2006 Loss Factor Methodology
2 Bus Example

Operations Forecasting

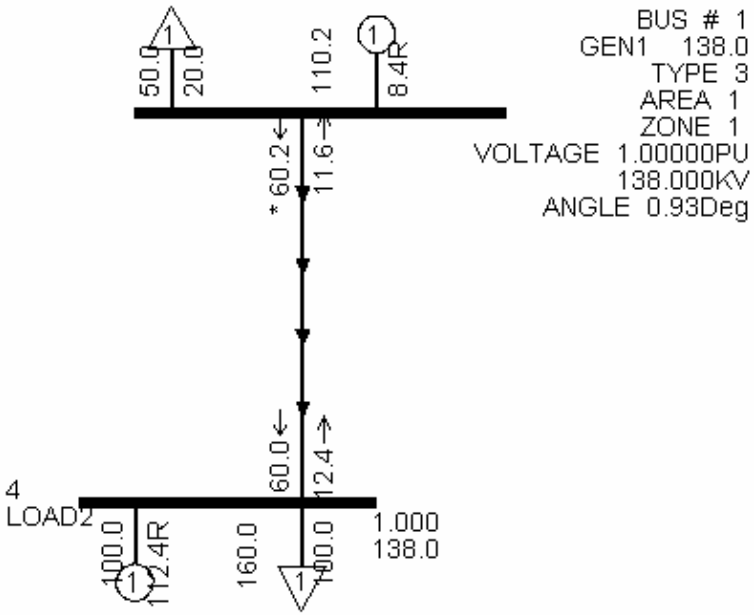
March 10, 2005

Purpose

- The purpose of this presentation is:
  - to provide a simple 2 bus example demonstrating the concept of transmission losses,
  - to confirm the allocation of losses and distribution of credits and charges.

The Two Bus System

- Below is the model used to demonstrate the loss allocation
- Specific generation amounts are used in the analysis



Assumptions – the Model

- The model consists of two buses – 1 and 4
- Generator at bus 4 is on-line for all cases - including 0 MW generation. It provides reactive support.
- Swing bus is the generator whose LF is being calculated.
- Loads are also incremented/decremented at individual buses.
- Total Loss indicates the loss in the two bus system.
- Losses are only accrued on the line; no transformers are modeled, buses are loss less

Losses

- Average LF numbers are obtained by dividing the marginal numbers by 2.
- LFs are calculated using the proposed 50% area load methodology (proposed AESO solution).
  - In the Methodology, loads are incremented /decremented evenly according to their magnitude which is referred here as scaled.
- Loss contribution is obtained by multiplying the generation and the scaled average loss factor.
- Total loss contribution is the sum of loss contribution of two generators.

Losses (2)

- Total loss contribution and total loss are very close when the total loss is not close to zero.
- When the total loss is very small round-off errors become significant as we considered only two decimal places.

Loss Factor Calculated for Generator Connected at Bus 1

		5 MW Load Change						
		Marginal			Average			
Gen 1	Gen 4	Scaled	At Bus 1	At Bus 4	Scaled	At Bus 1	At Bus 4	Total Loss
211.13	0.00	1.09%	0.00%	1.38%	0.54%	0.00%	0.69%	1.13
185.8	25.00	0.89%	0.00%	1.19%	0.45%	0.00%	0.59%	0.8
160.53	50.00	0.70%	0.00%	0.99%	0.35%	0.00%	0.50%	0.53
135.32	75.00	0.60%	0.00%	0.79%	0.30%	0.00%	0.40%	0.32
110.16	100.00	0.40%	0.00%	0.60%	0.20%	0.00%	0.30%	0.16
60.00	150.00	0.10%	0.00%	0.10%	0.05%	0.00%	0.05%	0.00
10.07	200.00	-0.20%	0.00%	-0.40%	-0.10%	0.00%	-0.20%	0.07

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Loss Factor Calculated for Generator Connected at Bus 4

		5 MW Load Change			Average						
		Marginal							Loss Contribution		Total
Gen 1	Gen 4	Scaled	At Bus 1	At Bus 4	Scaled	At Bus 1	At Bus 4	Total Loss	G1	G4	
211.13	0.00	-0.40%	-1.42%	0.00%	-0.20%	-0.71%	0.00%	1.13	1.15	0.00	1.15
185.8	25.00	-0.30%	-1.21%	0.00%	-0.15%	-0.61%	0.00%	0.8	0.83	-0.04	0.79
160.53	50.00	-0.20%	-1.01%	0.00%	-0.10%	-0.51%	0.00%	0.53	0.56	-0.05	0.51
135.32	75.00	-0.20%	-0.71%	0.00%	-0.10%	-0.35%	0.00%	0.32	0.40	-0.08	0.33
110.16	100.00	-0.20%	-0.50%	0.00%	-0.10%	-0.25%	0.00%	0.16	0.22	-0.10	0.12
60.00	150.00	0.00%	-0.10%	0.00%	0.00%	-0.05%	0.00%	0.00	0.03	0.00	0.03
10.07	200.00	0.00%	0.40%	0.00%	0.00%	0.20%	0.00%	0.07	-0.01	0.00	-0.01

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Examples from the Tables

- Example 1.
  - G1: 211.13 MW (slide 7) * 0.54% (slide 7) = 1.15 MW (slide 8)
  - G2: 0 MW * (-.2%) = 0 MW (slide 8)
  - G1+G2 = 1.15 MW, Total loss recovery.
- Example 2.
  - G1: 185.8 MW (slide 7) * 0.45% (slide 7) = 0.83 MW (slide 8)
  - G2: 25 MW * (-15%) = 0.04 MW (slide 8)
  - G1+G2 = 0.79 MW, Total loss recovery.

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Results

- As can be seen, losses accrue based on flows on the line in the two bus model
- Credits and charges are accrued based on the distribution of load and generation
- When generation flows from a bus, the bus is accrued charges
- When generation flows to a bus, credits are accrued at the bus
- The generalized and specific loss methodologies hold true in the two bus model

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Questions

- What else can we tell you?


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