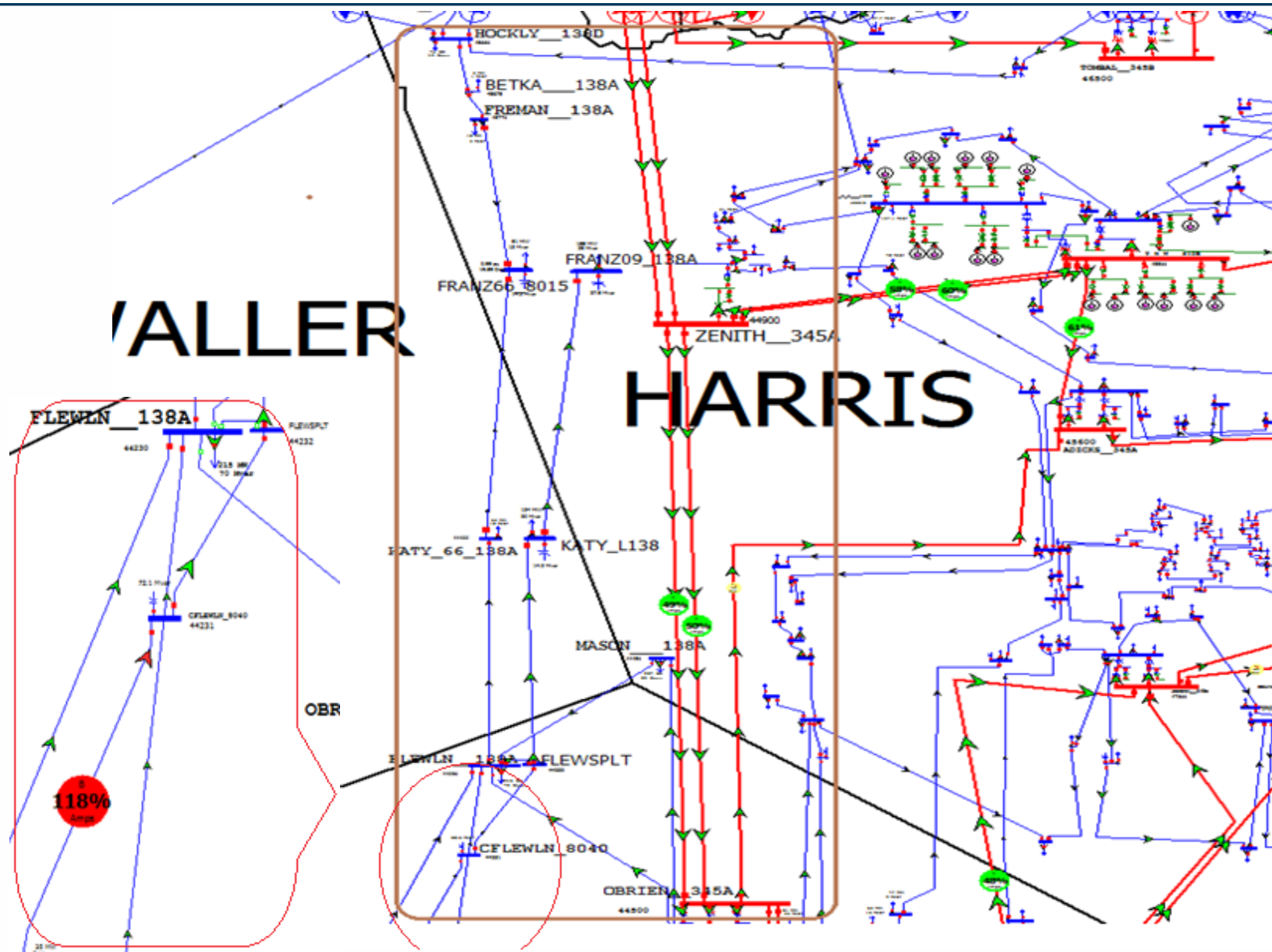

CNP Katy Area Upgrade Project – ERCOT Independent Review

**RPG Meeting
April 22, 2014**

Area of Concern



Study Model

- **Base Case**

- The 2018 Reliability final Case from the 2013 RTP
- A Katy Area Upgrade Project modeled

- **Transmission Changes**

- Remove the Zenith – Franz 138 kV line
- Remove the new 800/1000 MVA 345/138 kV autotransformer at Zenith Substation
- Restore the original configurations in and among Substations Katy, Franz, and Freeman, so the Katy – Franz 138 kV circuit 09 has 280 MVA emergency rating; the Katy – Franz 138 kV circuit 66 has 280 MVA emergency rating; the Franz – Freeman 138 kV circuit 66 has 220 MVA emergency rating.

