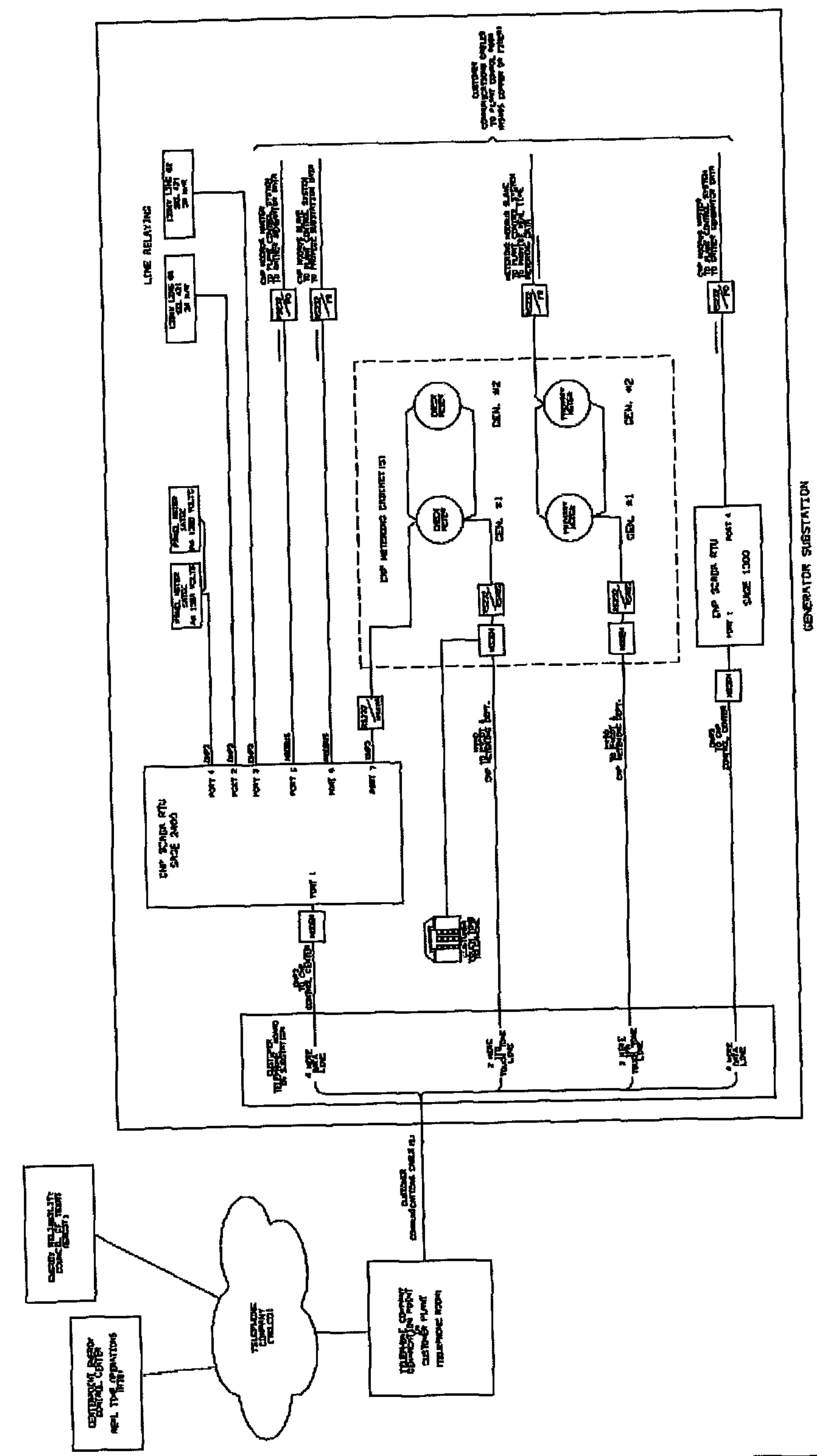


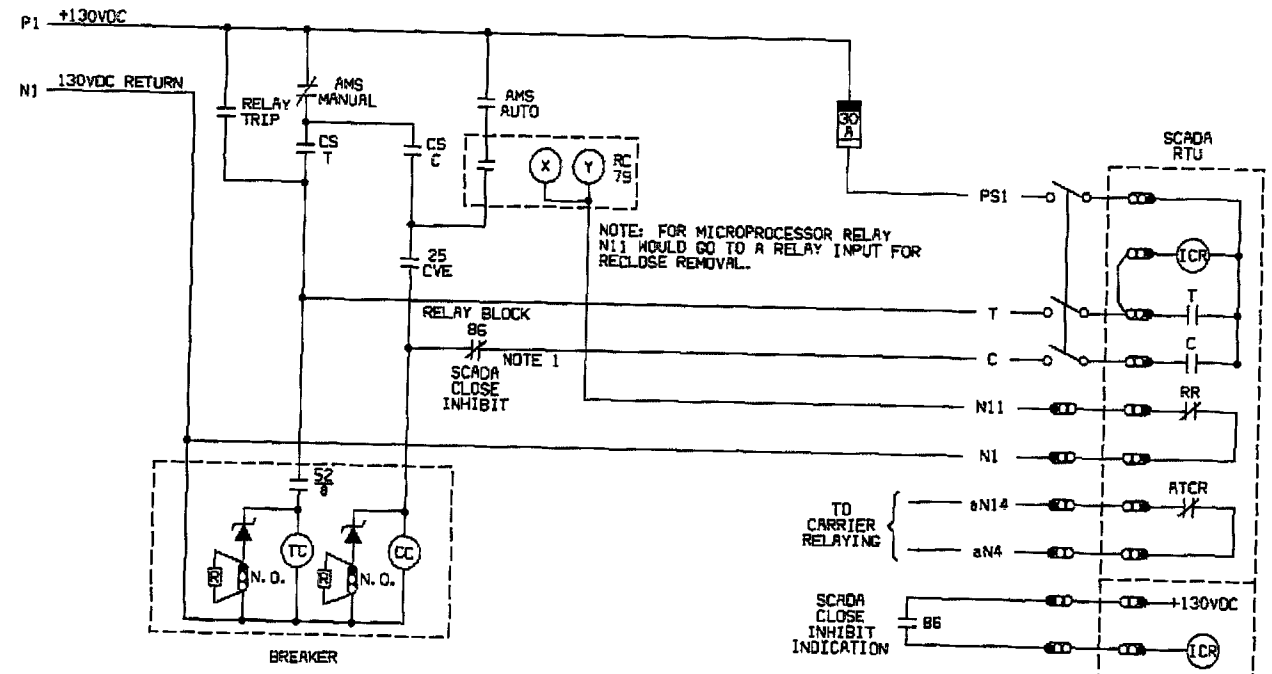
CNP Drawing: BSC-564-500-01 sh.2

Generator Substation Communications Block

Diagram Figure 2

CenterPoint Energy
Houston Electric

WRITTEN	12/30/03	C.W. Mogannam
CHECKED	12/30/03	R.M. Secrest
APROVED	12/30/03	M.W. Furnish
	Page 11 of 12	
	SPC 007 400 02	



LEGEND

RR = RECLOSE REMOVAL LATCHING RELAY INSIDE SCADA
ATCR = AUTOMATIC CARRIER REMOVAL
ICR = INDICATION CONTROL RELAY MONITORS STATUS OF A SWITCH
SCI = SCADA CLOSE INHIBIT
– DISCONNECTING TERMINAL BLOCK, DARK END IS TOP, LINK OPENS DOWN
– FUSE

NOTE: 1.) RELAY BLOCK CONTACT SHOWN COULD REPRESENT SEVERAL CONTACTS IN SERIES

SUBSTATION BASIC

FIGURE 3 TYPICAL
TRANSMISSION BKR SCADA CONTROL

	WRITTEN	12/30/03 C.W. Mogannam
	CHECKED	12/30/03 R.M. Secrest
	APROVED	12/30/03 M.W. Furnish

CenterPoint Energy
Houston Electric

SPC 007 400 02

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CNP Drawing: BSC-007-400-02 SH.3

Transmission breaker SCADA Control

Figure 3

Exhibit H – GT5
Full Interconnection Study Report for New Generation

CONFIDENTIAL

Full Interconnection Study Report
for
New Generation

Deer Park Energy Center, LLC
Deer Park Expansion

Reference ERCOT Generation Interconnection Request 14INR0015

February 25, 2013

Prepared by: CenterPoint Energy
Transmission Planning

Table of Contents

Executive Summary

This Full Interconnection Study (the Study) evaluates the impacts on the CenterPoint Energy Houston Electric, LLC ("CenterPoint Energy" or "CNP" or "Company") transmission system due to the addition of Deer Park Energy Center, LLC's ("DPEC") proposed new generation facilities known as the Deer Park Expansion at DPEC's existing plant in Harris County, Texas to CenterPoint Energy's transmission grid.

The proposed generation consists of one 215 MW gas fired combustion turbine ("GT Unit 5"). The proposed generation will be connected to CenterPoint Energy's 345 kV Center substation in Harris County. DPEC has represented to CNP that the current total DPEC plant summer capability is 1021 MW. The total DPEC plant capability after this proposed expansion will increase to 1236 MW. The proposed generation has a proposed Commercial Operation Date of June 01, 2014.

CenterPoint Energy completed a steady state load flow analysis of the latest 2014 and 2016 Electric Reliability Council of Texas ("ERCOT") Steady State Working Group ("SSWG") cases, modified to include the increase in DPEC's capacity. The proposed Deer Park Expansion causes N-1 contingency loading that exceeds the maximum continuous rating of a circuit. The CenterPoint Energy Transmission Design Criteria limits loading to less than continuous rating for a N-1 contingency. This was the only CenterPoint Energy or ERCOT planning criteria concern that was identified. CenterPoint Energy did not identify any short circuit or dynamic stability problems associated with the proposed generation

To prevent single contingency line loading from exceeding the CenterPoint Energy System Design Criteria the PH Robinson to Center and Center to Cedar Bayou lines must be upgraded.

