PROMOD Modeling Modifications

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PROMOD Modeling modifications

- Cutting edge methods for PROMOD analysis developed by ATC. In-depth discussion at the July PROMOD Users' Group meeting.

  ➢ Modeling Generation Contingencies

  ➢ Accounting for impact of losses on constraint ratings
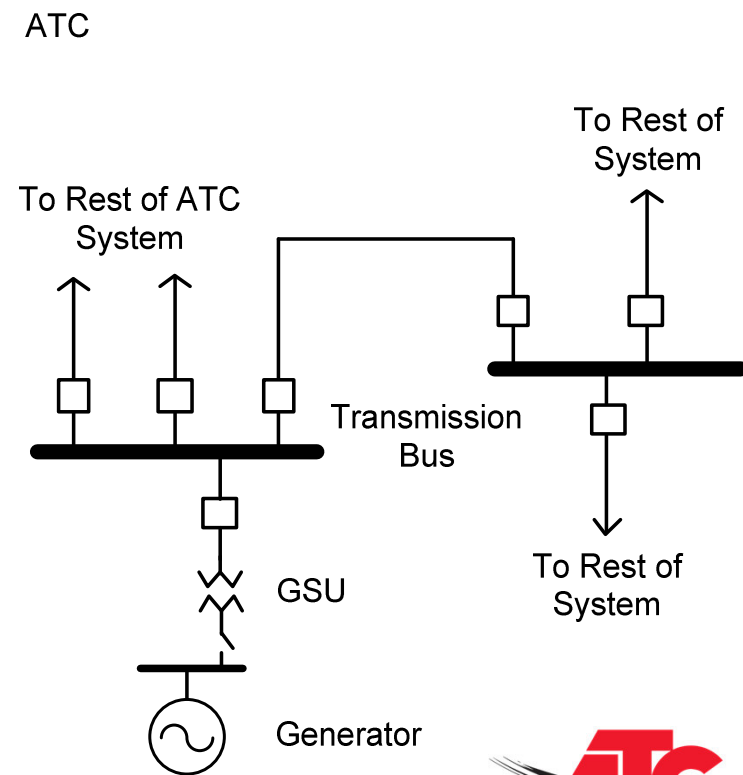
ATC
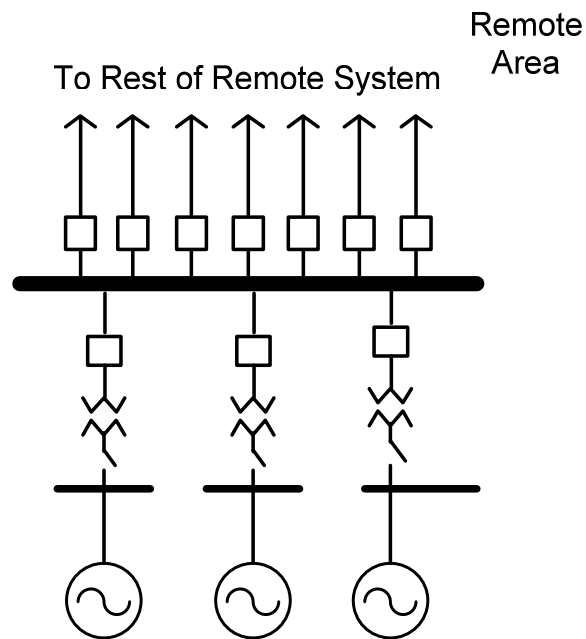**AMERICAN TRANSMISSION COMPANY®**

Modeling Generation Contingencies in PROMOD

Issue: Generation contingencies can't be modeled in PROMOD, but may cause congestion and have economic impacts.

