8VOLUNTE 500 1
							Open 18018 8PHIPP B 500 18468 8VOLUNTE 500
			3	2086.1		L:18027 5SUMMER 161 18713 5LAFAYET 161 1	
							C:18692 5E BOWL 161 19007 5BRSTO T 161 1
							Open 18692 5E BOWL 161 19007 5BRSTO T 161
			4	2193.2		L:18027 5SUMMER 161 18713 5LAFAYET 161 1	
							C:19006 5GLASG T 161 19007 5BRSTO T 161 1
							Open 19006 5GLASG T 161 19007 5BRSTO T 161
			5	2488.6		L:19006 5GLASG T 161 19007 5BRSTO T 161 1	
							C:18027 5SUMMER 161 18713 5LAFAYET 161 1
							Open 18027 5SUMMER 161 18713 5LAFAYET 161
			6	2633.8		L:18018 8PHIPP B 500 18468 8VOLUNTE 500 1	
							C:18468 8VOLUNTE 500 18469 5VOLUNT1 161 1
							Open 18468 8VOLUNTE 500 18469 5VOLUNT1 161
			7	2738.7	*	L:18027 5SUMMER 161 18713 5LAFAYET 161 1	
							C:18018 8PHIPP B 500 18468 8VOLUNTE 500 1
							Open 18018 8PHIPP B 500 18468 8VOLUNTE 500
			8	2747.3		L:18018 8PHIPP B 500 18468 8VOLUNTE 500 1	
							C:15001 8BOWEN 500 15097 8CONSAUG 500 1
							Open 15001 8BOWEN 500 15097 8CONSAUG 500

Generator Operating Limits

- TVA's Proposal To Balance The Needs of the IPP's Without Reducing TVA System Reliability

Definition

- The GOL for a generator creates a value for which with ATC calculations, can be used to reserve Point-to-Point Transmission service from the generating facility inside the Transmission Provider Control Area to an adjacent Control Area.

Methodology for Calculating GOLs

- The Transmission Provider calculates GOL values on a monthly basis
- Power transfers are simulated from the Control Area to the adjacent Control Areas to find the ATC
- Transfer Limits will be established based upon a limiting element due to a single contingency

System Models for the GOL Study

- Basecase Models
  - Coordinated Models with TVA Neighboring Utilities
  - Have detailed items such as transmission, generator outages
  - Scale system load to the appropriate level
  - Insert all external outages (SDX Data)

Modeling IPP Generators (Phase One)

- Activate all IPP's to their full generating capacity (using TVA as a sink)
- Exceptions
  - IPP's scheduled to be off-line
  - IPP's that have not completed the necessary upgrades to the transmission system

Transfer Study

- A transfer study is done from TVA to the adjacent control areas
- The results provide the level of available transfer capabilities from TVA to other control areas
- The modeled generation is then transferred as the GOL to the IPP

Modeling IPP Generators (Phase Two)

- Sometimes the calculated TTC is not always enough to meet current commitments and could end up producing a “negative” ATC value pending system load and transmission configuration
- These limiting elements reducing the ATC on the TVA grid are not always due to specific generators, but are due to all generators providing their own small share to overloading a specific transmission element
- To eliminate the negative transfer levels, a new study is done with reduced IPP generation levels modeled
  - The amount of reduction is pending system load and transmission configuration
  - Each generator is reduced by a percentage of its generating capacity

Final GOL Results

- When the IPPs have been scaled to a level that permits acceptable transfer capabilities from TVA to the adjacent control areas, then that scaled level of generation becomes the GOL available for each generator