The following projects are recommended for the interconnection of the proposed generation addition, GT Unit 5 with a capacity of 215 MW:

a. Thermally upgrade the Center–P.H. Robinson 345 kV circuit 97 and Center to Cedar Bayou 345 kV circuit 97 to at least 1300 MW continuous rating. The estimated cost of this transmission upgrade is **$250,000.**

b. DPEC has the following options for interconnecting GT Unit 5:
1. Basic Offer: DPEC selects to gang connect GT unit 5 with the existing steam unit by installing a new GIS cable pot head structure adjacent to the existing pothead structure inside the CenterPoint yard. A new 234 MVA cable will be installed within the DPEC plant between the new GT #5 and the new pothead structure. The existing steam unit generator lead will remain in service and both steam unit and GT#5 unit will be metered independently The substation cost for this offer is estimated at **$590,000.**

2. Enhanced Offer 1: If DPEC selects to gang connect GT#5 with an existing unit and makes the connection at a new pothead structure and insulated bus at the GIS building, the substation cost for this offer is estimated at **$690,000.**
3. Enhanced Offer 2: If DPEC prefers to connect GT#5 to a new terminating position on an existing bay in the GIS, the substation cost for this offer is estimated at **$4,190,000.**

The total cost, including the thermal upgrade, for the Deer Park Expansion will range from **$840,000** (basic offer) to **$4,440,000** (enhanced offer 2). The cost estimates do not include costs that may be incurred by DPEC.

Disclaimers

1. CenterPoint Energy based the Study on the latest information provided by DPEC. If changes are made to the information provided by DPEC, modifications may be necessary in required interconnection location or facilities in order for DPEC's generation facility to interconnect or stay interconnected to CenterPoint Energy.

2. The Study is based upon CenterPoint Energy's system configuration and the ERCOT ("SSWG") base cases as they exist at the time of the Study. Changes to either could affect the Study results.

3. Changes to the ERCOT system that might be made by other utilities before DPEC's project is completed could impact the Study results and conclusions.

4. The Study is based on available public-domain information and the currently anticipated configuration of the generation and transmission system for the year studied. In the event the generation or transmission facilities change or other significant data differs from the studied parameters, the results of the study could differ.

5. In accordance with the ERCOT Regional Planning Group (RPG) Charter and Procedures, the RPG is the primary mechanism through which stakeholder communication related to planning activities in the ERCOT Region is accomplished. Transmission upgrade projects that are identified through ERCOT's generation interconnection process may be reviewed through the RPG Project Review Process, subject to the confidentiality provisions of the generation interconnection procedure. The affirmative result of this review is formal endorsement of the transmission upgrade projects by ERCOT. The RPG Project Review Process may introduce additional delays before transmission upgrade project design and/or construction may commence.

6. Transient stability analyses performed by CenterPoint Energy in this Study are used to determine network stability impacts of different interconnection alternatives, so that the most reasonable and effective interconnection alternative can be selected. CENTERPOINT ENERGY MAKES NO EXPRESS OR IMPLIED REPRESENTATION OR WARRANTY REGARDING PROTECTION OF THE APPLICABLE GENERATING UNITS AGAINST DAMAGE FROM TRANSIENT STABILITY EVENTS OR OTHER DISTURBANCES THAT MAY OCCUR ON THE ERCOT TRANSMISSION SYSTEM, AND RECOMMENDS THAT THE GENERATION OWNER CONDUCT SUCH ANALYSES AND PERFORM ANY OTHER MEASURES NECESSARY TO PROTECT THE GENERATION OWNER'S FACILITIES FROM TRANSIENT STABILITY EVENTS AND OTHER DISTURBANCES.

7. In accordance with the ERCOT Generation Interconnection or Change Request Procedures, ERCOT Staff is required to perform an independent economic analysis of the transmission projects that are identified through the generation interconnection process as being needed for the direct connection of the proposed generation facility and which are expected to cost more than $25 million. The economic analysis may delay and/or change transmission upgrade project design and construction.

8. If a CCN is required for the new transmission facilities, additional delays and costs will be incurred.

Background

Deer Park Energy Center, LLC ("Generator" or "DPEC") applied to the Electric Reliability Council of Texas ("ERCOT") requesting interconnection of one new generation unit at an existing facility within the CenterPoint Energy Houston Electric, LLC ("CenterPoint Energy" or "Company") service territory as an expansion to the existing DPEC. The requested interconnection is for the addition of one 215 MW gas fired combustion turbine at the existing DPEC plant in Harris County, Texas with an anticipated commercial operation date of June 1, 2014 ("DPEC Expansion"). On November 18, 2011 ERCOT issued the Generation Screening Study report and notified CenterPoint Energy that Generator wants to proceed with full interconnection study for the DPEC Expansion. On March 1, 2012 DPEC entered into a Letter Agreement for preparation of a full interconnection study in accordance with an agreed to scope of work for ERCOT generation Interconnection Request No 14INR0045. The requested interconnection is proposed for one gas turbine unit, with maximum summer capacity of 215MW. DPEC has represented to CNP that the current total DPEC plant summer capability is 1021 MW. The total DPEC plant capability after this proposed expansion will increase to 1236 MW. The Customer also indicated that the generation expansion to the DPEC plant is expected to begin commercial operation by June 01, 2014.

Study Objectives

1. Perform load flow, short circuit and stability studies for the following purposes:
    a. Determine transmission system configuration required for the generation expansion at the proposed location. Designs are tested against the applicable North American Electric Reliability Corporation (NERC), ERCOT, and CenterPoint Energy design criteria.
2. Prepare a report for the system impact studies which includes the results of the steady state load flow, short circuit and stability analyses.
3. The study does not include determination of the settings for a power system stabilizer (PSS). Any required PSS tuning study shall be the responsibility of the Generating Entity.
4. Prepare facilities for the options identified by the system impact studies

Study Assumptions

CenterPoint Energy used the ERCOT Steady-State Working Group cases issued on February 27, 2012 (12_DSB_Posted_022712). CenterPoint Energy evaluated the 2014 summer peak base case with economic dispatch based on DPEC's plan to have the new generation operational by summer peak 2014. The base case was first revised to model the new capacity of the DPEC plant's existing units to total 1021MW then the proposed 215 MW GT Unit 5 was added. Output was decreased on generators throughout the ERCOT system to offset DPEC's generation addition. The base case was further revised to add new transmission projects in Mont Belvieu area

which includes the new 345/138 KV autotransformer at Jordan substation. Appendix A lists the modifications made to the ERCOT base cases.

Studies were conducted in accordance with CNP Transmission System Design Criteria, which includes monitoring Rate A for N-1 contingencies and Rate B for common mode contingencies. Also, bus voltages are identified that exceed the 0.95 p.u. to 1.05 p.u. range for N-1 contingencies and the 0.92 p.u. to 1.05 p.u. range for common mode contingencies.

The interconnection was evaluated under the following scenarios:

1. CenterPoint Energy modeled the proposed generation connected to the existing 345kV Center Substation to determine the most reliable, economical, and environmentally acceptable interconnection option, using the 2014 Summer Peak Base Case issued by the ERCOT Steady-State Working Group on February 27, 2012. The analysis was also performed for year 2016 to have a future look at the impact of the proposed generation.
2. CenterPoint Energy decreased generation output from all generators proportionally throughout the ERCOT system to offset the generation addition at the DPEC plant.
3. Three sensitivity cases were also created to test the system during summer peak with a high import condition and a winter minimum condition. The winter minimum case was created from the ERCOT winter min case and with the additional GT unit output modeled at maximum winter capacity of 225 MW. These cases were used to determine if the system is stable when losing both 345 kV circuits connecting the Center substation, therefore losing the whole Center 345 kV substation and Deer Park Energy Center's units. The third sensitivity case was to test the summer peak condition when the generation at the Cedar Bayou plant was at maximum output.
5. Steady-state Power Flow Analysis
6. Short circuit analysis
7. Transient stability analysis

Results of Single (N-1) Contingency Analysis

The following tables list only the contingencies that have at least 3% changes in circuit loading compared with the modified base case loadings.

Table 1 shows the results of the single contingency analysis for summer peak 2014 and 2016, comparing the revised base cases (with new capacities of the existing units at the DPEC plant) and the case with the proposed expansion.

Overload Table											Casefiles			
Overload Information						Contingency Information					2014 Base case %	DPEC 2014 %	2016 base case %	DPEC 2016 %
FromBus #	FromBus Name	ToBus #	ToBus Name	Ckt	Rating	FromBus #	FromBus Name	ToBus #	ToBus Name	Ckt				
40000	CEDARP_345A	40240	CENTER_345A	97	1137	40240	CENTER_345A	42000	P_H_R_345E	97	<95.0	105.3	<95.0	105.4
40240	CENTER_345A	42000	P_H_R_345E	97	1137	40000	CEDARP_345A	40240	CENTER_345A	97	<95.0	106.8	<95.0	106.9

Table 1: Single Contingency Analyses

Table1 shows that, under 2014 system peak conditions, the outage of the Center – P.H.Robinson ("PHR") 345 kV circuit 97 would load the Center – CEDARP 345 kV circuit 97 below 95% of its continuous rating of 1137 MVA in the revised 2014 summer peak base case but this contingency would load this circuit to 105.3 % of the same rating with the addition of the proposed DPEC unit. Similarly, the outage of the Center – CEDARP 345 kV circuit 97 would load the Center – PHR 345 kV circuit 97 below 95% its continuous rating of 1137 MVA in the revised 2014 summer base case but this contingency would load this circuit to 106.8 % of the same rating with the addition of the proposed DPEC unit. Similar loadings are seen in the year 2016 cases.

Results of Common Mode Contingency Analysis

For year 2014 and year 2016, the common mode analysis does not show any additional problems in the base case with the proposed generation of DPEC.

Overload Table - Common mode

Overload Information						Casefiles			
FromBus #	FromBus Name	ToBus #	ToBus Name	Ckt	Rating MW	2014 Basecase %	DPEC 2014 %	2016 base case %	DPEC 2016 %
40240	CENTER_	42000	P_H_R_	97	1450	71	79.8	77	85.8

Contingency: Outage Cedarp-Jordan 345 kV Ckt 99 & Chamber-King3345kV Ckt 97

Table 1A: Common Mode Analysis

Results of Sensitivity Analysis

A sensitivity analysis was performed to identify problems associated with the outage of both 345 kV circuits connecting the Center substation to the system causing the loss of all DPEC units, including the proposed generation. Tripping the DPEC units would result in governor response, which is approximated by scaling ERCOT generation, to immediately balance the ERCOT base load. For this test, the sensitivity analysis used two cases: a summer condition case with higher import and a winter minimum case with winter dispatch in which several units are off line. The following table shows the interface flow of the summer peak case and winter minimum case for the base case and cases with the addition of GT Unit 5 at the DPEC plant.