- Only transmission elements can be outaged in the event file

- Generation separated from system causes islands, creating solution difficulties
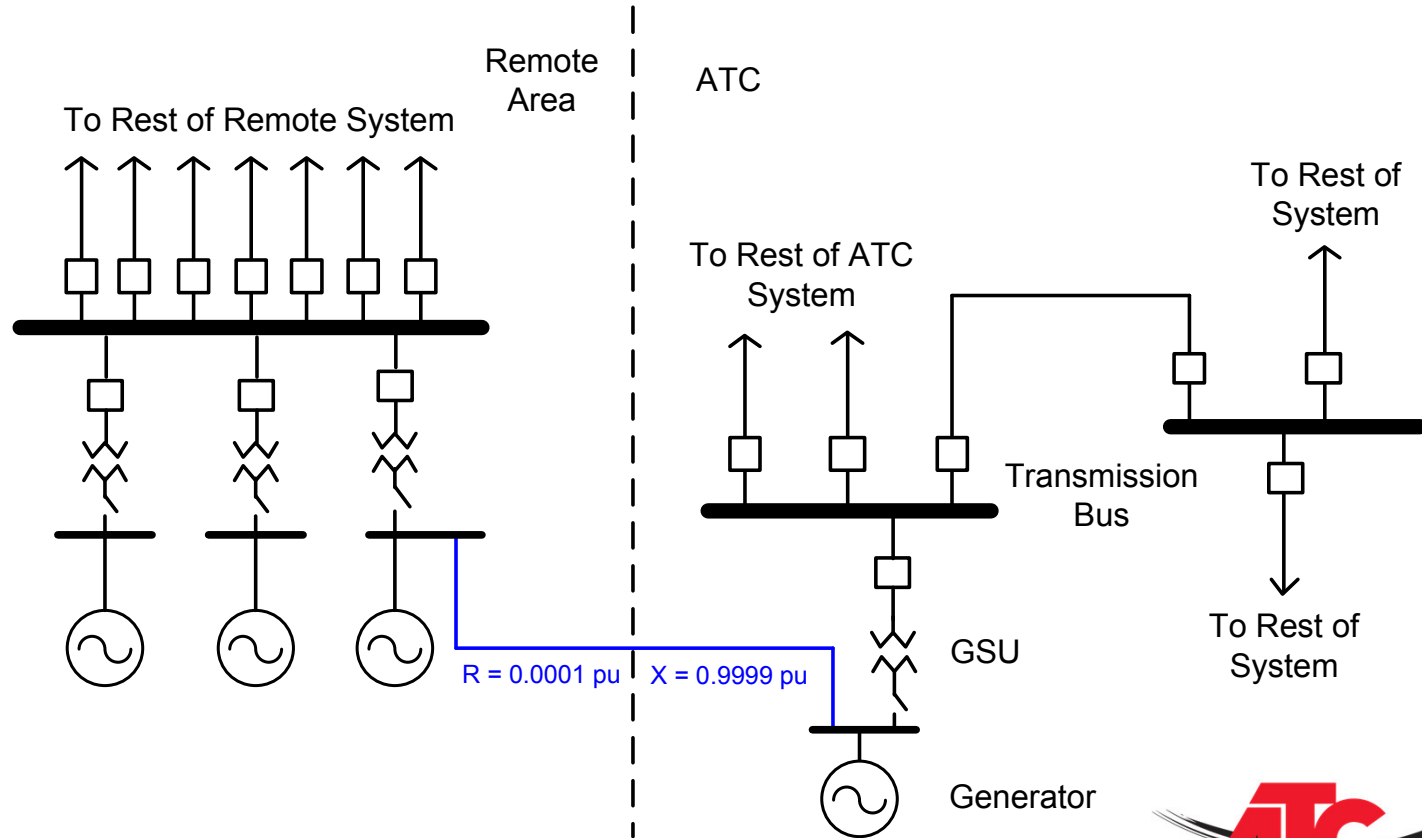
Modeling Generation Contingencies in PROMOD

Use a high impedance line to connect generator to be outaged to the system swing or other remote location…