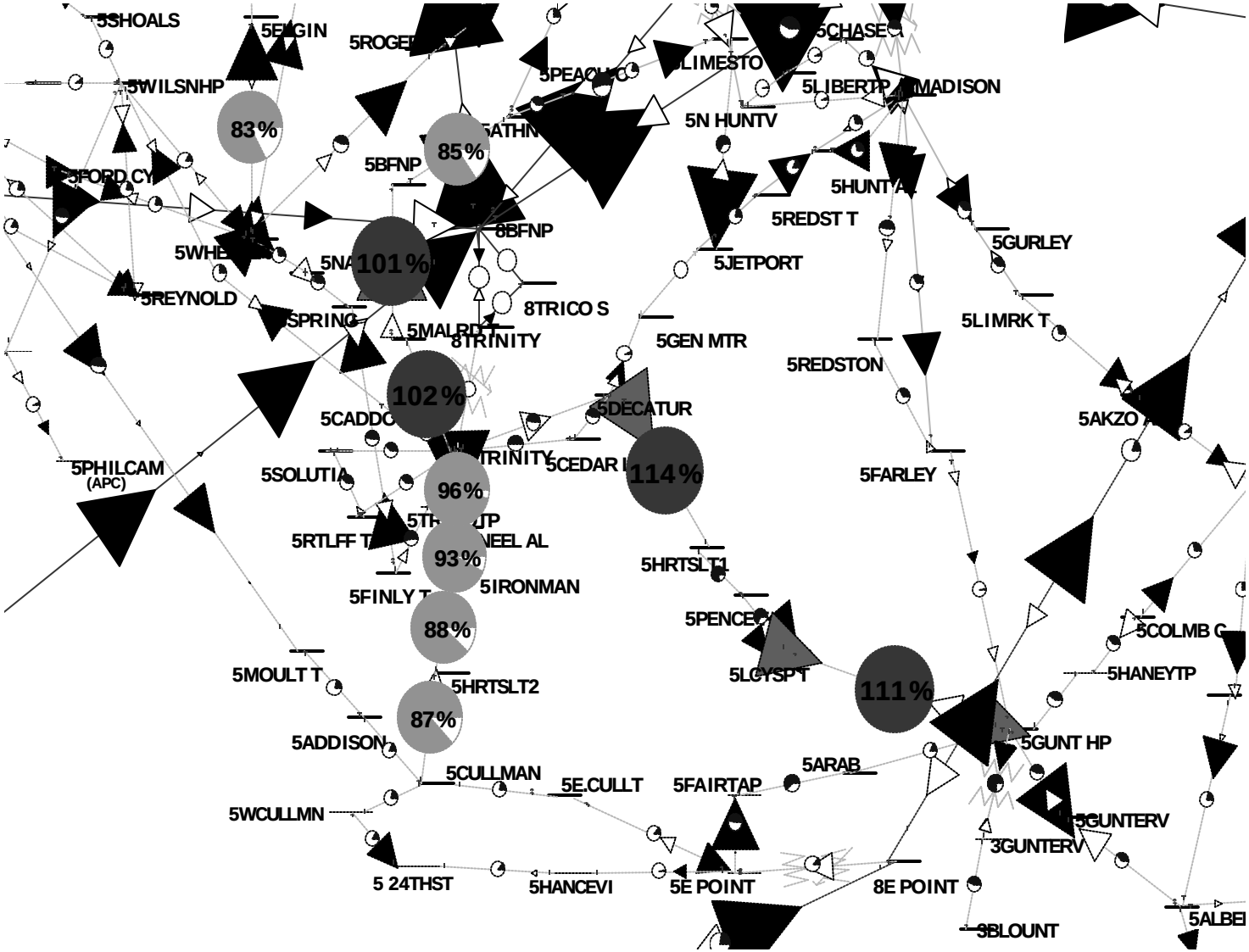
Daily Short Term Firm Within Zones

- Many IPPs fall within a local area or zone with other IPPs
- If an IPP does not utilize the capacity available, then it will be made available to the remaining IPPs within that zone

Local Area Problems

- An area (zone) with all IPPs running at maximum capacity may cause local elements to exceed their rating

