TVA Customer Conference

Transmission Capacity & Generator Limits

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

GOL - Definition

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

System Models for the GOL Study

- Base-case 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)

Critical Flowgates To Monitor

- Critical Flowgates need to be identified along with Generator Shift Factor's (GSF) from significant IPP's
  - GSF = The percentage of generation which will impact a specific flowgate

Setting Up Zones

- Zones are defined by IPP's which have the same generation shift factor (GSF) on their local flowgates
  - Focusing on those flowgates which are limitations in the area

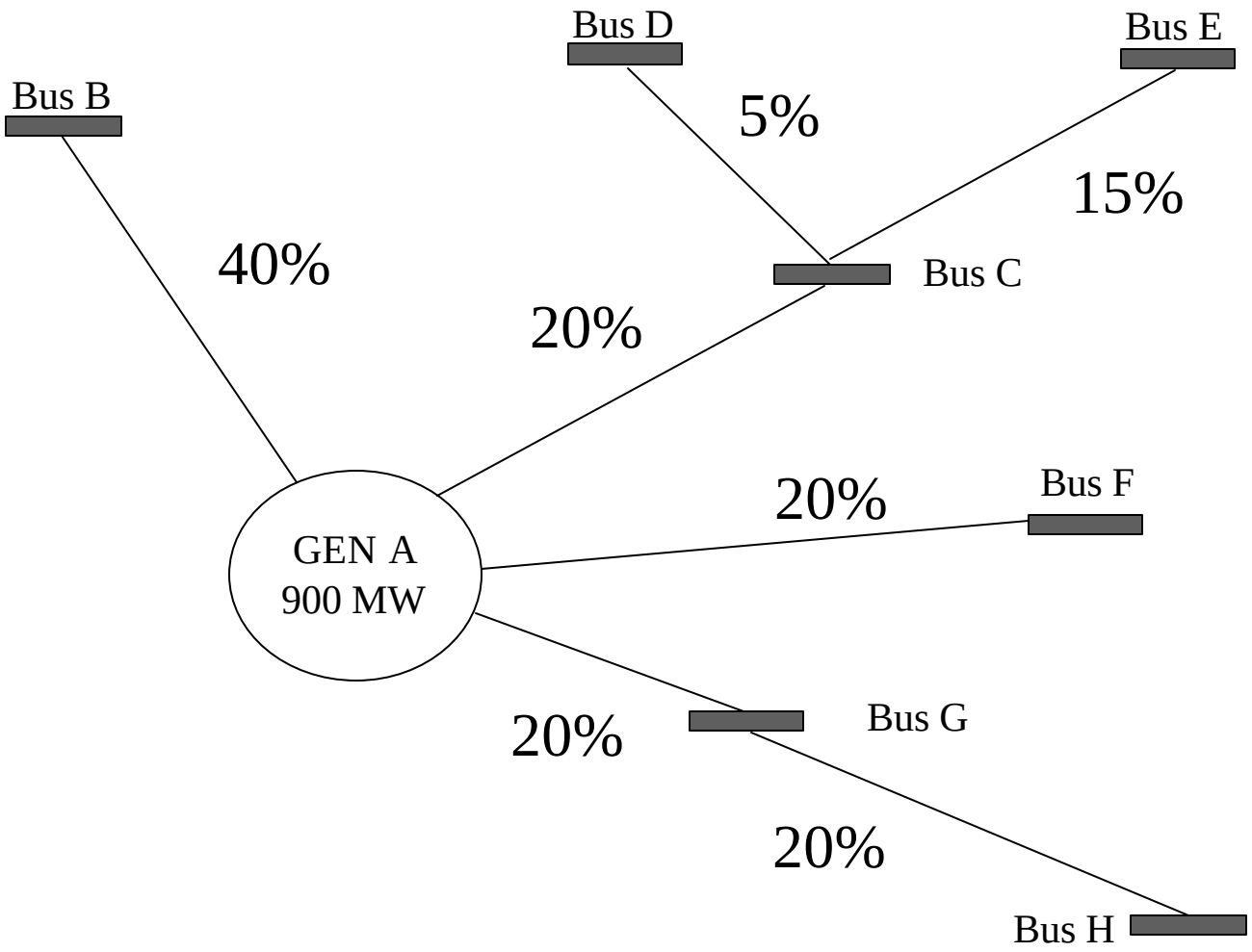
Calculation Process

- Develop model and solve case
- Find the power flows on all critical flowgates after a first contingency
- Subtract the power flow from facility contingency rating
- If difference is greater than zero, divide difference by GSF, otherwise GOL is Zero
  - (Rating - Base Case Flow) / GSF% = GOL for that Zone

