Attachment 'A'

ERCOT SYSTEM PLANNING REVIEW OF ONCOR'S SECOND DFW DYNAMIC REACTIVE DEVICE PROJECT (RENNER)

2010 SUMMER PEAK NETWORK CONDITIONS

July 3, 2008

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REVIEWERS

This review was prepared by John Schmall, Lead Planning Engineer.

GLOSSARY

DFW	Dallas and Fort Worth region
DWG	Dynamics Working Group (within ROS)
NERC	North American Electric Reliability Corporation
PV	Power versus Voltage relationship
ROS	Reliability and Operations Subcommittee (within ERCOT)
SSWG	Steady State Working Group (within ROS)
SVC	Static Var Compensator (device for providing dynamic reactive support)
UVLS	Under Voltage Load Shedding
WECC	Western Electricity Coordinating Council

1. EXECUTIVE SUMMARY

The Oncor Electric Delivery Company is seeking ERCOT approval of their proposal to install 300 MVAr of dynamic reactive support at the Renner station. The project justification is based on the recovery of post-contingency voltages in the DFW area to acceptable levels following a NERC Category C contingency for 2010 peak load conditions. The critical disturbance studied by Oncor involves a single-phase bus fault cleared with breaker failure relaying which disconnects four generators, two 345 kV lines and a 345-138kV autotransformer with a 14 cycle total fault clearing time. Oncor studies identified that the proposed project addresses the following conditions:

1. Voltage collapse in the DFW area following the critical contingency when one DFW area generating unit is unavailable
2. The loss of over 2400 MW of DFW area load due to the operation of UVLS schemes following the critical contingency when all DFW area generation is available.

ERCOT staff confirmed that these two conditions can be mitigated by the installation of a 300 MVAr dynamic reactive device at the Renner station.

ERCOT staff accepts the Oncor position that due to the design and intent of their UVLS scheme in the DFW area to serve as a "safety net", planned actuation of UVLS (in the DFW area) in response to a NERC Category C event should not be relied upon. Furthermore, there are several ERCOT Transmission Owners who support the idea that transmission facilities should be designed and built to prevent any significant loss of firm load (magnitude and/or duration) due to a NERC Category C event (although a temporary load shedding scheme may suffice until such facilities can be constructed). Accordingly, the loss of over 2400 MW of DFW area load would certainly be considered significant and the implementation of a mitigation plan would be considered appropriate.

ERCOT staff supports the installation of a 300 MVAr dynamic reactive device at Renner station and generally agrees that there is an ongoing fundamental need for dynamic reactive support in the DFW area. However, it is difficult to identify an appropriate level of support not only due to uncertainties associated with the availability of potentially emissions restricted generation resources in the DFW area, but also due to uncertainties in precisely predicting the DFW load level and composition. Simulations have shown that acceptable voltage recovery is highly sensitive to variations in the projected DFW area load and particularly the assumed percentage of motor load.

The installation of a dynamic reactive device at Renner does provide a second DFW area location for dynamic reactive capability which addresses one of the ERCOT recommendations from the Parkdale dynamic reactive device project review.

ERCOT staff believes that the installation of dynamic reactive devices at both Parkdale and Renner are critical to and substantially improve DFW area reliability. However, after these installations and prior to making further investments for dynamic reactive capability in the DFW area, Oncor should pursue alternatives that have been shown to improve system response. For example, it would appear to be possible to achieve fault clearing times less than 14 cycles for breaker failure conditions. Upgrading transmission protection systems in order to reliably achieve faster fault clearing times at critical locations is likely to improve reliability margins and delay future investments in dynamic reactive capability. Additional options such as modifying station configurations in order to reduce the severity of the critical contingencies should also be considered and presented as alternatives to future proposals for dynamic reactive device installations in the DFW area.

2. INTRODUCTION

Oncor Electric Delivery Company is seeking ERCOT approval of their proposed project to install dynamic reactive support at the Renner station. This would be the second such installation in the DFW area. In 2007, ERCOT reviewed and approved an Oncor proposal to install 600 MVAr of dynamic reactive support at the Parkdale station by summer 2009.

Oncor study results indicate that an additional 300 MVAr of dynamic reactive support is required for 2010 peak load conditions. The project justification is based on the recovery of post-contingency voltages in the DFW area to acceptable levels following a NERC Category C contingency. The critical disturbance studied by Oncor involves a single-phase bus fault cleared with breaker failure relaying which disconnects four generators, two 345 kV lines and a 345-138kV autotransformer with a 14 cycle total fault clearing time. When all expected DFW area generation is available, the critical contingency results in the loss of over 2400 MW of load due to the operation of the Oncor UVLS scheme in the DFW area. (Oncor considers the operation of their UVLS scheme in response to NERC Category C events to be a violation of reliability standards.) When one of the DFW area generating units is unavailable, the critical contingency results in voltage collapse of the DFW area. Oncor proposes to mitigate these reliability violations by installing a 300 MVAr dynamic reactive device at Renner station.

The purpose of this ERCOT review is to confirm the Oncor study results. Additional analysis was performed to test the sensitivity of simulation results to the DFW area load level, the percentage of motor load in the DFW area and the fault clearing time.

ERCOT Staff requested and received from Oncor the necessary data sets to simulate the critical event that was used to justify the proposed dynamic reactive device at Renner. The 2010 data sets (base case files, contingency files, load data, dynamic model data) were examined and found to follow accepted industry practices for this type of system analysis. 600 MVAr of dynamic reactive capability at the Parkdale station was included in these models.

In the 2010 base cases provided by Oncor, the DFW area load was 20792 MW. 73.5% of the load (15280 MW) was represented as dynamic induction motor load utilizing the CIMWBL model. Standard ZIP models, as used by the DWG, were applied to the remaining ERCOT load. Eight additional simulation cases were developed by scaling the DFW area load to be approximately 2% greater and 3% less than the base case and varying the motor percentage from a low of 68.6% to a high of 78.0%. A summary of these cases and associated case IDs are presented in Table 1.