Reliability Analysis

- **N-1 Contingency Analysis**

- Contingency definitions in 2013 5YTP's 2018 Reliability Case

Monitored Element	Post-Contingency loading
Brazos – Flewellen 138 kV	118.2%
Freeman – Betka 138 kV	97.1%
Betka – Hockley 138 kV	98.7%

- **Selected G-1 & N-1 Contingency Analysis**

- Outage of single generator at substation STP (1375MW)
- Followed by N-1 contingency analysis

- **Selected X-1 & N-1 Contingency Analysis**

- Outage of single 345/138 kV autotransformer at substation Zenith
- Followed by N-1 contingency analysis

Project Options – Common Upgrades

- **Three project options (A-C) were studied**
- **Upgrades common to all three options**
 - Install a second 800 MVA normal rated / 1000 MVA emergency rated 345/138 kV autotransformer at Zenith Substation
- **Additional upgrades on top of the above ones discussed in following slides**

Project Option A (CNP Option 2)

- **Option A Upgrades**

- Convert Katy Substation from a double-tap configuration to a loop configuration on 138 kV circuit 09
- Parallel Flewellen – Franz 138 kV circuit 66 with 138 kV circuit 09 to form a new 138 kV circuit 09
- Construct two new approximately 6.4 mile 138 kV circuits from Zenith Substation to two Franz Substation tap points

- **Total cost including common upgrades : \$ 22.8 million**

Project Option B (CNP Option 4)

- **Option B Upgrades**

- Convert Katy Substation from a double-tap configuration to a loop configuration on 138 kV circuit 09
- Convert Franz Substation from a double-tap configuration to a loop configuration on 138 kV circuit 09
- Construct a new approximately 6.4 mile circuit from Zenith Substation to Franz tap on double-circuit structures creating a new 138 kV Zenith–Franz–Katy–Flewellen circuit 09
- Upgrade 1.6 miles of existing 138 kV circuit from Franz Substation north to the interface with the new 138 kV circuit to Zenith Substation

