

SSG -WI Economic Valuation of Transmission Additions – Day-2: Modeling Issues

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Transmission Modeling

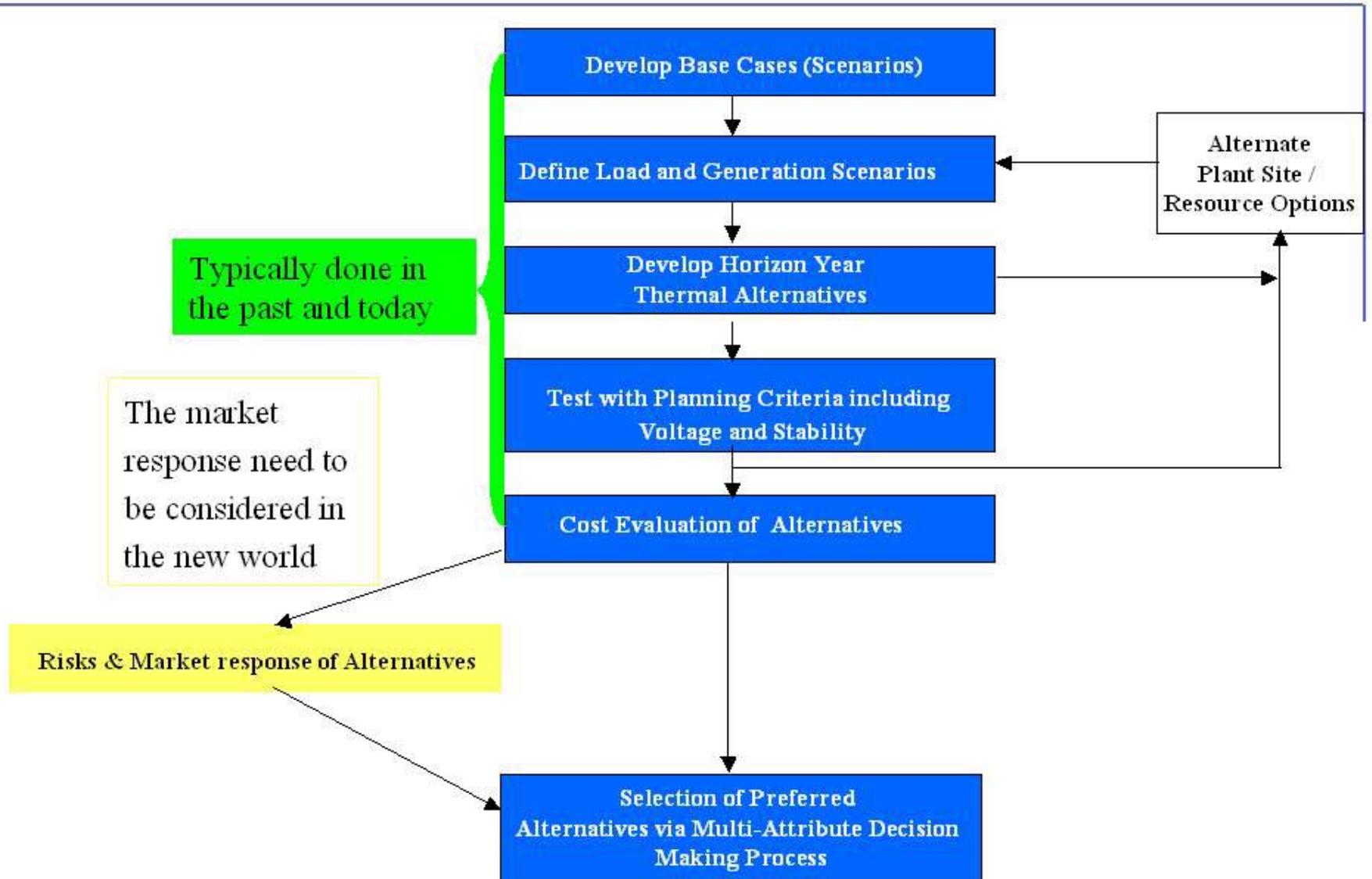
- *What's required for transmission expansion planning, AC vs. DC vs. Transportation?*
- *How should the Resource-transmission adequacy/reliability issues-constraints be modeled?*