Table 1: Summary of Simulation Case IDs

DFW Load Level	Motor Percentage		
	Low (68.6%)	Base (73.5%)	High (78.0%)
High Load (21206 MW)	**HL**	**HB**	**HH**
Base Load (20792 MW)	**BL**	**BB**	**BH**
Low Load (20206 MW)	**LL**	**LB**	**LH**

3. ERCOT REVIEW RESULTS

ERCOT Staff's simulation of the critical contingency on the 2010 summer on-peak case supplied by Oncor (Case BB) produced the same results as those indicated by Oncor in their project proposal. Simulations were performed for conditions where all DFW area generation was available and for four unique unit unavailability scenarios including the scenario cited by Oncor. Because Oncor identified the Renner site as a tentative location for the dynamic reactive device, simulations were also performed modeling a 300 MVAr SVC at Liggett (identified by Oncor as a potential alternative site for location of the SVC) to assess any system performance differences. Two of the unit outage scenarios analyzed resulted in voltage collapse with a 300 MVAr SVC modeled at either Renner or Liggett. These scenarios were stable when a 600 MVAr SVC was modeled at Renner or 300 MVAr SVCs were modeled at both Renner and Liggett. A summary of simulation results for Case BB is presented in Table 2a.

Table 2a: Stability Results for Case BB (base DFW load and motor percentage)

Case BB SVC Location (MVAr)	Generator Outage Scenario				
	None	**Unit A**	**Unit B**	**Unit C**	**Unit D**
None	UVLS(2419)	Collapse	Collapse	Collapse	Collapse
Renner (300)	Stable	Stable	Stable	Collapse	Collapse
Liggett (300)	Stable	Stable	Stable	Collapse	Collapse
Renner (600)	-	-	-	Stable	Stable
Renner (300) & Liggett (300)	-	-	-	Stable	Stable

Result Descriptions (applicable to all subsequent result tables)
Collapse = Simulation indicates voltage collapse in the DFW area (generally within 2 to 4 seconds following the disturbance)
UVLS(#) = Simulation indicates acceptable voltage recovery (# is the MW of load lost due to the operation UVLS schemes)
Stable = Simulation indicates acceptable voltage recovery with no initiation of UVLS
- = Simulation not explicitly run, but assumed stable per results of simulations performed with less dynamic reactive support

When the percentage of DFW motor load was reduced from 73.5% to 68.6%, all of the unit outage scenarios studied were stable without any additional dynamic reactive support as reported in Table 2b. When the percentage of DFW motor load was increased from 73.5% to 78.0%, all of the unit outage scenarios studied (including all units available) resulted in voltage collapse even when a 300 MVAr SVC was modeled at either Renner or Liggett. 600 MVAr of dynamic reactive support was required to produce a stable result when all DFW area generation was available and 1200 MVAr of dynamic reactive support was required to produce a stable result for all of the unit outage scenarios studied. Additional SVCs were modeled at Eagle Mountain and Collin (identified by Oncor as other possible sites for additional dynamic reactive capability). A summary of simulation results for Case BH is presented in Table 2c.

Table 2b: Stability Results for Case BL (base DFW load and low motor percentage)

Case BL SVC Location (MVAr)	Generator Outage Scenario				
	None	**Unit A**	**Unit B**	**Unit C**	**Unit D**
None	Stable	Stable	Stable	Stable	Stable

Table 2c: Stability Results for Case BH (base DFW load and high motor percentage)

Case BH SVC Location (MVAr)	Generator Outage Scenario				
	None	**Unit A**	**Unit B**	**Unit C**	**Unit D**
None	Collapse	Collapse	Collapse	Collapse	Collapse
Renner (300)	Collapse	Collapse	Collapse	Collapse	Collapse
Liggett (300)	Collapse	Collapse	Collapse	Collapse	Collapse
Renner (600)	Stable	Stable	UVLS(2317)	Collapse	Collapse
Renner (300) & Liggett (300)	Stable	UVLS(1878)	Collapse	Collapse	Collapse
Renner (300) & Liggett (300) & Eagle Mountain (300)	-	Stable	Stable	Collapse	Collapse
Renner (600) & Liggett (300)	-	Stable	Stable	Stable	UVLS(1408)
Renner (300) & Liggett (300) & Eagle Mtn (300) & Collin (300)	-	-	-	Stable	Stable
Renner (600) & Liggett (300) & Eagle Mountain (300)	-	-	-	Stable	Stable

When the DFW area load level was reduced by approximately 3%, only two of the studied unit outage scenarios resulted in voltage collapse without any dynamic reactive support added to the case. Those two scenarios were stable when a 300 MVAr SVC was modeled at either Renner or Liggett as reported in Table 2d. All of the scenarios for Case LL (low DFW load and low motor percentage) are assumed to be stable without any additional dynamic reactive support based on the results for Case BL (base DFW load and low motor percentage) reported in Table 2b. When the high motor percentage was applied to the low load case, all of the analyzed unit outage scenarios resulted in voltage collapse without any dynamic reactive support added to the case. A 300 MVAr SVC at either Renner or Liggett provided sufficient dynamic reactive support when all DFW area generation was available, but did not prevent voltage collapse for all of the scenarios where a single unit was unavailable. Simulation results for two of the outage scenarios exhibited acceptable voltage recovery, but relied upon the actuation of UVLS schemes in the DFW area. 600 MVAr of dynamic reactive support was required to produce a stable result for all analyzed scenarios. A summary of simulation results for Case LH is presented in Table 2e.