Tie Line Flows	2014 SP Basecase	DPEC-2014 Sum HI	DPEC-2015Win Min
Sngltn - Tomball ckt 74	857.46	1052.97	516.03
SNGLTN - ZENITH CKT 98	705.3	923.67	414.8
SNGLTN - ZENITH CKT 99	705.58	924.03	414.96
ROANS - KUYDAL CKT 75	559.52	725.35	387.15
<North To Houston>	**2827.86**	**3626.03**	**1732.94**
STP - WAP CKT 39	510.28	587.84	434.81
STP - DOW CKT 18	603.06	672.55	525.32
STP - DOW CKT 27	603.06	672.55	525.32
HILLJE - WAP CKT 64	524.28	601.27	428.09
HILLJE - WAPSplit CKT 72	585.36	810.56	508.17
<South To Houston>	**2826.04**	**3344.78**	**2421.71**

Table 2: Interface flows, pre-contingency

The results of the load flow sensitivity tests show that, for the high-import and for the winter minimum cases, the system can withstand the outage of the whole DPEC generation due to the loss of both 345 kV circuits from Center substation to CEDARP and PHR substations without causing any voltage lower than .92 p.u. or line loading greater than emergency rating.

A third sensitivity case was a variation of case DPEC 2014 in which the generation output of Cedar Bayou plants were also increased to maximum. Single and common mode contingencies were tested for this case and the results were compared in Table 3 (single contingencies) and Table 3A (common mode contingencies) (Note: since case DPEC 2014 models Cedar Bayou generation almost at the maximum output, there is no significant difference between the two cases) .

Overload Table

Overload Information						Contingency Information					Casefiles	
FromBus #	FromBus Name	ToBus #	ToBus Name	Ckt	Rating	FromBus #	FromBus Name	ToBus #	ToBus Name	Ckt	DPEC 2014 %	DPEC 2014-Max CBY output %
40000	CEDARP_	40240	CENTER_	97	1137	40240	CENTER_	42000	P_H_R_	97	105.3	105.3
40240	CENTER_	42000	P_H_R_	97	1137	40000	CEDARP_	40240	CENTER_	97	106.8	106.8

Table 3: Single contingency comparison

Compared with Table 1, Table 3 shows that with Cedar Bayou units (CB 1, 2 &4) at maximum generation output there is no material change in single contingency overloading results because the case DPEC 2014 already models output of these units very close to their maximum.

Overload Table - Common mode

Overload Information						Casefiles			
FromBus #	FromBus Name	ToBus #	ToBus Name	Ckt	Rating MW	2014 Basecase %	DPEC 2014 %	2016 base case %	DPEC 2016 %
40240	CENTER_	42000	P_H_R_	97	1450	71	79.8	77	85.8

Contingency: Outage Cedarp-Jordan 345 kV Ckt 99 & Chamber-King3345kV Ckt 97

Note 1: Outage both Chamber-King 345 kV ckt 97 and Cedarp-N Belt 345 kV ckt 99

Table 3A: Common mode comparison

For the common mode failure analysis, with the full generation output at Cedar Bayou Plant, the loss of CEDARP-Jordan 345 kV CKT 97 and Chamber to King 345 kV circuit 97 would load the Center-PHR 345 kV circuit to 79.8% of emergency rating of 1450 MVA in 2014 and to 85.8% in 2016. The result indicates that the Center-PHR 345 kV circuit 97, with an emergency rating of 1450 MW, could accommodate the generation output of the DPEC expansion without any constraint on DPEC plant output under this most critical common mode contingency.

Additionally, the results of the 2016 summer peak case do not show any other violations.

The continuous and emergency ratings of the 345 kV circuits from CENTER substation to CEDARP and PHR are currently 1137 MVA and 1450 MVA, respectively. The continuous rating is limited by conductors (2-795ACSR, 90 degree C). Since the overloading problems of the CNP circuits may occur on single contingency when the units at DPEC Deer Park and Cedar Bayou plants are at their full output, and since ERCOT uses the emergency rating (2 hour rating) to determine pre-contingency generation constraints, the generation at DPEC with the proposed generation is not expected to experience pre-contingency generation constraints, i.e. when both 345 kV getaway circuits from CENTER substation are in service. However, when one of the getaway circuits is on maintenance outage then the output of the DPEC plant might be constrained absent the proposed thermal upgrade of Cedar Bayou - Center - PH Robinson.

GSU Transformer Tap Setting

The customer provides the following data for the GSU for the GT Unit 5:
MVA rating: 135/180/225 MVA. (OA/FA/FOA)
Nominal Voltage: 352 KV/ 15 kV.
Impedance X=10% @ OA.
No ON Load Tap Changer position.
Number of NO Load Tap Positions = 5, Highest level, (Position 5) = 369.6 kV, Lowest Level (position1) = 334.4 kV, each step = 8.8 kV.
Tap setting study was performed for 3 most probable positions and the results are shown in the following table.
In this study, the transmission voltage side is set to meet ERCOT Voltage profile of 1.029 pu. (355 KV)

		Summer Peak			Winter Min		
		dpec-case1			dpec-case2		
Options	NLT Position	Generator Termial Voltage, pu	Generator Termial Voltage, KV	Qmax =Qmin (MVAR)	Generator Termial Voltage, pu	Generator Termial Voltage, KV	Qmax =Qmin (MVAR)
1	4	1.00059	15.01	103	0.89369	13.41	-80.5
2	3	1.02516	15.38	103	0.92784	13.92	-80.5
3	2	1.05082	15.76	103	0.96211	14.43	-80.5

The above results indicate that while the transmission voltage was maintained at 355 KV successfully and the generator can produce up to QMAX of 103 MVAR Lagging for any of the three No Load Tap (NLT) settings, the leading power QMIN cannot reach 80.5MVAR Leading. The results also show that for NLT position 3, if the QMIN of the unit is limited to 25 MVAR leading, then the generator terminal voltage in the winter minimum scenario would be inside the +/- 5% of 15 KV range. CenterPoint Energy recommends that DPEC consult with the transformer and generator manufacturers concerning the limit of operation of the generator unit in leading mode and the NLT setting of the GSU transformer. CenterPoint Energy requests that DPEC consult CenterPoint Energy prior to finalizing the NLT setting and energizing the new GSU transformer.

Short Circuit Analysis

Short circuit analyses were performed for the 2014 base case and for the case with the DPEC's expansion.

Table 4 below summarizes the changes in fault duty due to the addition of the proposed GT units at the Center 345 kV substation and two nearby 345 kV substations: the CEDARP and the PHR substations. At the Center 345 kV substation, the breakers are identified as having a 50 kA fault duty rating. At the nearby CEDARP and PHR 345 kV substations, the breakers have 50 kA and 40kA fault duty ratings, respectively. The 3-phase and single phase fault currents for these three buses, before and after the addition of the GT Unit 5 at the DPEC plant, shown in Table 4, are all below the rated values of the breakers.

				Base Case (2014 SP)				2014SP With GT5 at DPCE			
				3 phase fault		1 phase fault		3 phase fault		1 phase fault	
Buses		KV	Rating KA	KA	%	KA	%	KA	%	KA	%
40240	CENTER	345	50	25.2	50.40%	23.9	47.80%	26.4	52.80%	25.7	51.40%
40000	CEDARP	345	50	37.1	74.20%	34.1	68.20%	37.6	75.28%	35.5	71.00%
42000	P_H_R	345	40	28.3	70.75%	23.6	59.00%	28.5	71.25%	23.8	59.50%

Table 4: Short circuit analyses

Stability Analysis

Stability analyses were performed for the 2014 base case and the case with DPEC's expansion.

The new generator was set to control the existing Center 345 kV bus to 1.029 p.u. and studies were performed to determine the expected stability limits at Center and to determine the effect of this interconnection on the nearby generation stability margins. The 2012 flat start base case created by the ERCOT dynamic working group (DWG) was modified to create a 2014 flat start case and used as the starting case for the stability analysis. Table 5 summarizes the critical fault clearing time (CFCT) for the Center 345 kV bus and compares the CFCT of the nearby Cedar Bayou 345 kV bus before and after the addition of the proposed GT unit.

Table 5: Critical Fault Clearing Times

Generator/ Plant	Faulted Bus	Volt age (kV)	2014 Base Case		2014 with GT5	
			Critical Fault Clearing Time (Cycles)	Transmission Line Tripped to clear Fault	Critical Fault Clearing Time (Cycles)	Transmission Line Tripped to clear Fault
DPEC	Center (40240)	345	13	Center-CEDARP 345 kV CKT 97 & GT3	13	Center-CEDARP 345 kV CKT 97 & GT3
DPEC	Center (40240)	345	13	Center-PHR 345 kV CKT 97 & GT1	13	Center-PHR 345 kV CKT 97 & GT 1
Cedar Bayou	CEDARP (40000)	345	11	CEDARP-N.Belt CKT 99 and CB Auto1	11	CEDARP-N.Belt CKT 99 and CB Auto 1

The critical fault clearing time (CFCT) for the proposed combined cycle plant at Deer Park Energy Center (DPEC plant) is 13 cycles with the addition of the GT5. The results indicate the proposed interconnection would have minimal effect on the CFCT of DPEC plant or nearby generation. In addition, the new generation does not cause any out of step conditions for CenterPoint Energy transmission elements as long as the fault at the DPEC plant is cleared within 13 cycles. The CFCT at CEDARP remains unchanged at 11 cycles after the new unit is added at the DPEC plant. See Appendix B for dynamics model data for the new GT generating units and Appendix C for rotor angle stability plots of DPEC generating units and near-by plants.