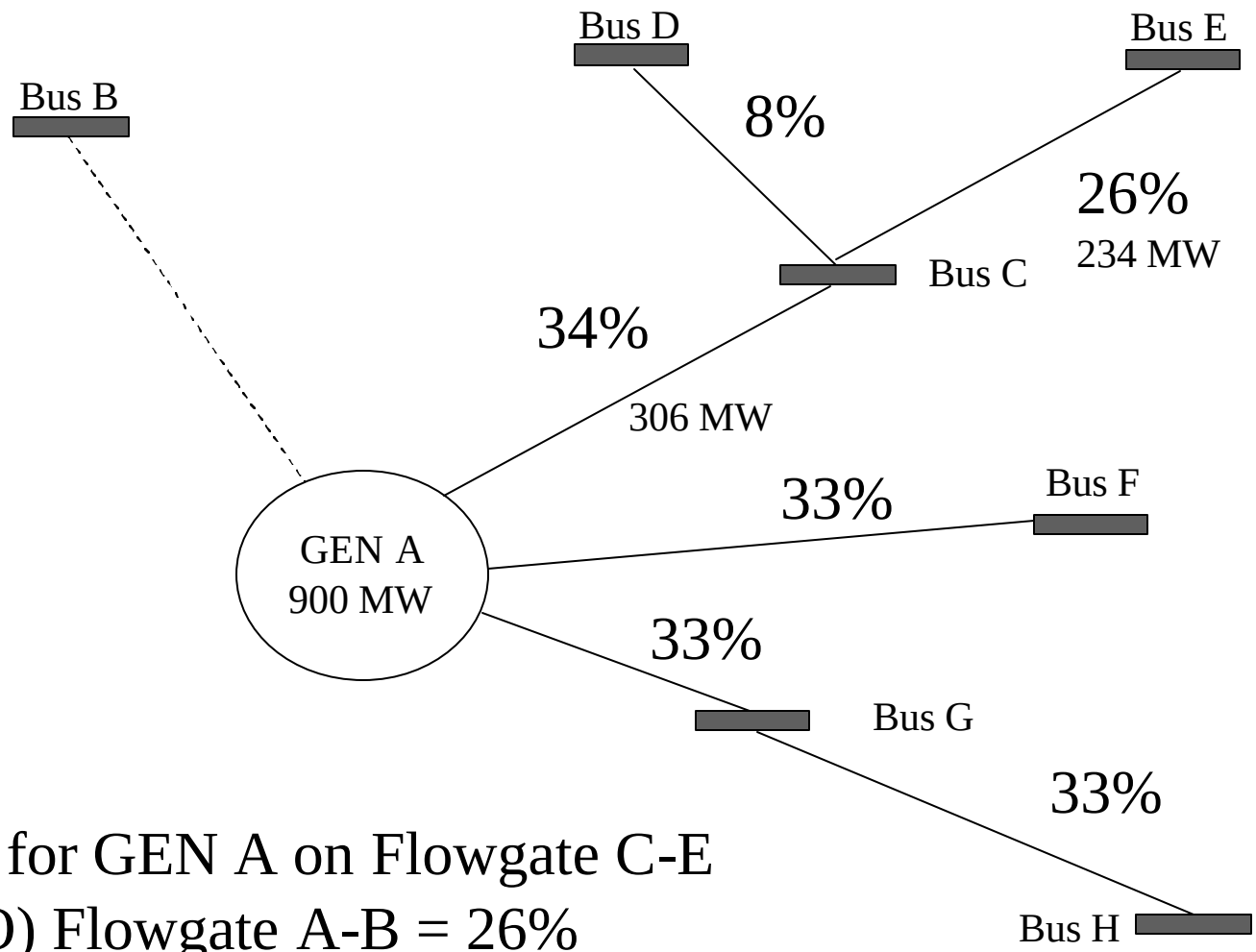
Conclusion

- A Zone may have more than one flowgate. The lowest GOL will be the selected amount for that Zone.
- If there is more than one IPP in a Zone, the first to place its reservation will be given preference.