Table 2d: Stability Results for Case LB (low DFW load and base motor percentage)

Case LB SVC Location (MVAr)	Generator Outage Scenario				
	None	**Unit A**	**Unit B**	**Unit C**	**Unit D**
None	Stable	Stable	Stable	Collapse	Collapse
Renner (300)	-	Stable	Stable	Stable	Stable
Liggett (300)	-	Stable	Stable	Stable	Stable

Table 2e: Stability Results for Case LH (low DFW load and high motor percentage)

Case LH	**Generator Outage Scenario**				
SVC Location (MVAr)	**None**	**Unit A**	**Unit B**	**Unit C**	**Unit D**
None	Collapse	Collapse	Collapse	Collapse	Collapse
Renner (300)	Stable	Stable	UVLS(40)	Collapse	Collapse
Liggett (300)	Stable	UVLS(1383)	UVLS(2629)	Collapse	Collapse
Renner (600)	-	Stable	Stable	Stable	Stable
Renner (300) & Liggett (300)	-	Stable	Stable	Stable	Stable

When the DFW area load level was increased by approximately 2%, a 300 MVAr SVC at either Renner or Liggett prevented voltage collapse only when all DFW area generation was available. Two of the studied unit outage scenarios required an additional 600 MVAr of dynamic reactive support to prevent voltage collapse while the other two unit outage scenarios required an additional 900 MVAr of dynamic reactive support to prevent voltage collapse. A summary of simulation results for Case HB is presented in Table 2f. When the low motor percentage was applied to the high load case, all studied scenarios were stable with a 300 MVAr SVC modeled at either Renner or Liggett. A summary of simulation results for Case HL is presented in Table 2g. When the high motor percentage was applied to the high load case, 900 MVAr of dynamic reactive support was required to produce a stable result when all DFW was generation was available and 1500 MVAr of dynamic reactive support was required to produce a stable result for all of the unit outage scenarios studied. A summary of simulation results for Case HH is presented in Table 2h.

Table 2f: Stability Results for Case HB (high DFW load and base motor percentage)

Case HB	**Generator Outage Scenario**				
SVC Location (MVAr)	**None**	**Unit A**	**Unit B**	**Unit C**	**Unit D**
None	Collapse	Collapse	Collapse	Collapse	Collapse
Renner (300)	Stable	Collapse	Collapse	Collapse	Collapse
Liggett (300)	Stable	Collapse	Collapse	Collapse	Collapse
Renner (600)	-	Stable	Stable	UVLS(2852)	Collapse
Renner (300) & Liggett (300)	-	Stable	Stable	Collapse	Collapse
Renner (300) & Liggett (300) & Eagle Mountain (300)	-	-	-	Stable	Stable
Renner (600) & Liggett (300)	-	-	-	Stable	Stable

Table 2g: Stability Results for Case HL (high DFW load and low motor percentage)

Case HL	**Generator Outage Scenario**				
SVC Location (MVAr)	**None**	**Unit A**	**Unit B**	**Unit C**	**Unit D**
None	Stable	Stable	Stable	UVLS(2973)	Collapse
Renner (300)	-	-	-	Stable	Stable
Liggett (300)	-	-	-	Stable	Stable

Table 2h: Stability Results for Case HH (high DFW load and motor percentage)

Case HH SVC Location (MVAr)	Generator Outage Scenario				
	None	Unit A	Unit B	Unit C	Unit D
None	Collapse	Collapse	Collapse	Collapse	Collapse
Renner (300)	Collapse	Collapse	Collapse	Collapse	Collapse
Liggett (300)	Collapse	Collapse	Collapse	Collapse	Collapse
Renner (600)	Collapse	Collapse	Collapse	Collapse	Collapse
Renner (300) & Liggett (300)	Collapse	Collapse	Collapse	Collapse	Collapse
Renner (300) & Liggett (300) & Eagle Mountain (300)	Stable	Collapse	Collapse	Collapse	Collapse
Renner (600) & Liggett (300)	Stable	Stable	UVLS(2442)	Collapse	Collapse
Renner (300) & Liggett (300) & Eagle Mtn (300) & Collin (300)	-	Stable	Stable	Collapse	Collapse
Renner (600) & Liggett (300) & Eagle Mountain (300)	-	Stable	Stable	Collapse	Collapse
Renner (600) & Liggett (300) & Eagle Mtn (300) & Collin (300)	-	-	-	Stable	Stable

ERCOT staff also investigated the impact of reducing the fault clearing time. For each study case, the critical contingency was simulated with a 12 cycle clearing time instead of 14 cycles. As reported in Table 3, the amount of dynamic reactive capability necessary to produce a stable result for all analyzed scenarios is generally less when the fault is cleared faster. Results for simulations with 12 cycle fault clearing times are presented in Tables 4a through 4h.

Table 3: Dynamic Reactive Capability Required to Achieve a Stable Result for All Analyzed Scenarios

Case ID	Required Amount of Dynamic Reactive Capability		Result Table for Simulations with 12 Cycle Clearing Time
	14 Cycle Clearing Time	12 Cycle Clearing Time	
BB	600 MVAr	300 MVAr	Table 4a
BL	0 MVAr	0 MVAr	Table 4b
BH	1200 MVAr	600 MVAr	Table 4c
LB	300 MVAr	0 MVAr	Table 4d
LH	600 MVAr	300 MVAr	Table 4e
HB	900 MVAr	600 MVAr	Table 4f
HL	300 MVAr	0 MVAr	Table 4g
HH	1500 MVAr	900 MVAr	Table 4h

Table 4a: Stability Results for Case BB (base DFW load and motor percentage) **-** 12 cycle fault clearing time

Case BB **SVC Location (MVAr)**	**Generator Outage Scenario**				
	None	**Unit A**	**Unit B**	**Unit C**	**Unit D**
None	Stable	Stable	Stable	UVLS(38)	UVLS(2369)
Renner (300)	Stable	Stable	Stable	Stable	Stable
Liggett (300)	Stable	Stable	Stable	Stable	Stable

Table 4b: Stability Results for Case BL (base DFW load and low motor percentage) **-** 12 cycle fault clearing time