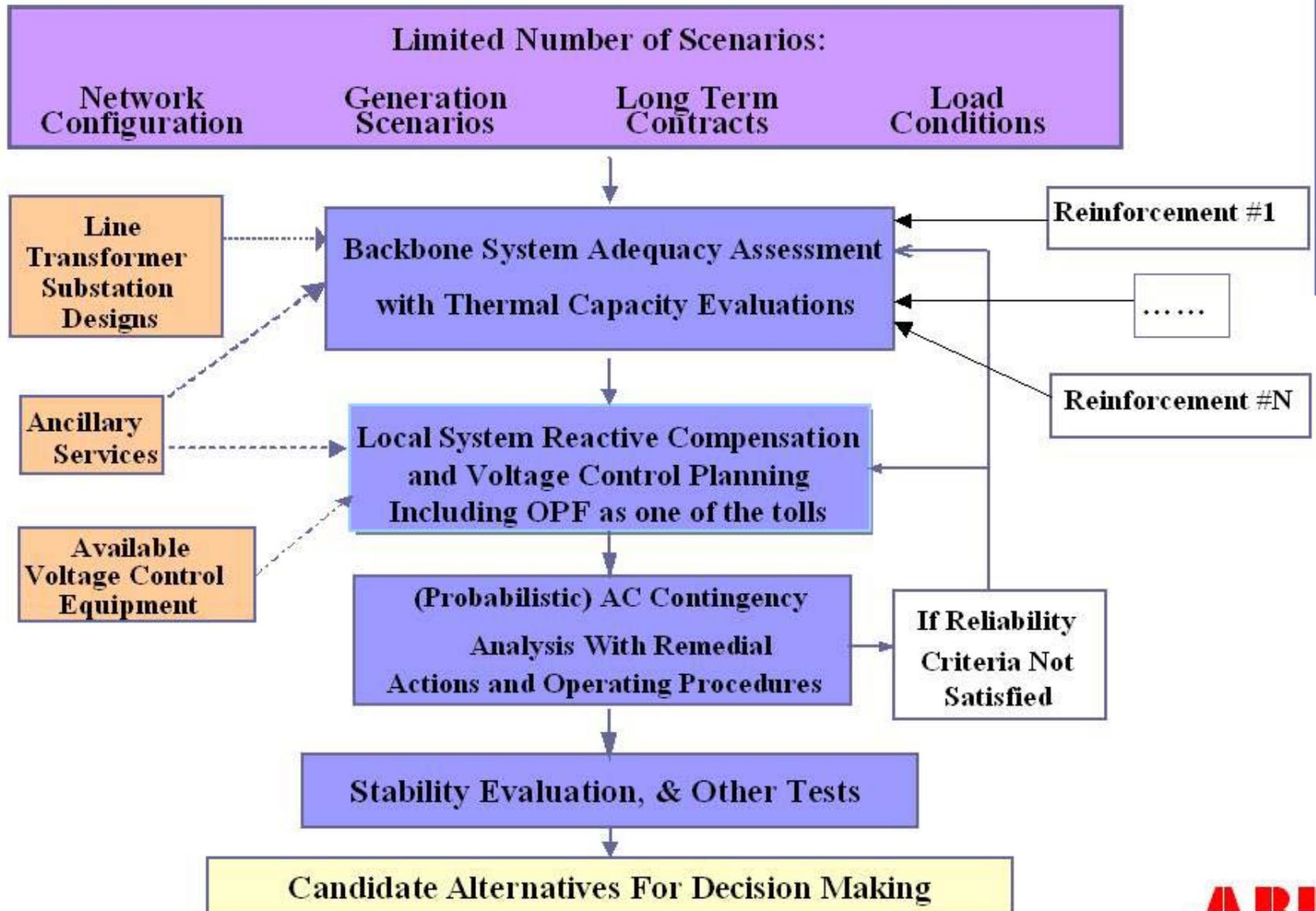
Panel 1 - Modeling Transmission

(a) AC vs. DC vs. transport algorithms – What's required
for transmission expansion planning?