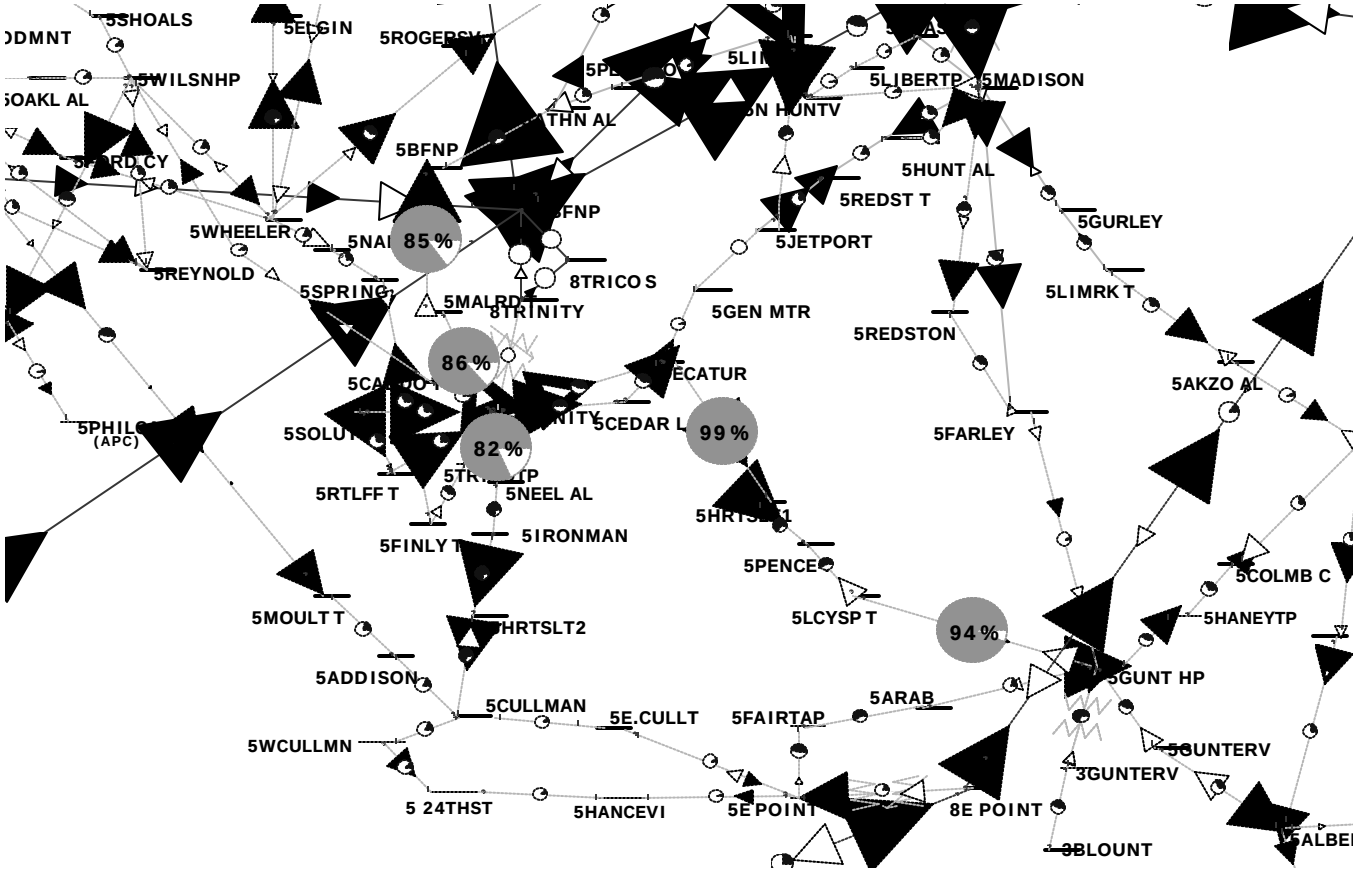
IPP “A” = 800, IPP “B” = 800



Real Time IPP Monitoring

- Pending system load and/or configuration some elements on the grid may experience overloads due to generation produced in certain zones
- Generation Shift Factors (GSF) will be calculated for each IPP and its effect on the critically loaded element
- The GSF will be used as necessary to reduce the IPP capacity to maintain system reliability
- In this case Firm commitments will be granted on a first come first serve basis

IPP “A” = 800, IPP “B” = 600



Non-Firm Reservations

- Most IPPs will be able to generate up to maximum capacity on a non-Firm basis