Sensitivity Study

The following short circuit and dynamic stability analyses used the new data for the generator step-up transformer (GSU) and generator model resubmitted by Customer on August 15, 2012.

Short Circuit Analysis

The new GSU has lower impedance of (.001+j .067) p.u. at 100 MVA base, compared with the original value of (.001+j.074) p.u. at 100 MVA base. The results of the short circuit analyses with the new impedance were summarized in Table 4a.

				Base Case (2014 SP)				2014SP With GT5 at DPCE (New data)			
				3 phase fault		1 phase fault		3 phase fault		1 phase fault	
Buses		KV	Rating KA	KA	%	KA	%	KA	%	KA	%
40240	CENTER	345	50	25.2	50.40%	23.9	47.80%	29.4	58.78%	25.8	51.60%
40000	CEDARP	345	50	37.1	74.20%	34.1	68.20%	37.6	75.20%	35.5	71.00%
42000	P_H_R	345	40	28.3	70.75%	23.6	59.00%	28.5	71.25%	23.8	59.50%

Table 4a: Short circuit analyses with new data

The results in Table 4a show the fault duty currents at the CENTER bus increases but within the rating of the substation equipment.

Stability Analysis

Table 5a: Comparison of Critical Fault Clearing Times

Generator/ Plant	Faulted Bus	Volt age (kV)	2014 With GT5 (Old data)		2014 with GT5 (New Data)	
			Critical Fault Clearing Time (Cycles)	Transmission Line Tripped to clear Fault	Critical Fault Clearing Time (Cycles)	Transmission Line Tripped to clear Fault
DPEC	Center (40240)	345	13	Center-CEDARP 345 kV CKT 97 & GT3	13	Center-CEDARP 345 kV CKT 97 & GT3
DPEC	Center (40240)	345	13	Center-PHR 345 kV CKT 97 & GT1	13	Center-PHR 345 kV CKT 97 & GT 1
Cedar Bayou	CEDARP (40000)	345	11	CEDARP-N.Belt CKT 99 and CB Auto 1	11	CEDARP-N.Belt CKT 99 and CB Auto 1

Table 5a shows the results of the stability analyses for the newly submitted data of generator, exciter and governor models. There is no difference in Critical Fault Clearing Times at the DPEC plant between the original data and new data of the GT#5. See Appendix B for new dynamic model data for the new generating unit. Appendix C shows rotor angle stability plots of DPEC generating units and near-by plants with the new data of GT#5.

Cost Estimates

Cost estimates for the system improvements required are listed in the flowing Table.

Table 6 lists the cost estimates for interconnection and the estimates depend on DPEC's choice of interconnection of GT Unit 5 as explained in the notes. The cost estimates do not include costs that may be incurred by DPEC. Appendix D shows descriptions of Offers in details.

Transmission upgrade projects that are identified through ERCOT's generation interconnection process may be reviewed through the RPG Project Review Process, subject to the confidentiality provisions of the generation interconnection procedure. The alternative option for the transmission thermal upgrade is to rebuild the 26 miles of the CEDARP-Center-PHR kV circuit with new structures and 1 circuit of 3-959ACSS/TW conductor. The cost for this transmission line rebuilding, assuming that the existing crossing towers do not require replacement, is estimated at $100 Million and this option is considered, but rejected due to the relatively high cost and time requirement. The customer has the following options for the interconnection at the Center substation.

Table 6: Interconnect GT#5

Offers	Projects	Cost Estimates	Descriptions/notes
Basic Offer			
	PH Robinson to Center to Cedar Bayou thermal upgrade to 1300 MVA.	$ 250,000	See notes 1&2
	Substation (Connect GT#5)	$ 290,000 $ 300,000	Upgrade equipment at CBY 345 kV substation for new rating of the conductors. Changes in the GIS for relaying, metering, and SCADA for new generator and to accommodate the Customer's new generator lead at the new GIS interface (Customer would **add a new pothead structure adjacent to the existing CNP pothead structure inside the CNP yard, install a 234 MVA generator lead to interconnect GT#5 with the new pothead structure then** gang connect GT unit 5 with the existing steam unit)
	Total	**$ 840,000**	

Generation interconnections are considered market sensitive information. To preserve the integrity of the marketplace, it is essential that this information not be made public or disclosed to other market participants. This information should not be made public until the reviews of the transmission service providers are completed and the generating customer has agreed to make this information public.

Enhanced Offer 1			
	PH Robinson to Center to Cedar Bayou thermal upgrade to 1300 MVA.	$ 250,000	See notes 1&2
	Substation (Connect GT#5)	$ 290,000 $ 400,000	Upgrade equipment at CBY 345 kV substation for new rating of the conductors. Changes in the GIS for relaying, metering, structural (new pothead structure & insulated bus), and SCADA for new generator and to accommodate the new generator lead connected to the GIS interface (Generator will build and pay for the **new** 345 kV generator lead from the new GT to an existing GIS Interface in parallel with an existing generator lead and **make the connection to a new CNP pothead structure at the GIS building)**
	Total	**$ 940,000**	
Enhanced Offer 2			
	PH Robinson to Center to Cedar Bayou thermal upgrade to 1300 MVA.	$ 250,000	See note 2
	Connect GT#5	$ 290,000 $ 3,900,000	Upgrade equipment at CBY 345 kV substation for new rating of the conductors. Upgrade the GIS for relaying, metering, structural, and SCADA for new generator and with a new breaker on **a new position in an existing bay** to interconnect GT#5. (Generator would build and pay for a new 345 kV generator lead fromGT#5 to a new GIS Interface)
	Total	**$ 4,440,000**	

Note 1: *Basic Connection requires DPEC to connect ("gang") the new generating unit with the steam unit on DPEC's side of the Point of Interconnection, as defined in the Standard Generation Interconnection Agreement (SGIA), subject to the limitation that no more than 1250*

MW of generation capacity is ganged together on one generator lead connecting to CENTER substation.

Note 2: *Transmission & substation improvements required include the following projects:*

a) *Center –PHR Thermally Upgrade 345 kV CKT 97F.*

b) *Center-CEDARP Thermally Upgrade 345 kV CKT 97D*

Conclusions & Recommendations

Based on the results of the studies presented in the previous sections, using the ERCOT Steady-State Working Group cases issued on February 27, 2012 (12_DSB_Posted_022712), CenterPoint Energy offers the following conclusions and recommendations:

Interconnection of GT Unit 5 will require the following transmission and substation upgrades:

a) Thermally upgrade the Center–P.H. Robinson 345 kV circuit 97 and Center to Cedar Bayou 345 kV circuit 97 to at least 1300 MW continuous rating. The estimated cost of this transmission upgrade is $250,000.

b) DPEC has the following options for interconnecting GT Unit 5:

1. Basic Offer:
DPEC selects to gang connect GT unit 5 with the existing steam unit by installing a new GIS cable pot head structure adjacent to the existing pothead structure inside the CenterPoint yard. A new 234 MVA cable will be installed within the DPEC plant between the new GT #5 and the new pothead structure. The existing steam unit generator lead will remain in service and both steam unit and GT#5 unit will be metered independently The substation cost for this offer is estimated at **$590,** (See Appendix D, Chart1)

2. Enhanced Offer 1: If DPEC selects to gang connect GT#5 with an existing unit and makes the connection at a new pothead structure and insulated bus at the GIS building, the substation cost for this offer is estimated at **$690,000.** (See Appendix D, Chart 2)

3. Enhanced Offer 2: If DPEC prefers to connect GT#5 to a new terminating position on an existing bay in the GIS, the substation cost for this offer is estimated at **$4,190,000.** (See Appendix D, Chart 3)

The total cost to interconnect the Deer Park Expansion will range from **$840,000** (basic offer) to **$4,440,000** (enhanced offer 2). These cost estimates do not include costs that may be incurred by DPEC.

A sensitivity analysis of the 2014 study case with DPEC's proposed generation indicates that the system can withstand the outage of all generation at the DPEC plant, including the new

generation, without any bus voltage lower than 0.92 p.u. or any transmission circuit exceeding its emergency rating.

Appendix A – Changes to the posted SSWG cases

Changes made to 2014 base case

ERCOT SWG Base Case posted on February 27, 2012 update

- Update PMAX, PMIN,QMAX, QMIN of DPEC existing units
- Add upgrade projects in Mont Belvieu area (345/138 KV autotransformer at the new Jordan substation
- Add zero sequence data to the circuits separating the generation entity and CNP system.