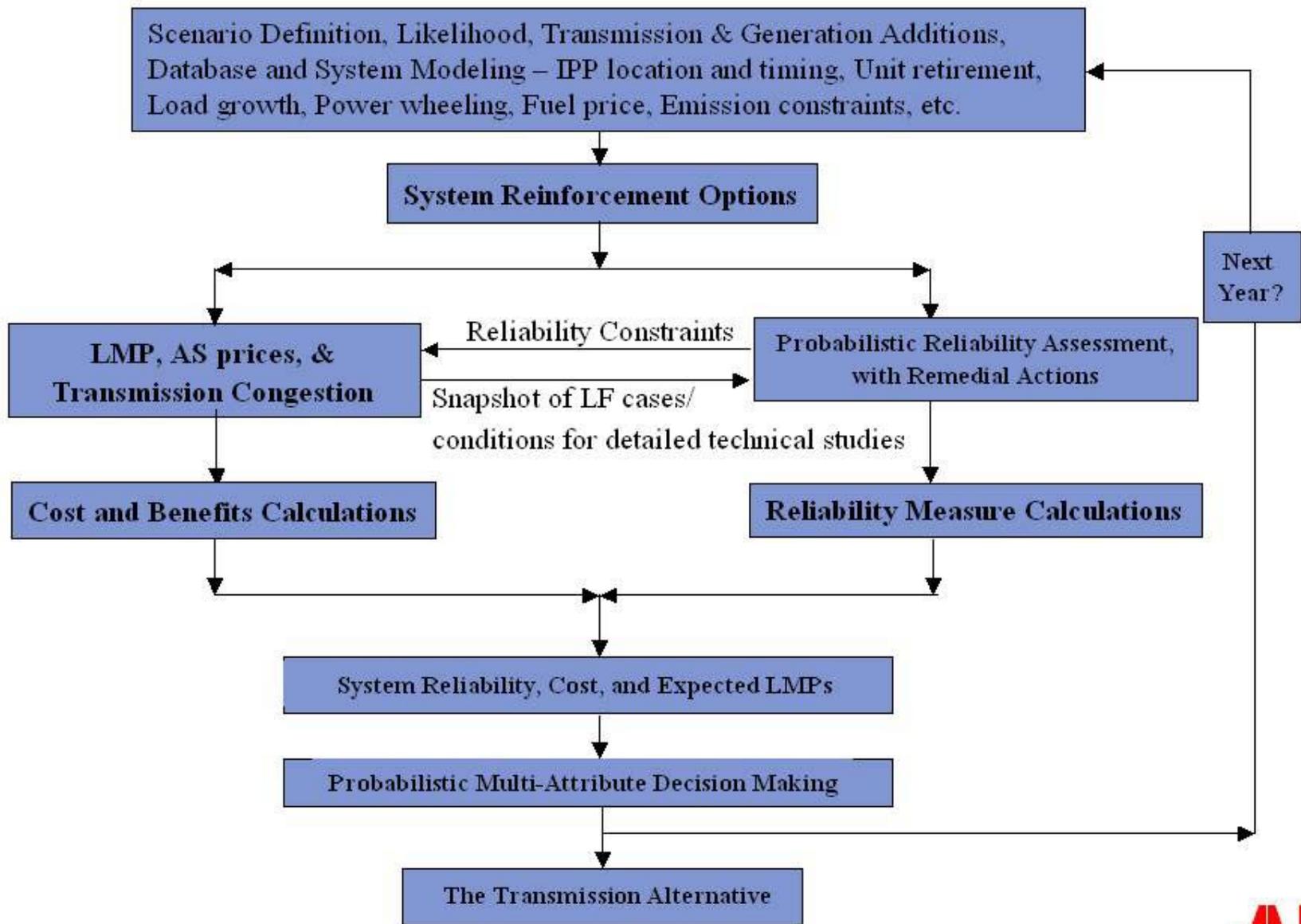
Long Term Transmission Expansion Planning Process



Short Term Operating Planning Studies



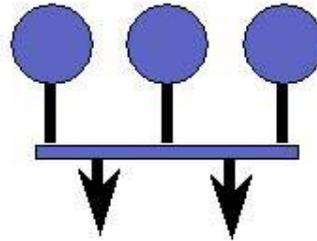
Integrated Economic and Reliability Assessment



Power Market Simulation Models

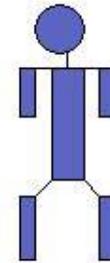
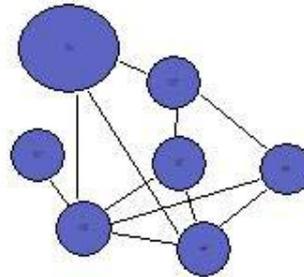
Supply Curve

- Ignores transmission



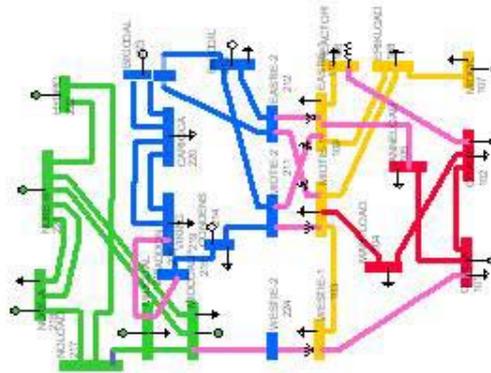
'Bubble' View

- Major interconnects only



Detailed View

- Very complex



ABB

SCUC/SCED Formulation

$$\text{Min } \left\{ \sum \bar{c}_g \Delta \bar{G} + \sum \bar{c}_d \Delta \bar{D} + \sum \bar{c}_\theta \Delta \bar{\theta} + \sum \bar{S}_t \Delta \bar{T} \right\}$$

$$\text{s.t. } \sum \bar{G} = \sum (\bar{L} + \bar{L}_{\text{osses}}) \quad \text{(Area Power Balances)}$$