Case BL **SVC Location (MVAr)**	**Generator Outage Scenario**				
	None	**Unit A**	**Unit B**	**Unit C**	**Unit D**
None	Stable	Stable	Stable	Stable	Stable

Table 4c: Stability Results for Case BH (base DFW load and high motor percentage) **-** 12 cycle fault clearing time

Case BH **SVC Location (MVAr)**	**Generator Outage Scenario**				
	None	**Unit A**	**Unit B**	**Unit C**	**Unit D**
None	Collapse	Collapse	Collapse	Collapse	Collapse
Renner (300)	Stable	Stable	Stable	Collapse	Collapse
Liggett (300)	Stable	Stable	Stable	Collapse	Collapse
Renner (600)	Stable	Stable	Stable	Stable	Stable
Renner (300) & Liggett (300)	Stable	Stable	Stable	Stable	Stable

Table 4d: Stability Results for Case LB (low DFW load and base motor percentage) **-** 12 cycle fault clearing time

Case LB **SVC Location (MVAr)**	**Generator Outage Scenario**				
	None	**Unit A**	**Unit B**	**Unit C**	**Unit D**
None	Stable	Stable	Stable	Stable	Stable

Table 4e: Stability Results for Case LH (low DFW load and high motor percentage) **-** 12 cycle fault clearing time

Case LH **SVC Location (MVAr)**	**Generator Outage Scenario**				
	None	**Unit A**	**Unit B**	**Unit C**	**Unit D**
None	Stable	Stable	Stable	Collapse	Collapse
Renner (300)	Stable	Stable	Stable	Stable	Stable
Liggett (300)	Stable	Stable	Stable	Stable	Stable

Table 4f: Stability Results for Case HB (high DFW load and base motor percentage) - 12 cycle fault clearing time

Case HB **SVC Location (MVAr)**	**Generator Outage Scenario**				
	None	**Unit A**	**Unit B**	**Unit C**	**Unit D**
None	Stable	Stable	Stable	Collapse	Collapse
Renner (300)	Stable	Stable	Stable	Stable	UVLS(92)
Liggett (300)	Stable	Stable	Stable	UVLS(38)	Stable
Renner (600)	-	Stable	Stable	Stable	Stable
Renner (300) & Liggett (300)	-	Stable	Stable	Stable	Stable

Table 4g: Stability Results for Case HL (high DFW load and low motor percentage) - 12 cycle fault clearing time

Case HL **SVC Location (MVAr)**	**Generator Outage Scenario**				
	None	**Unit A**	**Unit B**	**Unit C**	**Unit D**
None	Stable	Stable	Stable	Stable	Stable

Table 4h: Stability Results for Case HH (high DFW load and motor percentage) - 12 cycle fault clearing time

Case HH **SVC Location (MVAr)**	**Generator Outage Scenario**				
	None	**Unit A**	**Unit B**	**Unit C**	**Unit D**
None	Collapse	Collapse	Collapse	Collapse	Collapse
Renner (300)	UVLS(2354)	Collapse	Collapse	Collapse	Collapse
Liggett (300)	UVLS(2235)	Collapse	Collapse	Collapse	Collapse
Renner (600)	Stable	Stable	Stable	Collapse	Collapse
Renner (300) & Liggett (300)	Stable	Stable	Stable	Collapse	Collapse
Renner (300) & Liggett (300) & Eagle Mountain (300)	Stable	Stable	Stable	Stable	UVLS(786)
Renner (600) & Liggett (300)	Stable	Stable	Stable	Stable	Stable
Renner (300) & Liggett (300) & Eagle Mtn (300) & Collin (300)	-	Stable	Stable	Stable	Stable
Renner (600) & Liggett (300) & Eagle Mountain (300)	-	Stable	Stable	Stable	Stable

4. CONCLUSIONS

ERCOT staff has confirmed the following Oncor study results for 2010 summer peak conditions:

1. Voltage collapse in the DFW area following a NERC Category C contingency when one DFW area generating unit is unavailable.
2. The loss of over 2400 MW of DFW area load due to the operation of UVLS schemes following a NERC Category C contingency when all DFW area generation is available.

ERCOT staff has also confirmed that these two conditions can be mitigated by the installation of a 300 MVAr dynamic reactive device at the Renner station.

Additional conclusions based on this independent ERCOT review are as follows:

- A 300 MVAr dynamic reactive device at Renner prevented voltage collapse for the unit outage scenario cited by Oncor, but does not prevent voltage collapse for all single unit outage scenarios. ERCOT studies identified at least two unit outage scenarios where the 300 MVAr installation was not sufficient to prevent voltage collapse following the critical contingency.

- The system response was comparable when the 300 MVAr SVC was modeled at Liggett (a potential alternative site) instead of Renner. Voltage recovery was only slightly better when the SVC was modeled at the Renner site. (A comparison of typical voltage recovery profiles can be made by examining Figure 3 and Figure 4 in Appendix I.) In a few of the scenarios studied, a lower amount of UVLS was observed with the SVC modeled at the Renner location.

- Sensitivity studies tested the impact of the DFW load level and the availability of DFW area generation. The results indicated that slow voltage recovery and potential collapse are exacerbated by higher DFW area load levels and the unavailability of DFW area generation resources. The analysis demonstrated that acceptable voltage recovery is highly sensitive to variations in the projected DFW area load. The base DFW load level in the simulation cases was 20792 MW. Simulations performed with the DFW area load reduced by 3% indicate a stable response for several scenarios where voltage collapse was observed at base load level. Simulations performed with the DFW area load increased by 2% indicate voltage collapse for several scenarios where a stable response was observed at base load level.