Remote Area

ATC

To Rest of Remote System

To Rest of ATC System

To Rest of System

Transmission Bus

To Rest of System

GSU

Generator

Modeling Generation Contingencies in PROMOD

High impedance prevents this line from having an impact on current system flows…

Remote Area | ATC

To Rest of Remote System

To Rest of ATC System

To Rest of System

Transmission Bus

R = 0.0001 pu | X = 0.9999 pu

GSU

Generator

To Rest of System

Modeling Generation Contingencies in PROMOD

For GSU contingency, MW output of generator would be injected at remote area. Low R value means almost entire MW amount is conserved (i.e. no losses).
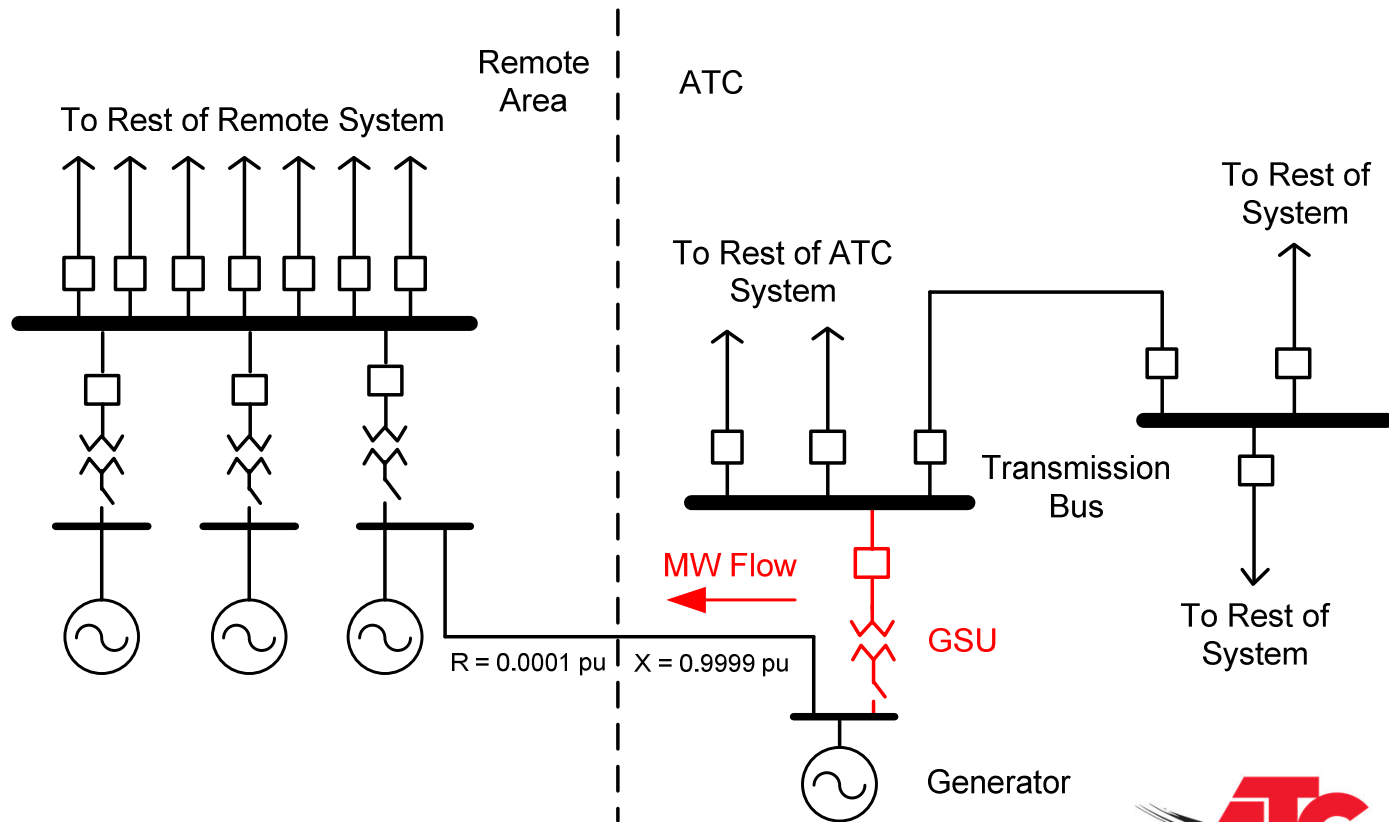
# Modeling Generation Contingencies in PROMOD