Appendix B – Dynamic models for DPEC units

```
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0.4519,0.2008,0.1711,0.078,0.35 /cnp_DPEC GT1,
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0.15,0.917,2.5,10,15,0.5,1,0,1,0.25,1.5,1,0,
1.5,0.5,0.95,0.95575,1,1.001,1.05,0.97568,164 / Calpine - DeerPark
GT1,HN-new trate
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GT2,HN-new trate
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0.15,0.917,2.5,10,15,0.5,1,0,1,0.25,1.5,1,0,
1.5,0.5,0.95,0.95575,1,1.001,1.05,0.97568,179 / Calpine - DeerPark
GT3,HN-new Trate
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0.15,0.917,2.5,10,15,0.5,1,0,1,0.25,1.5,1,0,
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GT4,Hn-new Trate
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1.5,0.5,0.95,0.95575,1,1.001,1.05,0.97568,215 / Calpine - DeerPark
GT5,HN
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6254,1,1,1,1.2,
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table modified HN      ,
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Newly Submitted Data

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1.5,0.5,0.95,0.95575,1,1.001,1.05,0.97568,215. / DPEC GT5, hn
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.95,0.09,3.71,0.05,10.5,0 /cnp_DPEC ST
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66,0.235,0.086,0.161 /cnp_DPEC ST,
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0.33937,0,0.52524,0.447449,0.639382,.956106,.800852,.974567,.87943,.97
6254,1,1,1,1.2,
300,0.15,0.5,10,2,3,10,0,0,0.5,295 /Calpine - DeerPark ST - lookup
table modified HN      ,
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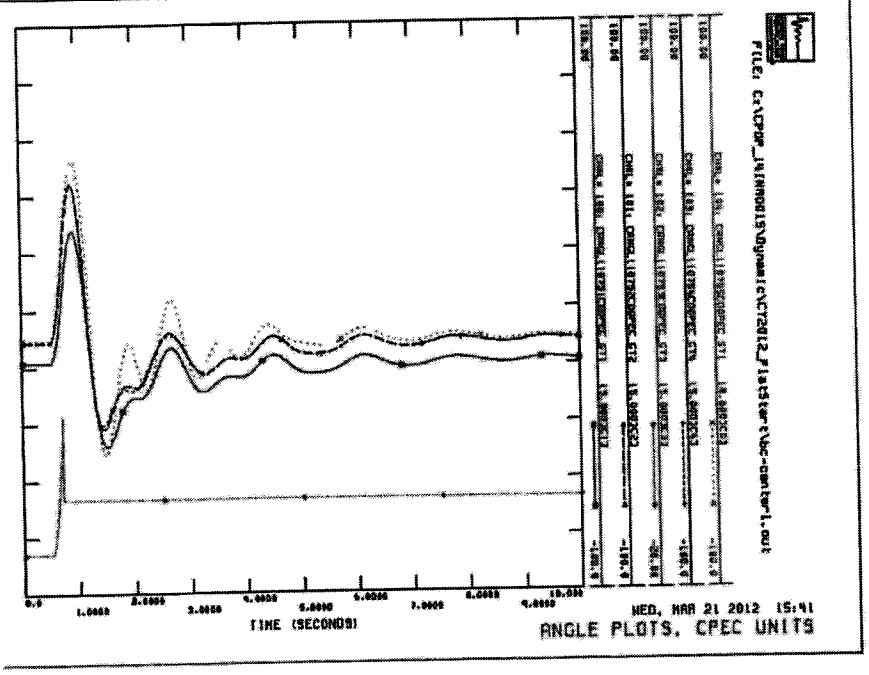
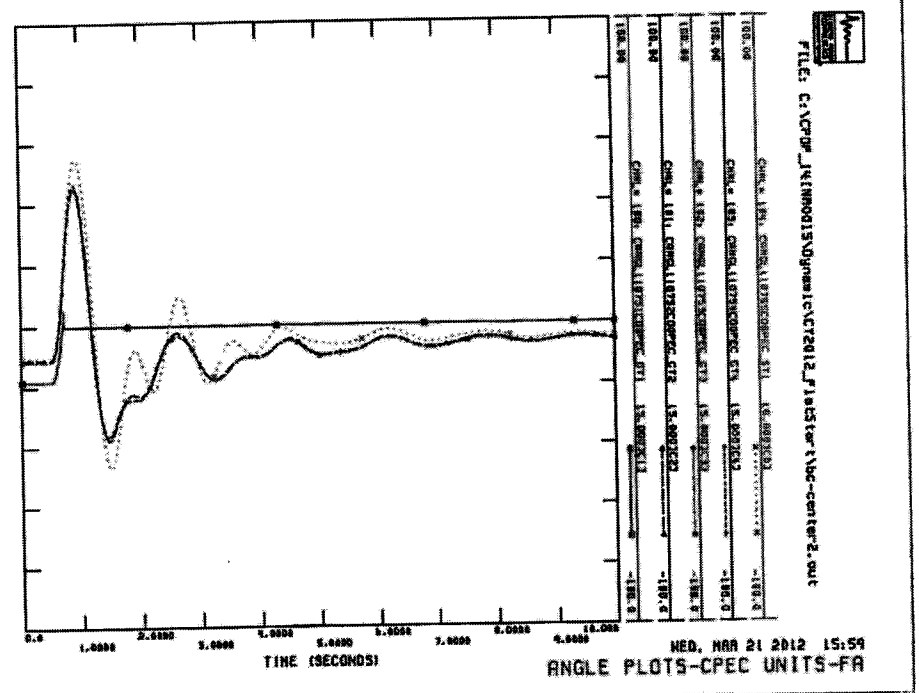
Appendix C – Dynamic Rotor Angle Plots

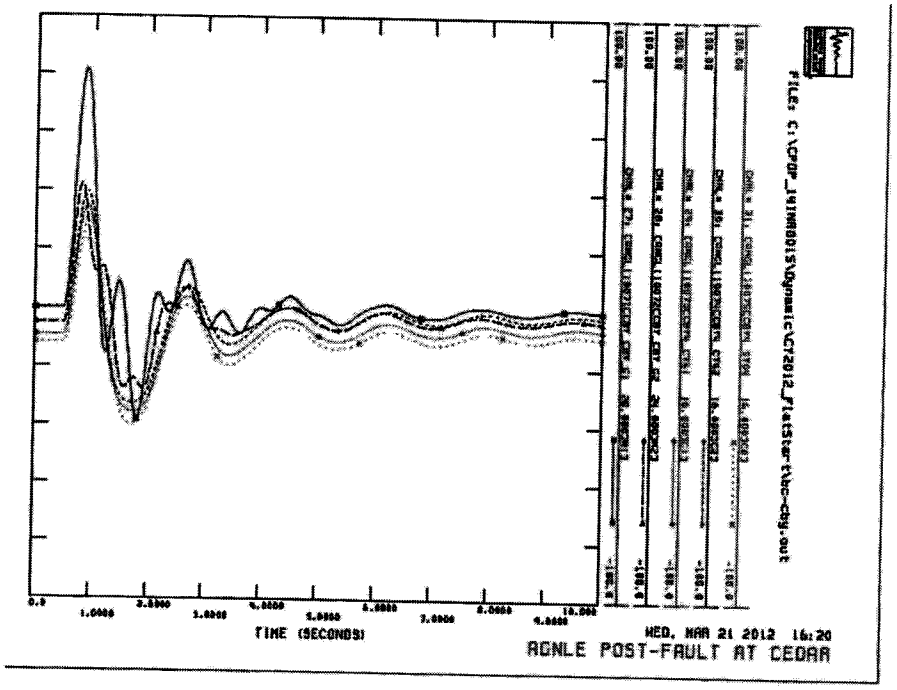
Base case, with a 3 phase, 13 cycle fault @ CEN bus, tripping CEN-CEDARP & GT3



Base case, with a 3 phase, 13 cycle fault @ CEN, tripping CEN - PHR & GT1

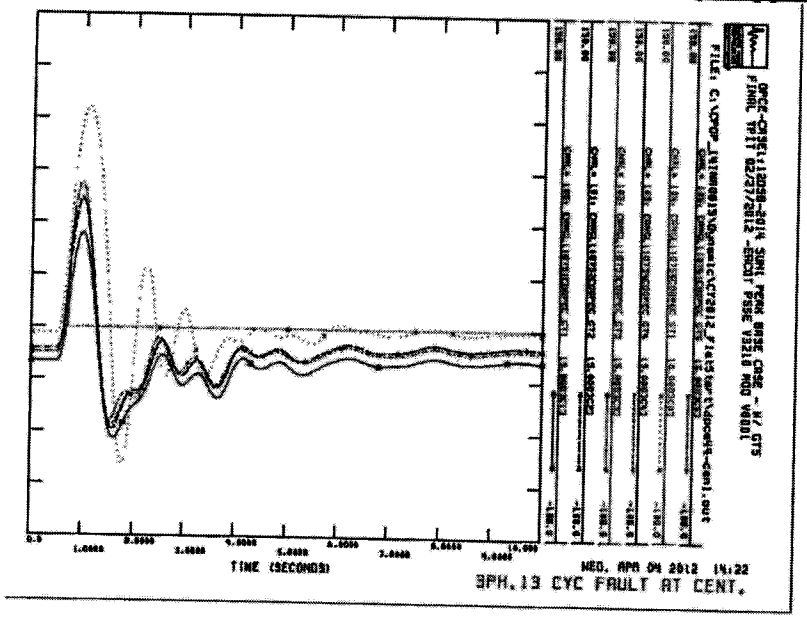


Basecase: Angle plot for CBY units, 3phase, 11 cycle fault at CEDARP 345 kV bus, tripping CEDARP-N.Belt ckt and A1

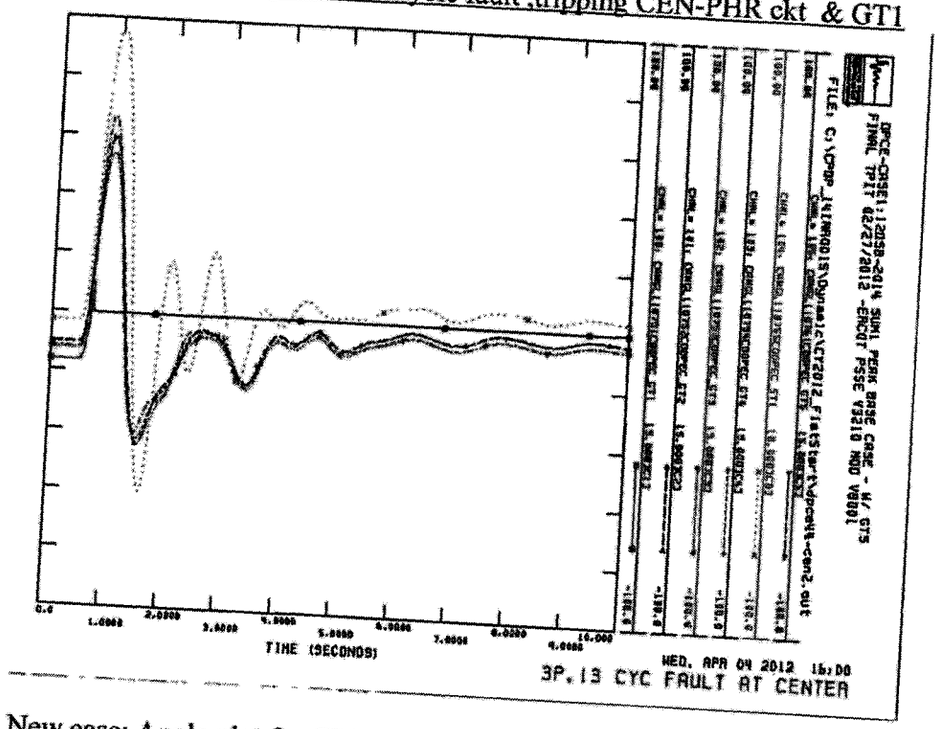


\

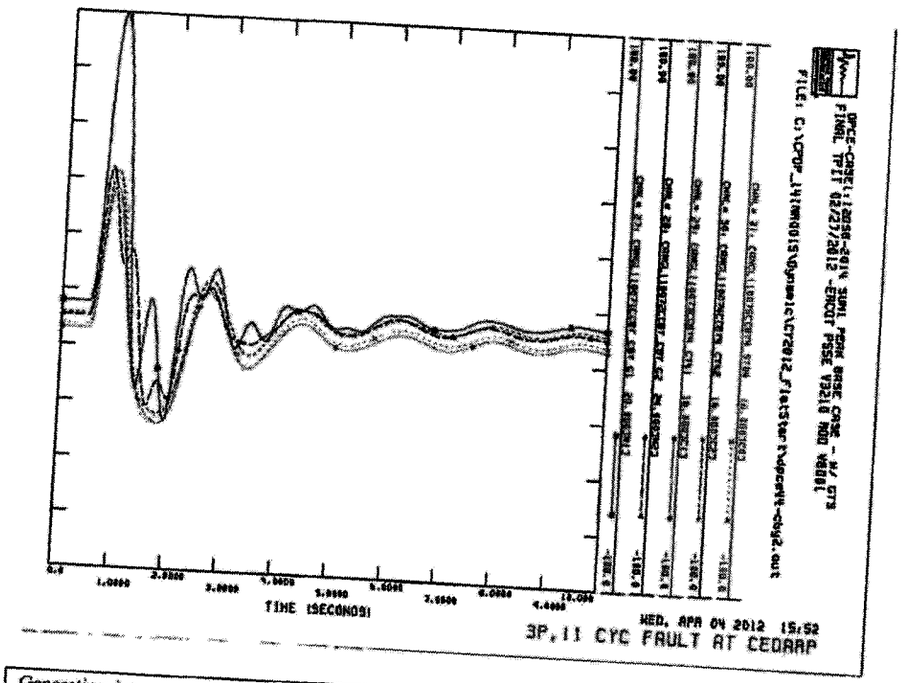
New case, with a 3phase fault @ CEN bus, 13cyle delay, tripping CEN-CBY ckt & GT3



New case, with a 3phase , 13 cycle fault ,tripping CEN-PHR ckt & GT1