- Sensitivity studies tested the impact of the percentage of motor load modeled in the DFW area. The results indicated that slow voltage recovery and potential collapse are exacerbated by higher percentages of motor load. The analysis demonstrated that acceptable voltage recovery is highly sensitive to the assumed percentage of motor load. The base motor load percentage (73.5%) appears to be a reasonable estimate by Oncor, but the actual motor load percentage under peak load conditions could be higher or lower. A tested low motor load percentage (68.6%) scenario indicated no need for additional dynamic reactive capability while a tested high motor load percentage (78.0%) scenario indicated a need for 600 MVAr of dynamic reactive capability to prevent voltage collapse even when all DFW area generation resources are available.

- Sensitivity studies tested the effect of lower total fault clearing times. The results indicated that faster fault clearing times can prevent the actuation of UVLS or voltage collapse and reduce the amount of dynamic reactive support required to achieve a stable system response.

- The installation of a dynamic reactive device at Renner provides a second DFW area location for dynamic reactive capability which addresses one of the ERCOT recommendations from the Parkdale dynamic reactive device project review.

ERCOT staff accepts the Oncor position that due to the design and intent of their UVLS scheme in the DFW area to serve as a "safety net", planned actuation of UVLS (in the DFW area) in response to a NERC Category C event should not be relied upon. Furthermore, there are several ERCOT Transmission Owners who support the idea that transmission facilities should be designed and built to prevent any significant loss of firm load (magnitude and/or duration) due to a NERC Category C event (although a temporary load shedding scheme may suffice until such facilities can be constructed). Accordingly, the loss of over 2400 MW of DFW area load would certainly be considered significant and the implementation of a mitigation plan would be considered appropriate.

ERCOT staff supports the installation of a 300 MVAr dynamic reactive device at Renner station and generally agrees that there is an ongoing fundamental need for dynamic reactive support in the DFW area. However, it is difficult to identify an appropriate level of support not only due to uncertainties associated with the availability of potentially emissions restricted generation resources in the DFW area, but also due to uncertainties in precisely predicting the DFW load level and composition. Simulations have shown that acceptable voltage recovery is highly sensitive to variations in the projected DFW area load and particularly the assumed percentage of motor load.

ERCOT staff believes that the installation of dynamic reactive devices at both Parkdale and Renner are critical to and substantially improve DFW area reliability. However, after these installations and prior to making further investments for dynamic reactive capability in the DFW area, Oncor should pursue alternatives that have been shown to improve system response. For example, it would appear to be possible to achieve fault clearing times less than 14 cycles for breaker failure conditions. Upgrading transmission protection systems in order to reliably achieve faster fault clearing times at critical locations is likely to improve reliability margins and delay future investments in dynamic reactive capability. Additional options such as modifying station configurations in order to reduce the severity of the critical contingencies should also be considered and presented as alternatives to future proposals for dynamic reactive device installations in the DFW area.

5. DESIGNATED PROVIDERS OF TRANSMISSION FACILITIES

In accordance with ERCOT’s Power System Planning Charter and Processes, ERCOT staff is to designate transmission providers for projects reviewed in the regional planning groups. These providers can agree to provide or delegate the new facilities or inform ERCOT they do not elect to provide them. For the project scope recommended in this report, Oncor Electric Delivery Company is the sole provider of transmission facilities for this project.

6. APPENDIX I: SELECTED SIMULATION PLOTS

Figure 1: DFW Area Bus Voltages for Case BB with All DFW Area Generation Available (UVLS Schemes Trip Approximately 2400 MW)