ATC Work Around

- Include Generator Step-Up (GSU) transformers in the event file

- Provide alternate (fake) high impedance path for generation to system swing in TVA

- High reactance (X) impedes flows under system normal conditions

- Low resistance (R) eliminates losses under GSU outage conditions

- Anticipates n-1 scenario for unit outages. Prepares system to handle additional import needs.

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Modeling Generation Contingencies in PROMOD

- Used in locations where planned outage of one unit plus forced outage of another may have significant economic impacts

- Used for large units with large system impacts
  - Genoa 3 (WI, DPC)
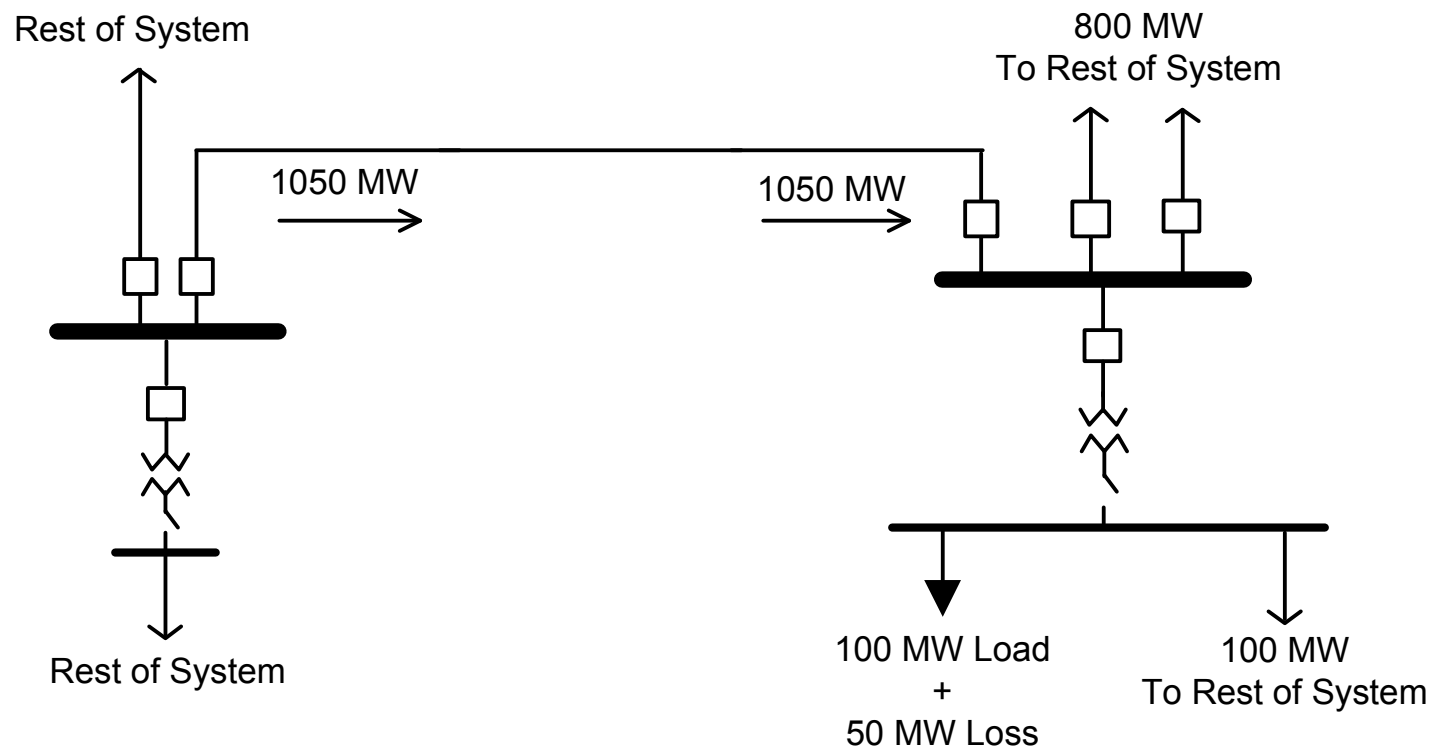
  - Rockport 1, 2 (IN, AEP)
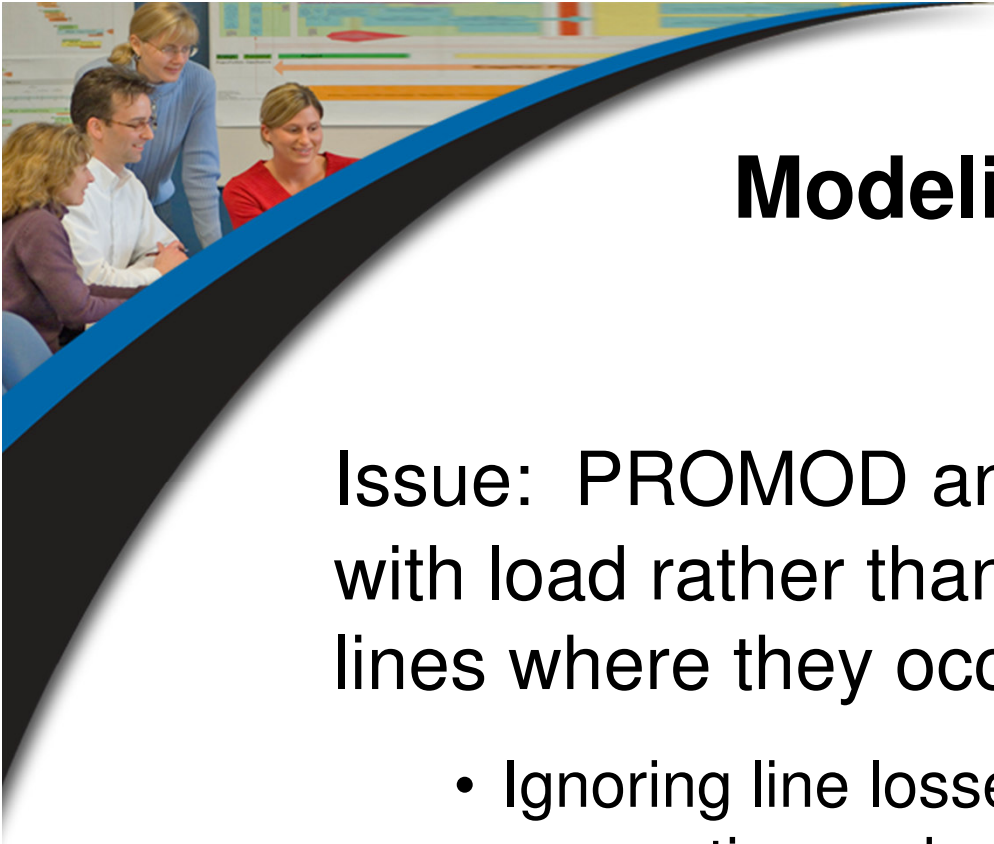
Modeling losses in PROMOD

Issue: PROMOD analysis lumps losses with load rather than placing them on the lines where they occur

- Ignoring line losses may result in neglected congestion and may have economic impacts.