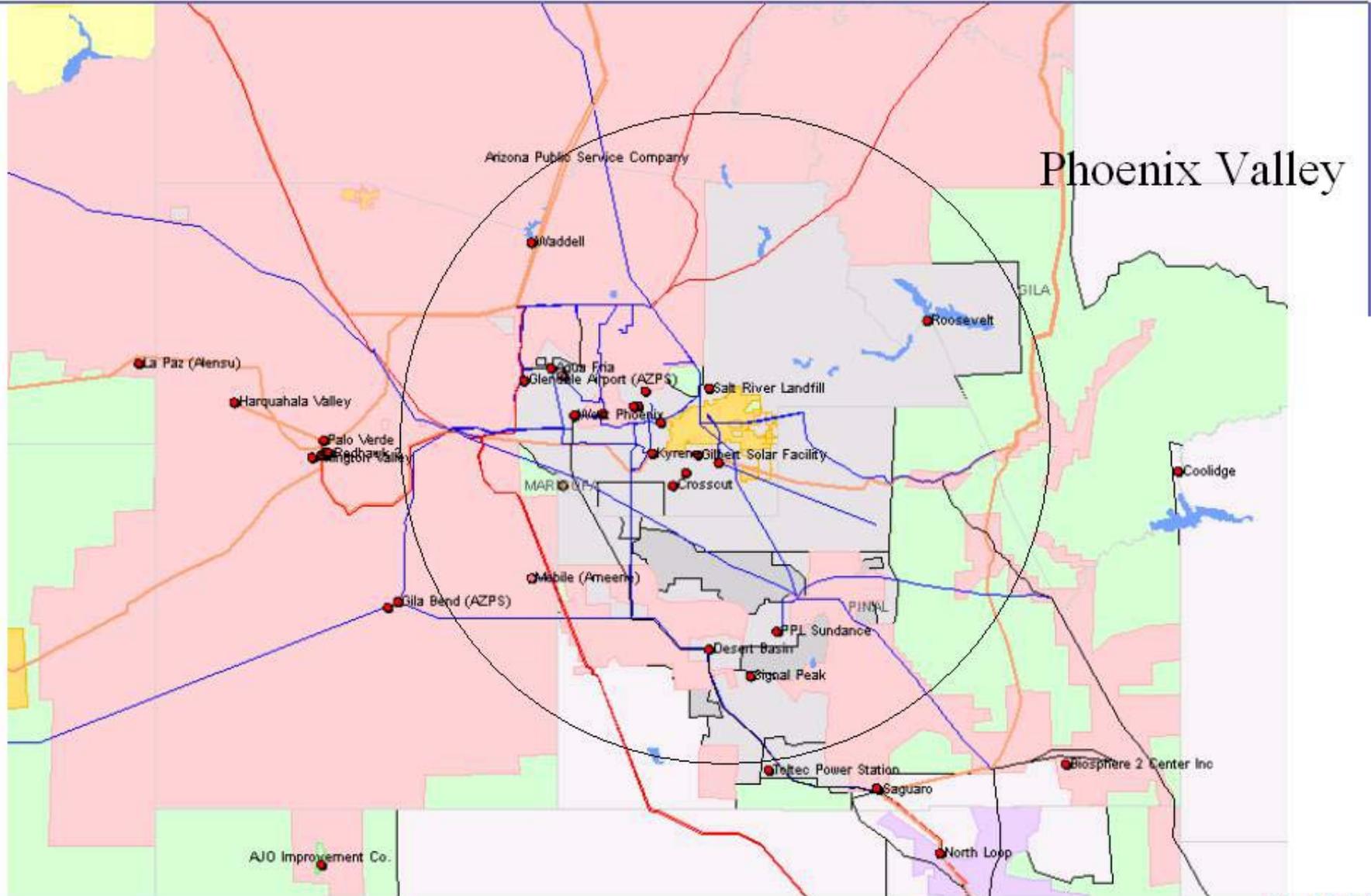
Transmission Constraints:

- Transmission system normal and emergency ratings
- Transmission system limits under contingency conditions (N-1)
- Interfaces/flowgates limits and nomograms due to voltage and stability problems
- Interfaces/flowgates limits and nomograms considering (N-1) contingencies

Control Variables :

- (1) Real Power Gen. Limits, (2) Dispatchable Demands, (3) Phase Shifter Limits, (4) HVDC/FACTS facilities, (5) Switched Shunts, and (6) LTCs steps.

Operational Concerns – Use Nomogram to Model



It's Critical to Model Transmission Unavailability