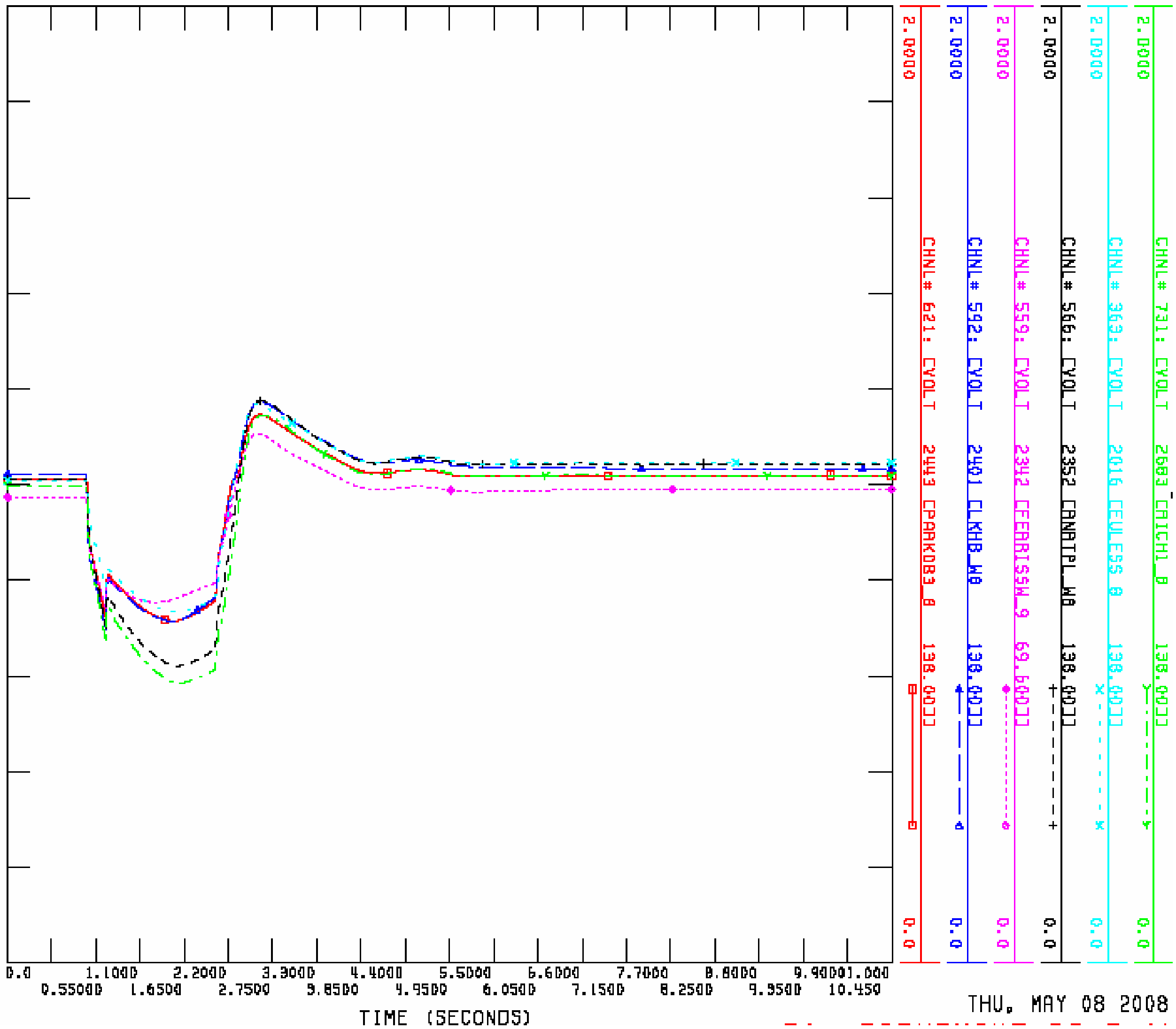

Figure 2: DFW Area Bus Voltages for Case BB with Unit B Unavailable (Voltage Collapse)

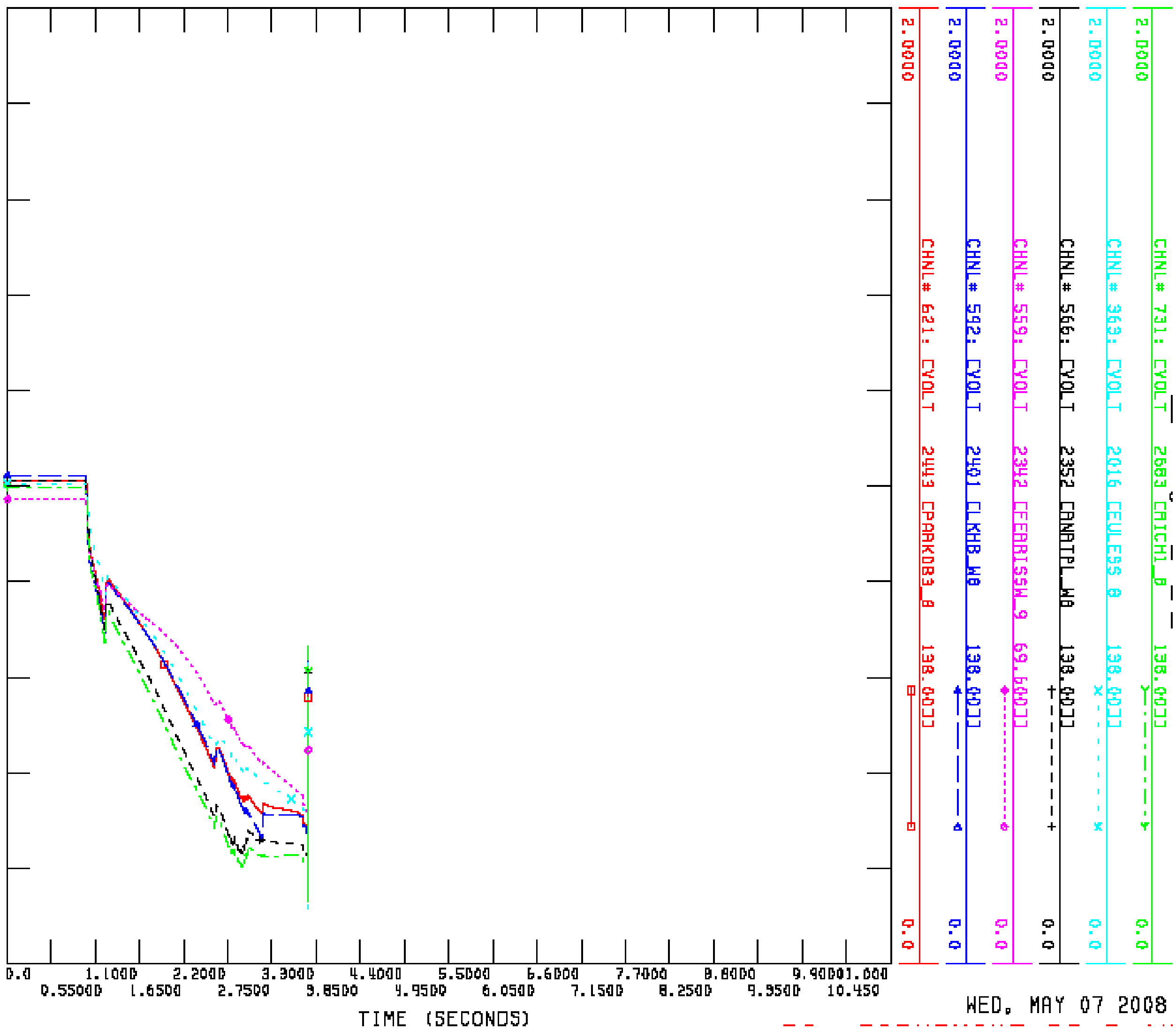

Figure 3: DFW Area Bus Voltages for Case BB with Unit B Unavailable and a 300 MVAr SVC Modeled at Renner (Stable Response)