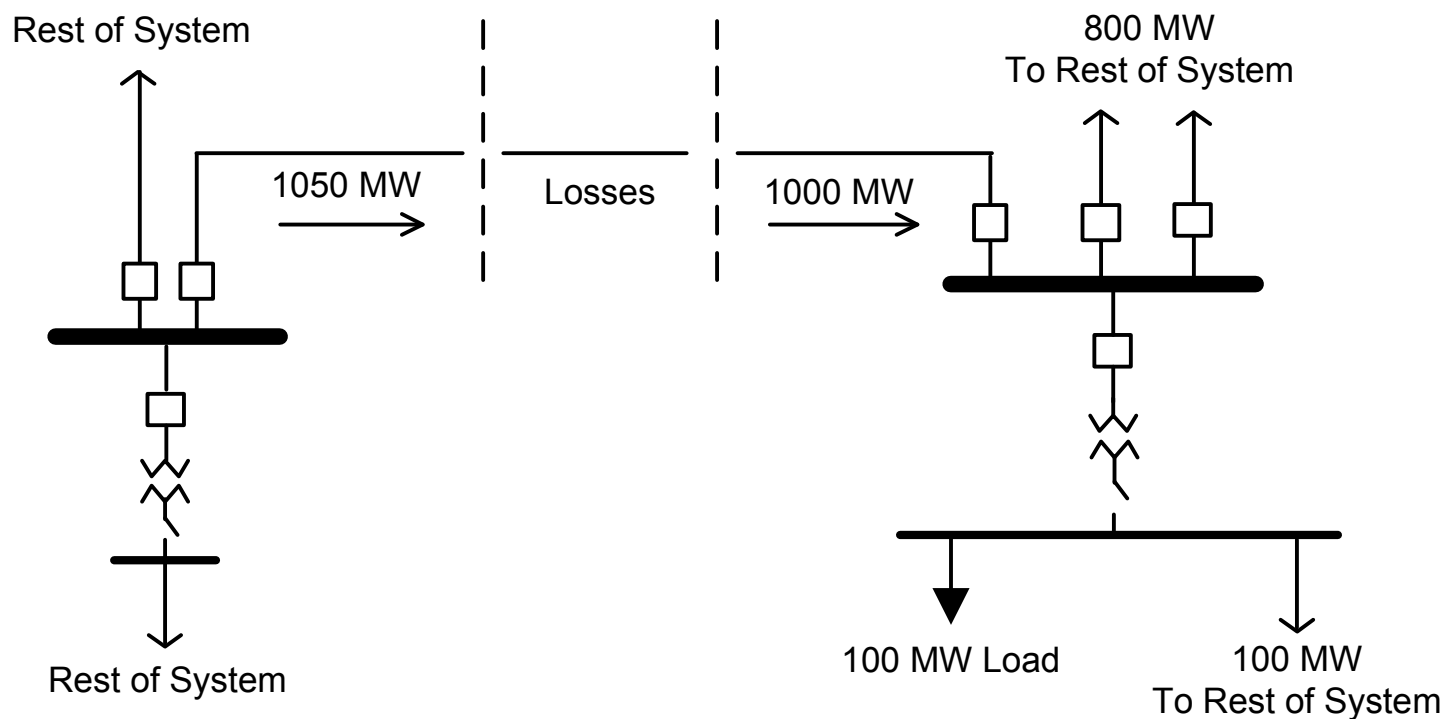- Issue of how much can be delivered across the line.

Line Losses in PROMOD

Rest of System

800 MW
To Rest of System

1050 MW → 1050 MW →

Rest of System

100 MW Load
+
50 MW Loss

100 MW
To Rest of System

Line Losses on System

Rest of System

1050 MW

Losses

1000 MW

800 MW
To Rest of System

Rest of System

100 MW Load

100 MW
To Rest of System

Modeling losses in PROMOD

ATC Work Around

- Use on long lines expected to have high losses

- Calculate expected losses based on the rating

- Reduce MVA rating in event file by loss totals

- Result is a lower amount of MW allowed to flow on the line (depicting losses on line) and a more accurate portrayal of the system

- This is the same method used by MUST* to create equivalent MW ratings on lines.

* Managing and Utilizing System Transmission (industry accepted analysis software)

Questions?