Example GOL, GSF's On Flowgates – (System Normal)



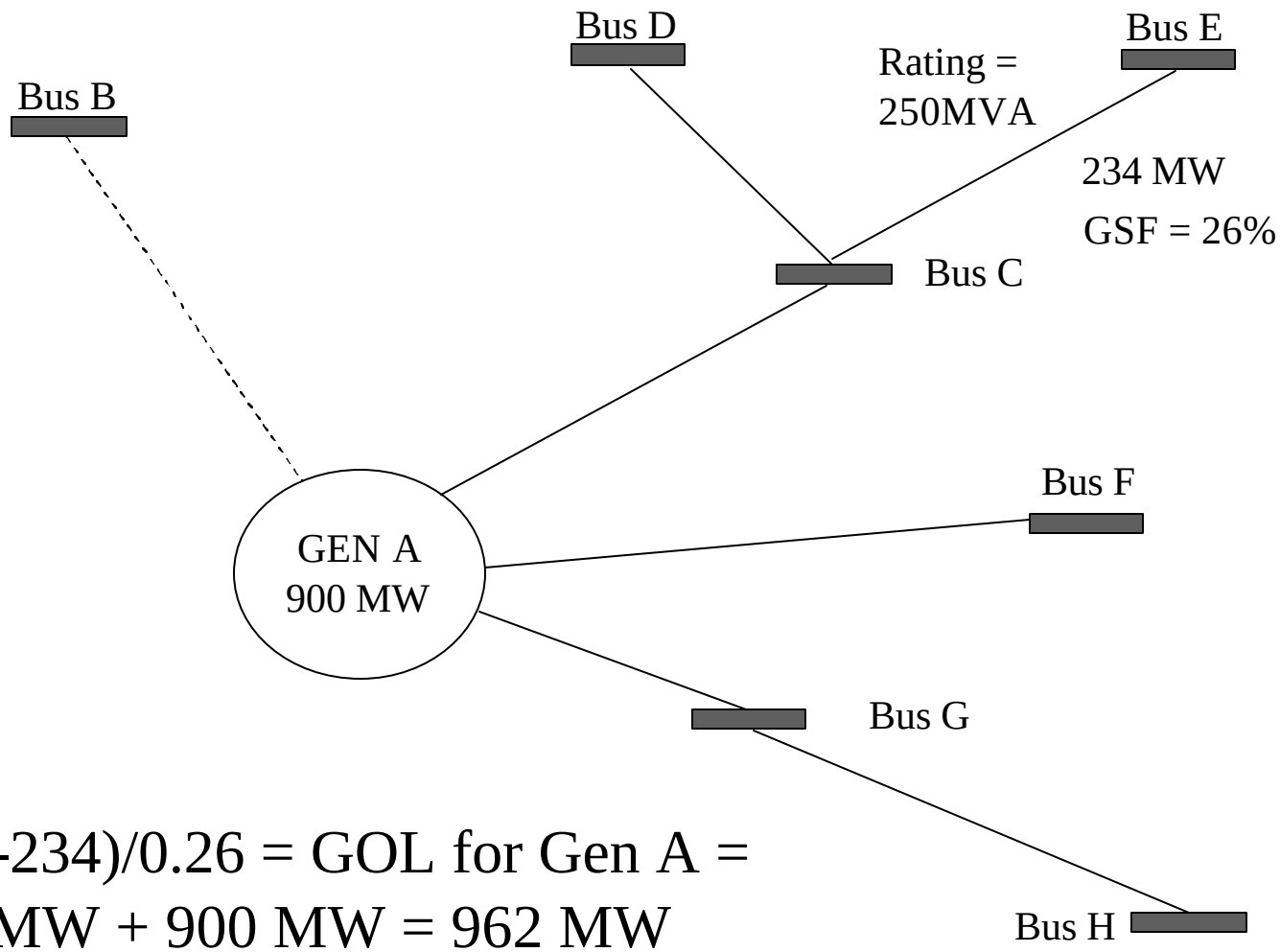
Example GOL, GSF's On Flowgates – (Contingency)



GSF for GEN A on Flowgate C-E

(FLO) Flowgate A-B = 26%

Example GOL, GSF's On Flowgates – (Contingency)



(250-234)/0.26 = GOL for Gen A =
~62 MW + 900 MW = 962 MW