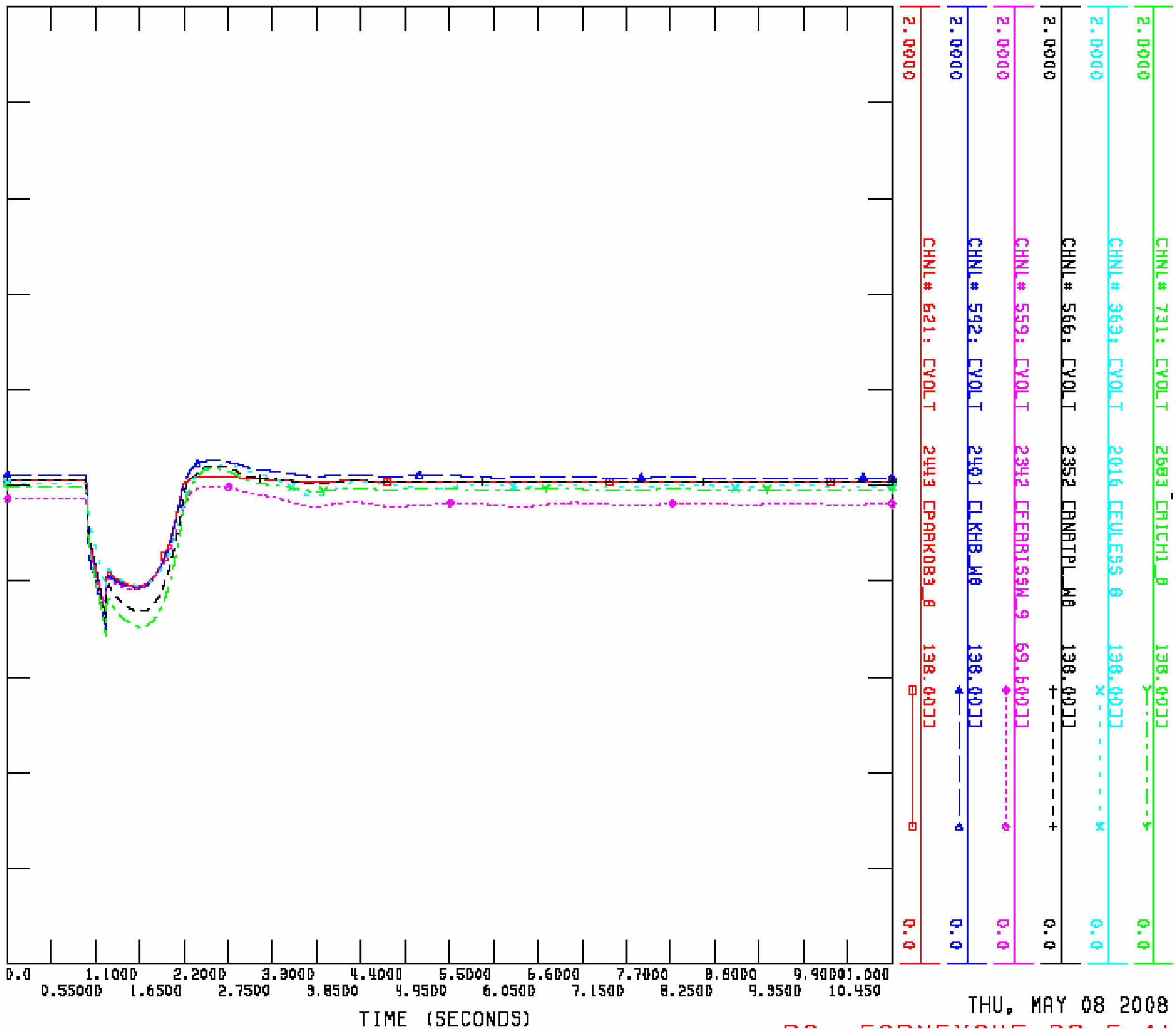

Figure 4: DFW Area Bus Voltages for Case BB with Unit B Unavailable and a 300 MVAr SVC Modeled at Liggett (Stable Response)