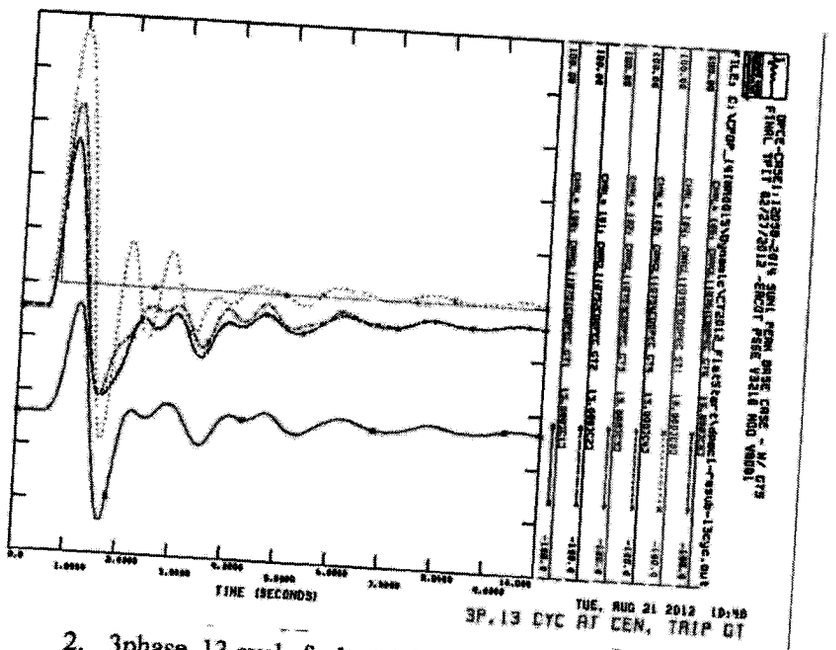


New case: Angle plot for CBY units, 3phase, 11 cycle fault at CEDARP 345 kV bus, tripping CEDARP-N.Belt ckt and A1

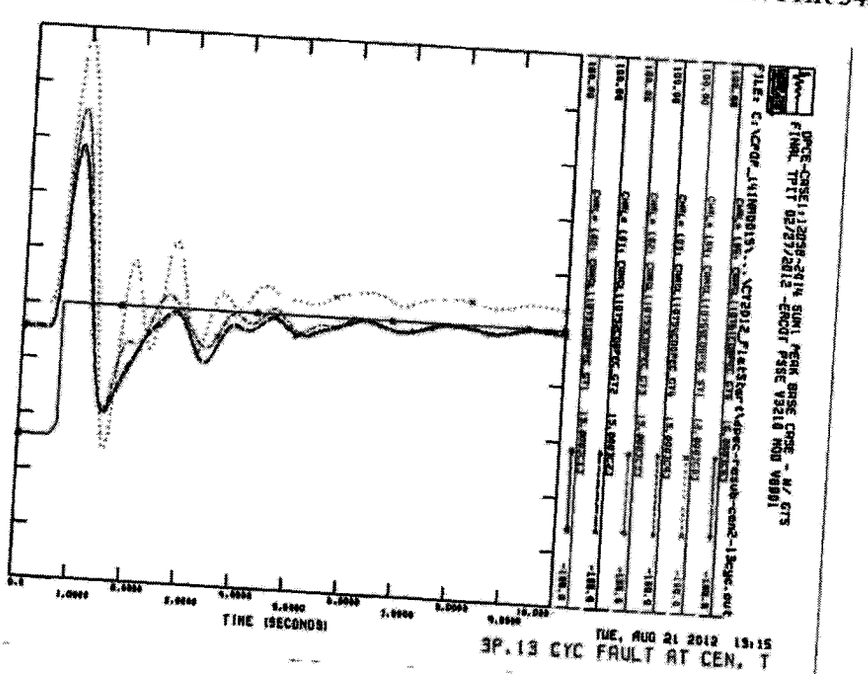


Angular Plots for new generator model for GT5

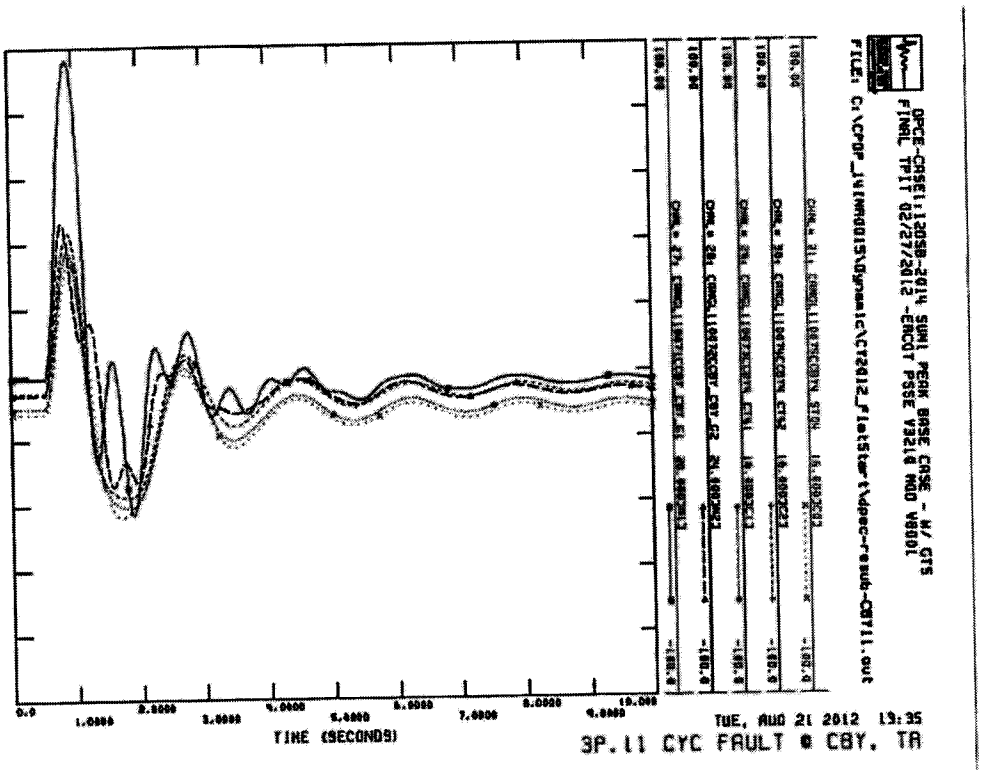
1. 3phase, 13 cycle faul t at CENTER, trip GT3 and CEN-CBY 345 kV ckt



2. 3phase, 13 cycle fault at CENTER, trip GT1 and CEN-PHR 345 kV ckt



3. 3phase, 13 cycle fault at CBY5, trip CBY A1 and CBY-Nbelt 345 kV ckt



Appendix D: Descriptions of Offers

Deer Park Expansion Project. Substation Configurations for all offers

Chart 1: Basic Offer 1

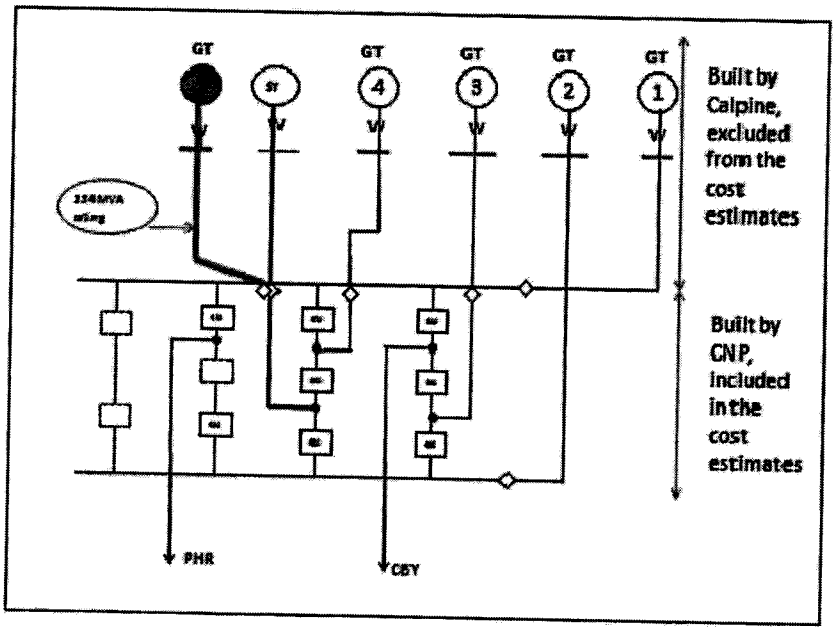


Chart 2: Enhanced Offer 1

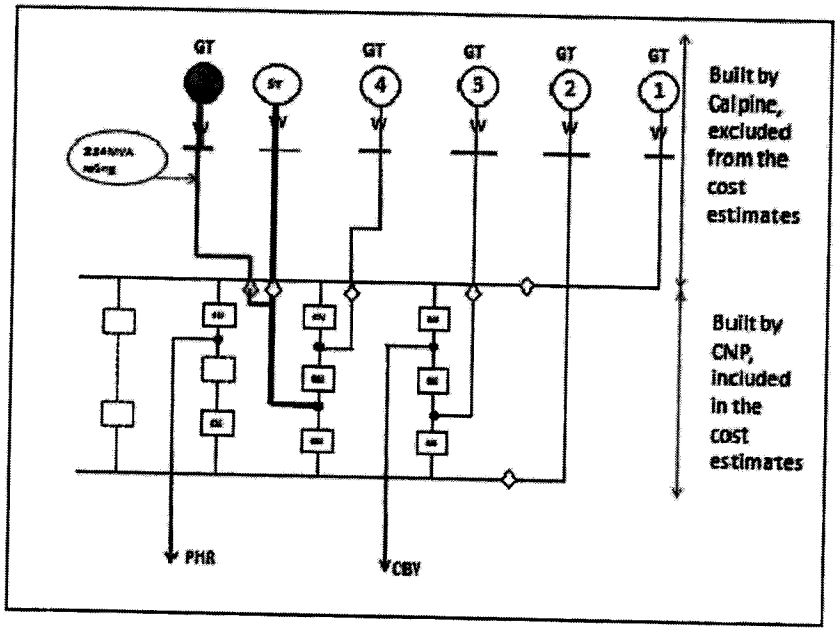
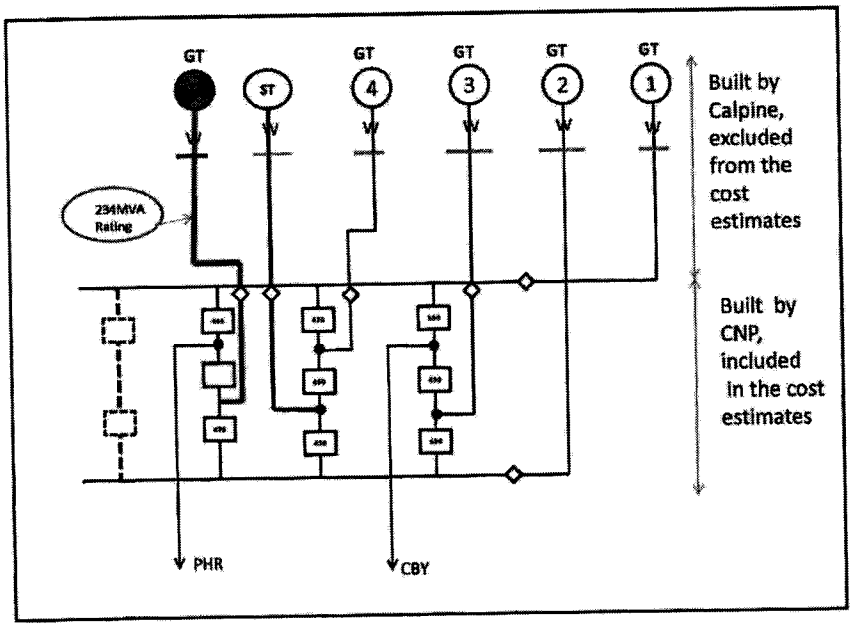
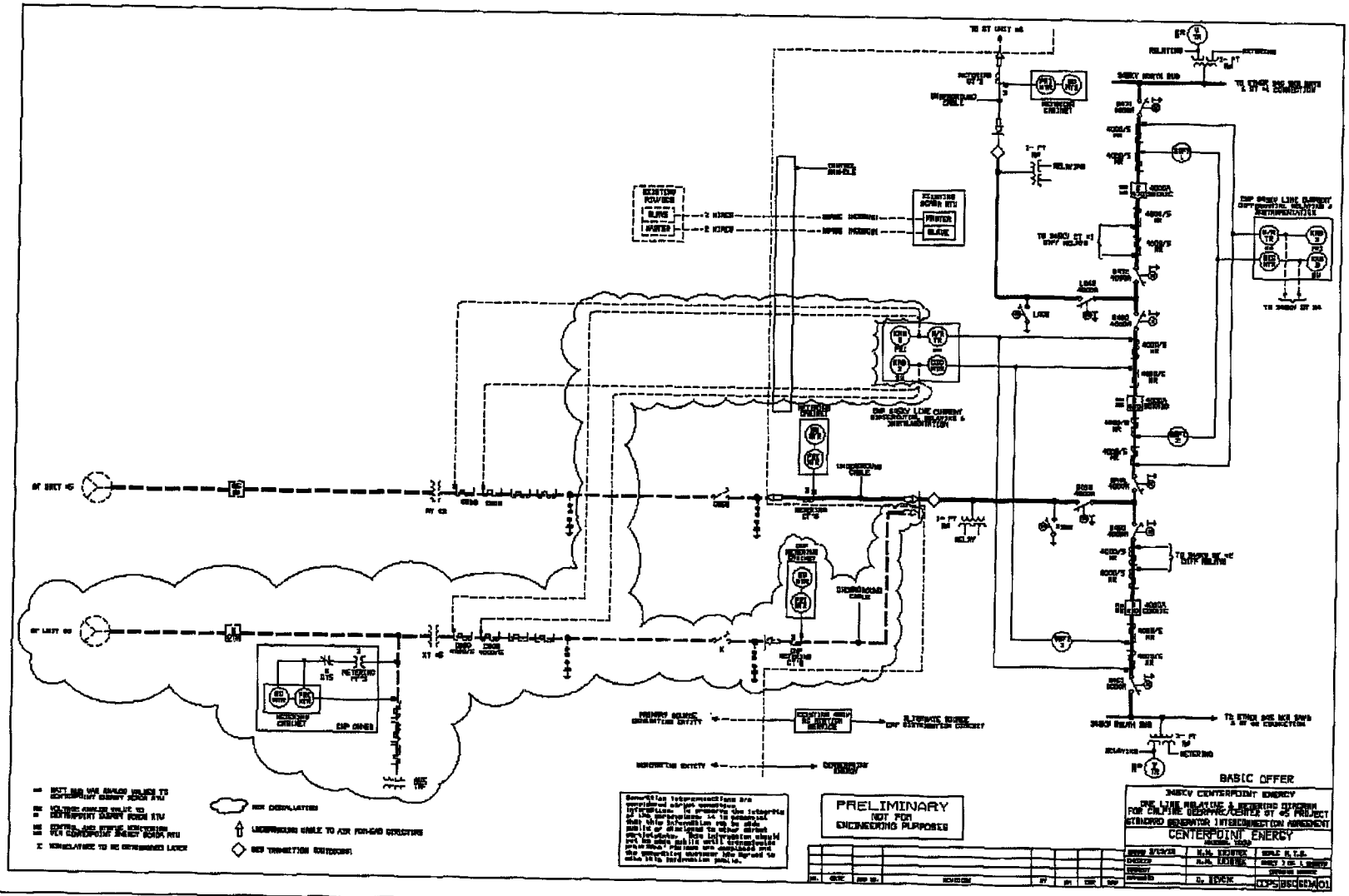


Chart 3: Enhanced Offer 2



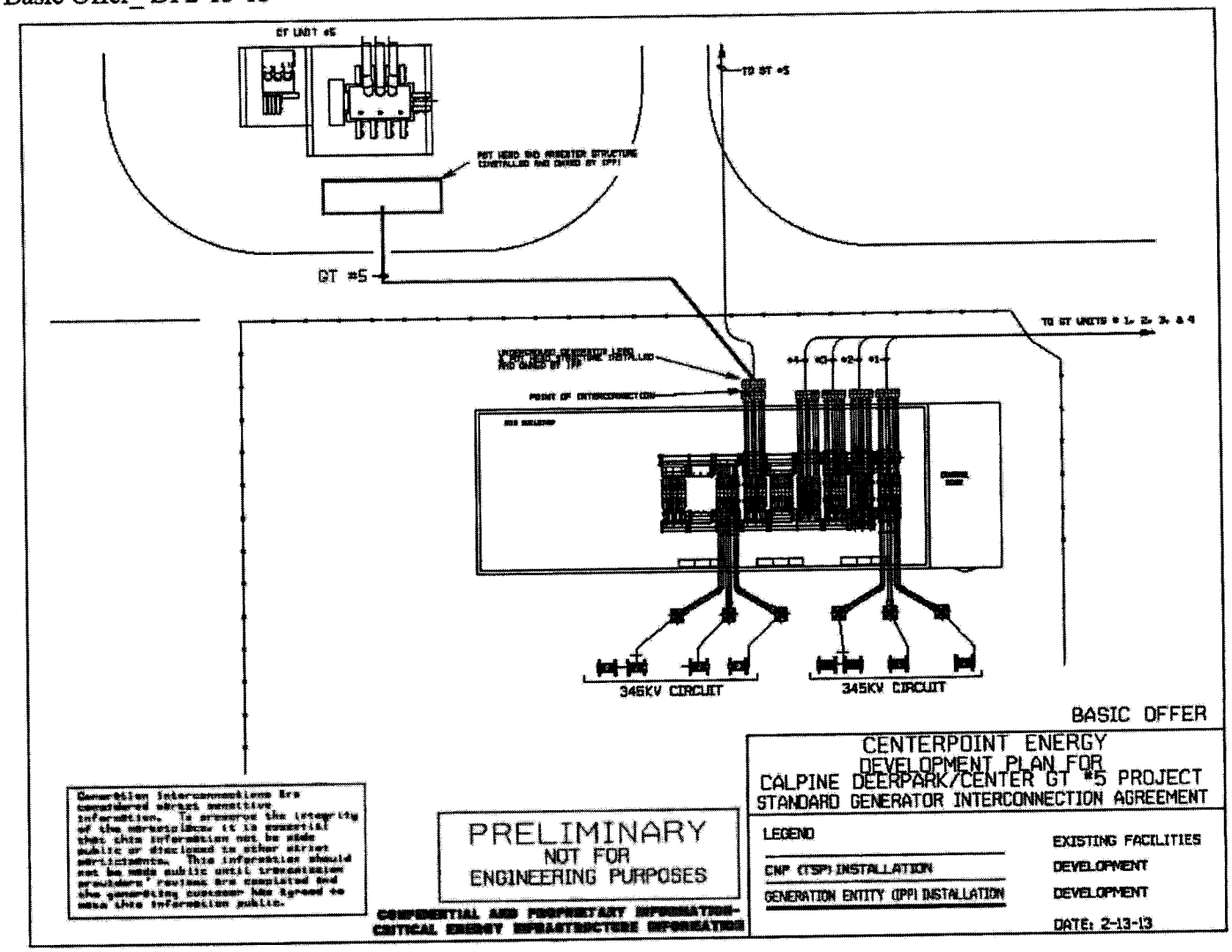
Appendix E: Facility Drawings

1a DPEC Basic Offer R&M



Generation interconnections are considered market sensitive information. To preserve the integrity of the marketplace, it is essential that this information not be made public or disclosed to other market participants. This information should not be made public until the reviews of the transmission service providers are completed and the generating customer has agreed to make this information public.