- **Total cost including common upgrades : \$ 20.4 million**

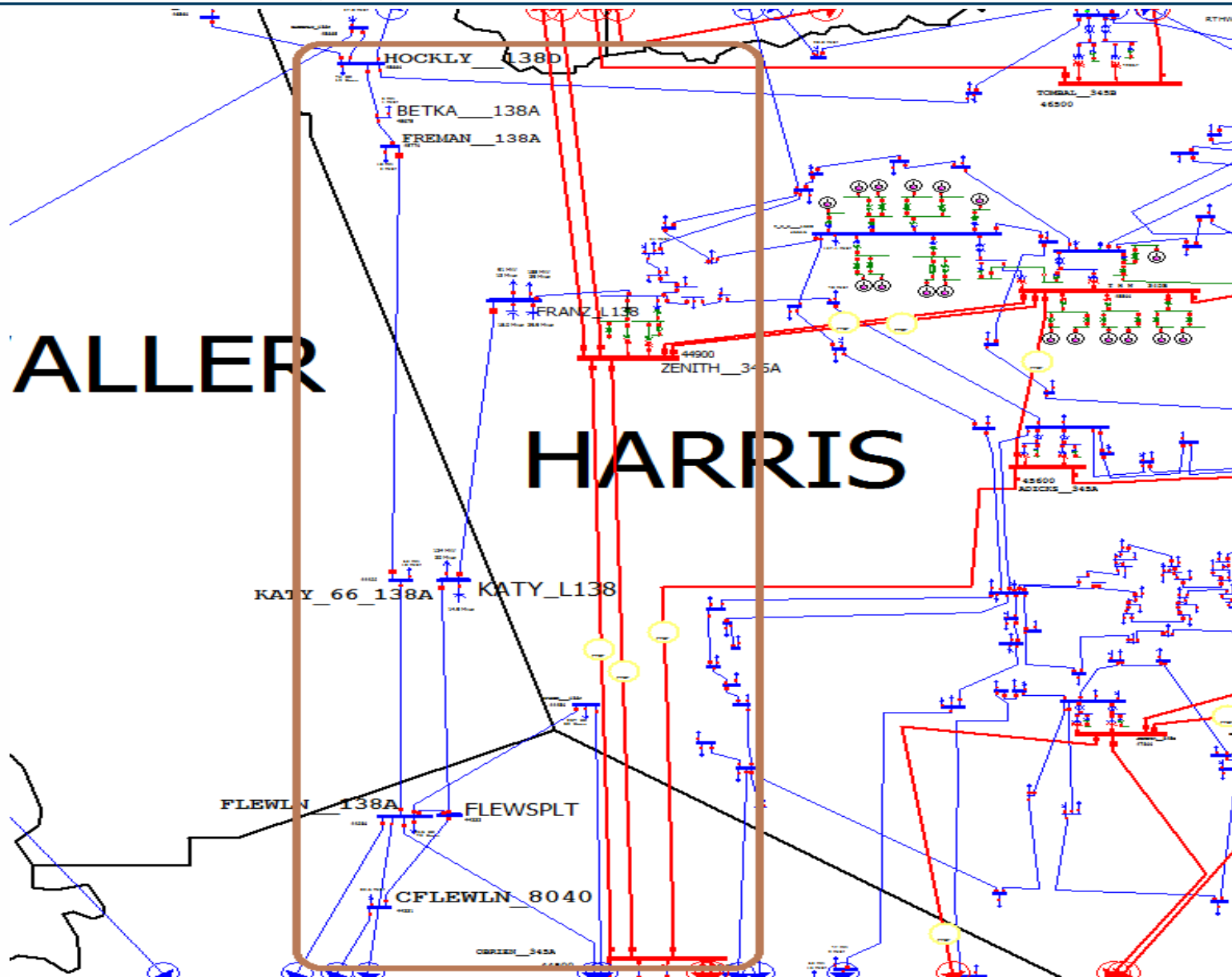
Project Option C

- **Option C Upgrades**
 - Re-conductor the 5.1 miles existing Brazos – Flewellen 138 kV line to 441/526 MVA normal/emergency rating
- **Total cost including common upgrades : \$ 13.7 million**
- **Assumptions**
 - T H Wharton to Addicks 345 kV line upgrade to an emergency rating 1450 MVA will be in place by 2018
- **Potential Future Upgrades for Option C**
 - Freeman – Betka – Hockley 138 kV circuit 66 is higher than 97% of their emergency ratings
 - Re-conductor the 12.0 miles existing 138 kV line to 220/280 MVA normal/emergency rating may cost 7.1 million
- **Total cost plus potential cost: \$ 20.8 million**

Comparison of Options

- **Investment Cost**
 - Option B's 20.4 million vs. Option C's 20.8 million, Option B is slightly better
- **System Loss Savings (under Peak Conditions)**
 - Option B ~ 9.2 MW vs. Option C ~ 1.1 MW
- **Option B is the least cost option that meets the reliability criteria (N-1, G-1&N-1, X-1&N-1) and supports future load growth**

Preferred Project Option – B



ERCOT Preferred Option

- **Option B Upgrades (CNP Option 4)**
 - Convert Katy Substation from a double-tap configuration to a loop configuration on 138 kV circuit 09
 - Convert Franz Substation from a double-tap configuration to a loop configuration on 138 kV circuit 09
 - Construct a new approximately 6.4 mile circuit from Zenith Substation to Franz tap on double-circuit structures creating a new 138 kV Zenith–Franz–Katy–Flewellen circuit 09
 - Upgrade 1.6 miles of existing 138 kV circuit from Franz Substation north to the interface with the new 138 kV circuit to Zenith Substation
 - Install a second 800 MVA normal rated / 1000 MVA emergency rated 345/138 kV autotransformer at Zenith Substation
- **Total cost including common upgrades : \$ 20.4 million**