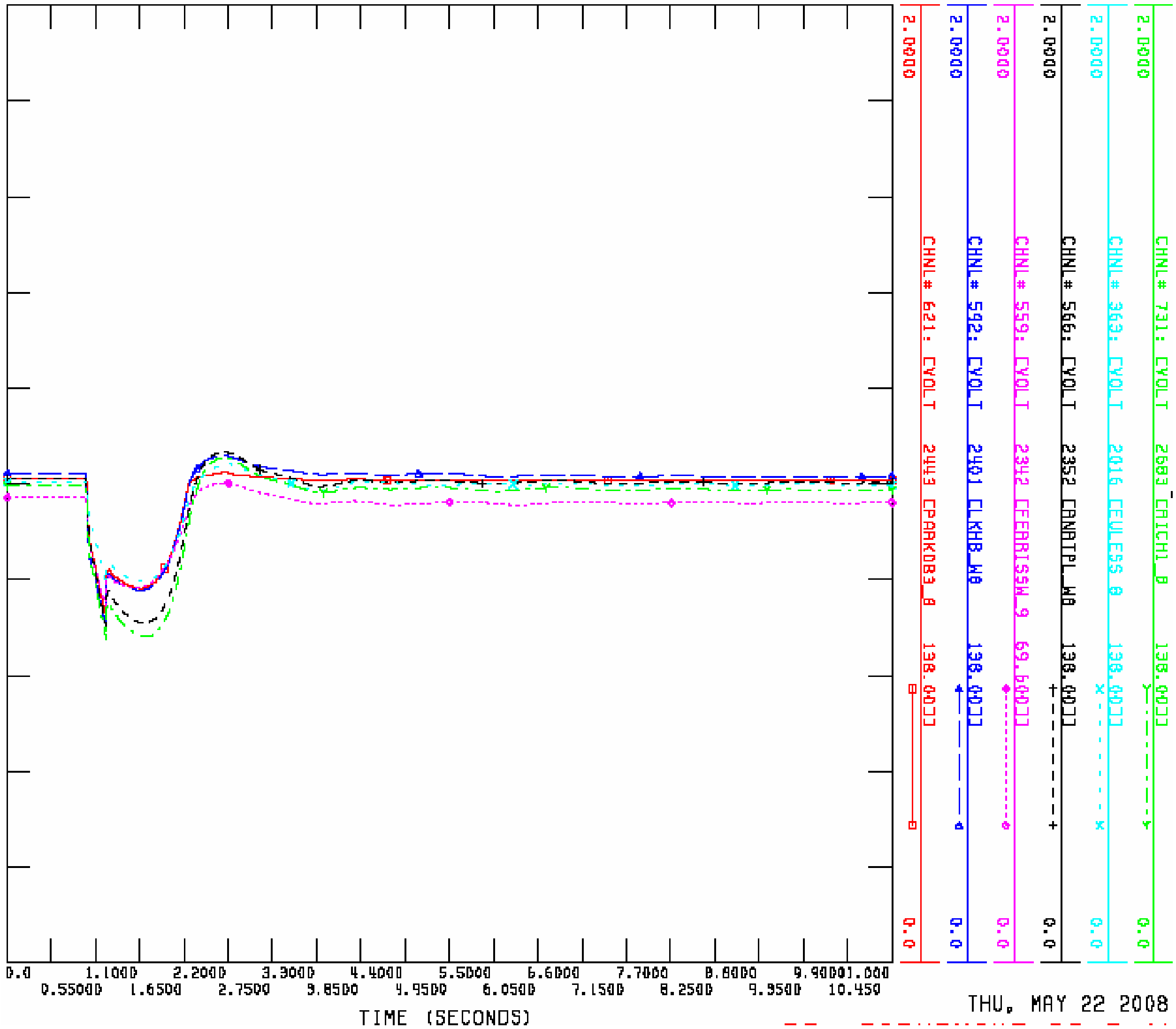

Figure 5: DFW Area Bus Voltages for Case BB with Unit D Unavailable and a 300 MVAr SVC Modeled at Renner (Voltage Collapse for 14 Cycle Total Fault Clearing Time)

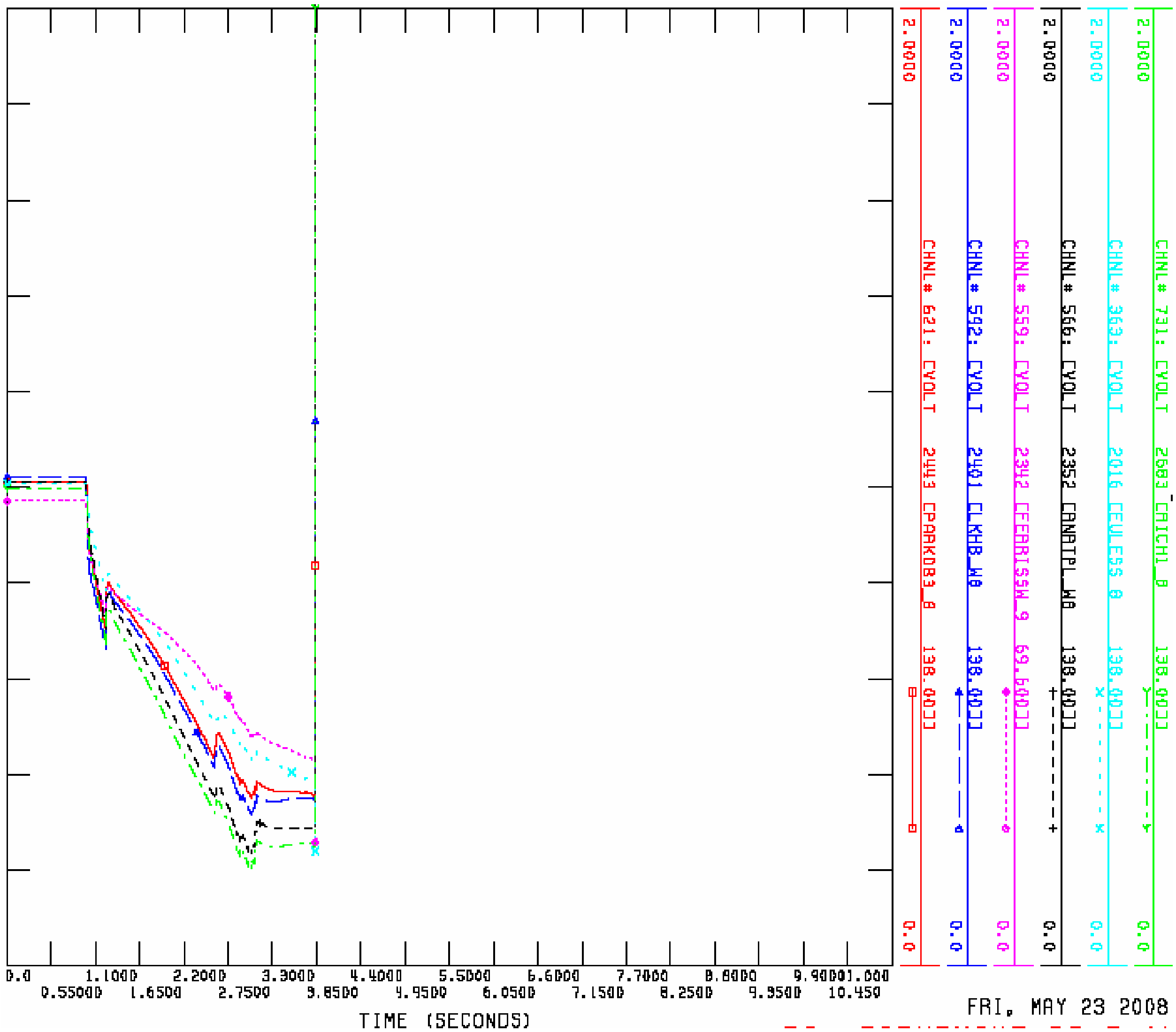

Figure 6: DFW Area Bus Voltages for Case BB with Unit D Unavailable and a 300 MVAr SVC Modeled at Renner (Stable Response for 12 Cycle Total Fault Clearing Time)