1.b DPEC- Basic Offer_ DP2-13-13



2. DPEC Enhanced Offer 1, R&M

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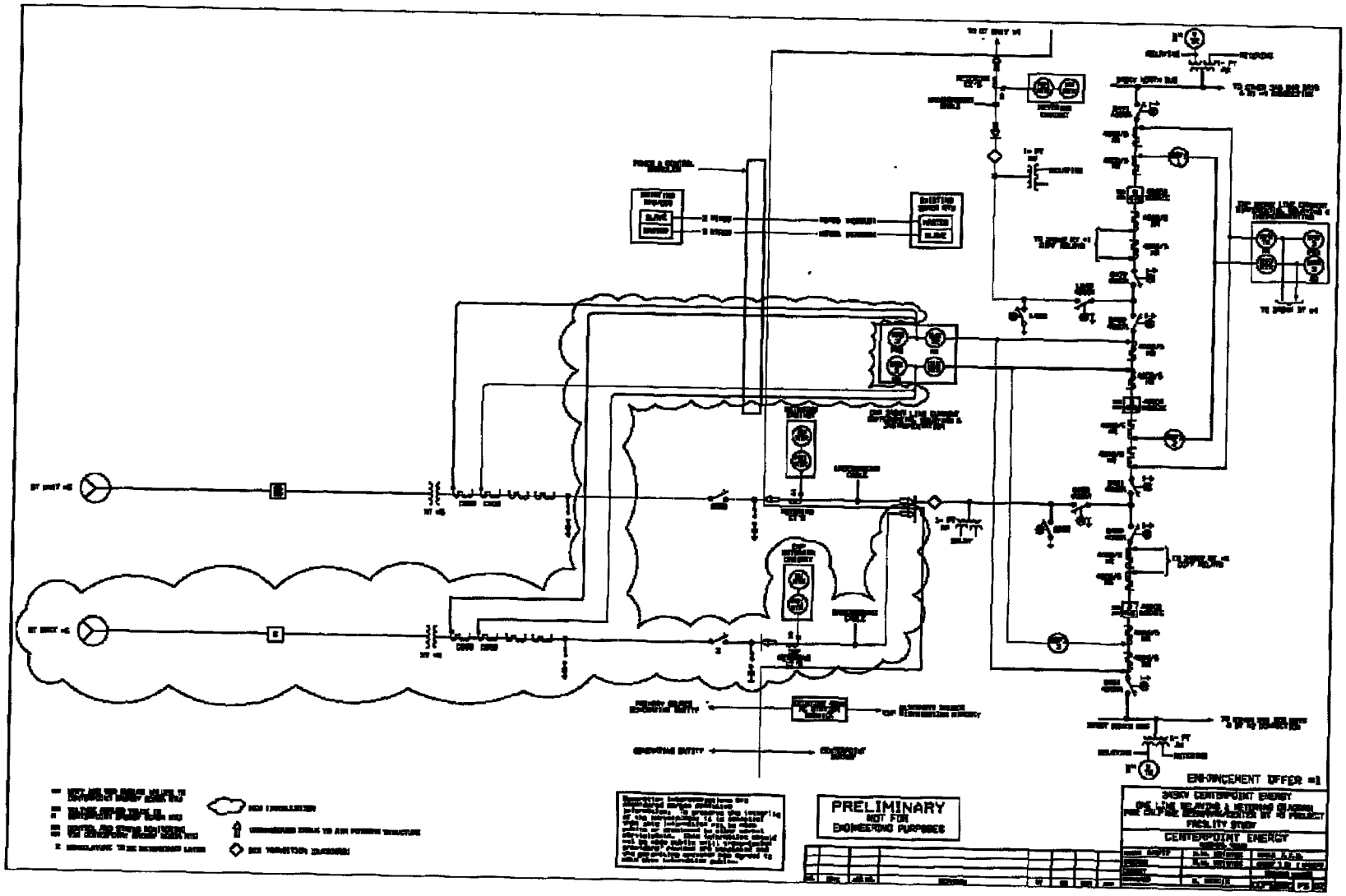
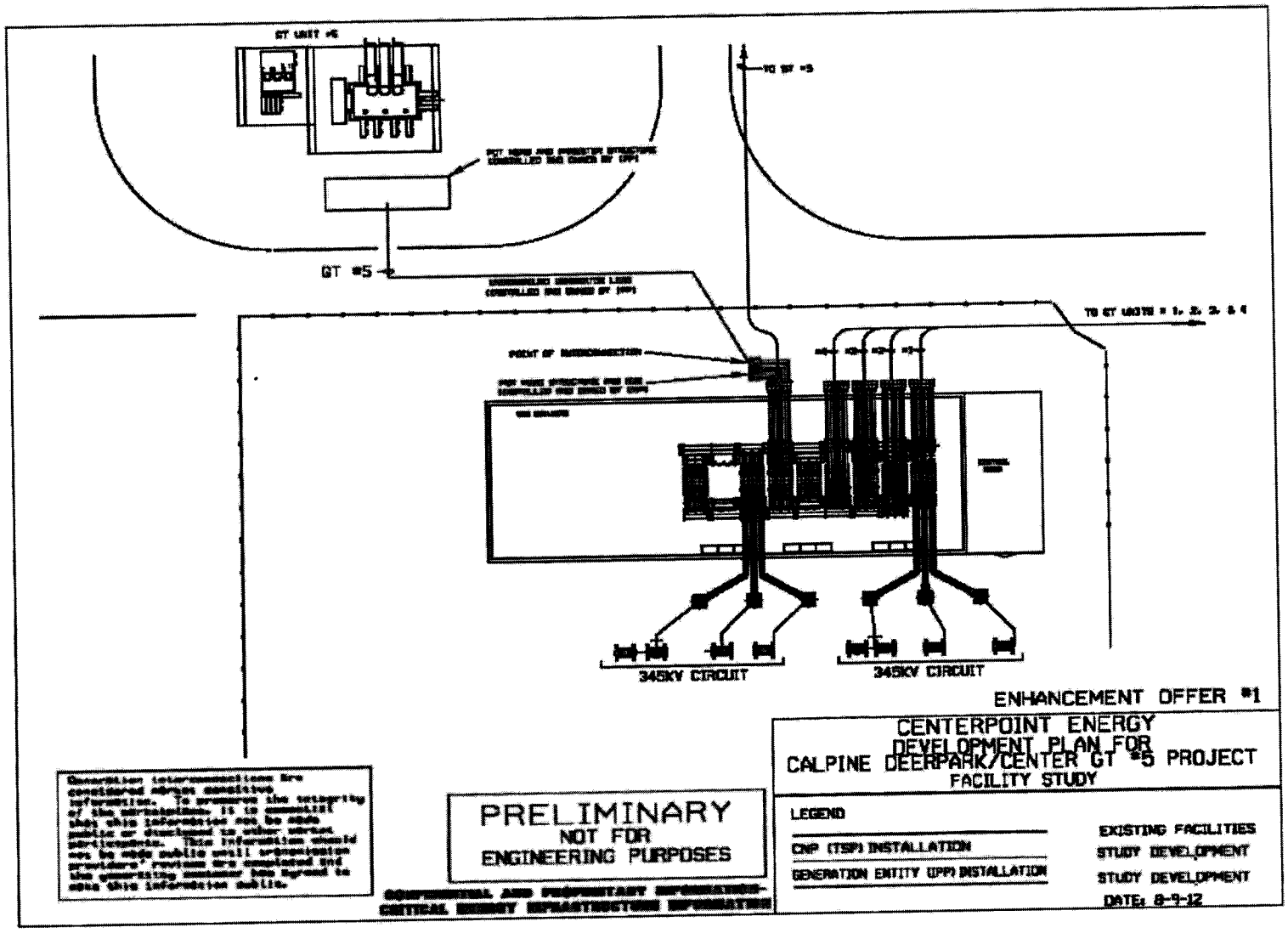
Generation interconnections are considered market sensitive information. To preserve the integrity of the marketplace, it is essential that this information not be made public or disclosed to other market participants. This information should not be made public until the reviews of the transmission service providers are completed and the generating customer has agreed to make this information public.



83

Generation interconnections are considered market sensitive information. To preserve the integrity of the marketplace, it is essential that this information not be made public or disclosed to other market participants. This information should not be made public until the reviews of the transmission service providers are completed and the generating customer has agreed to make this information public.

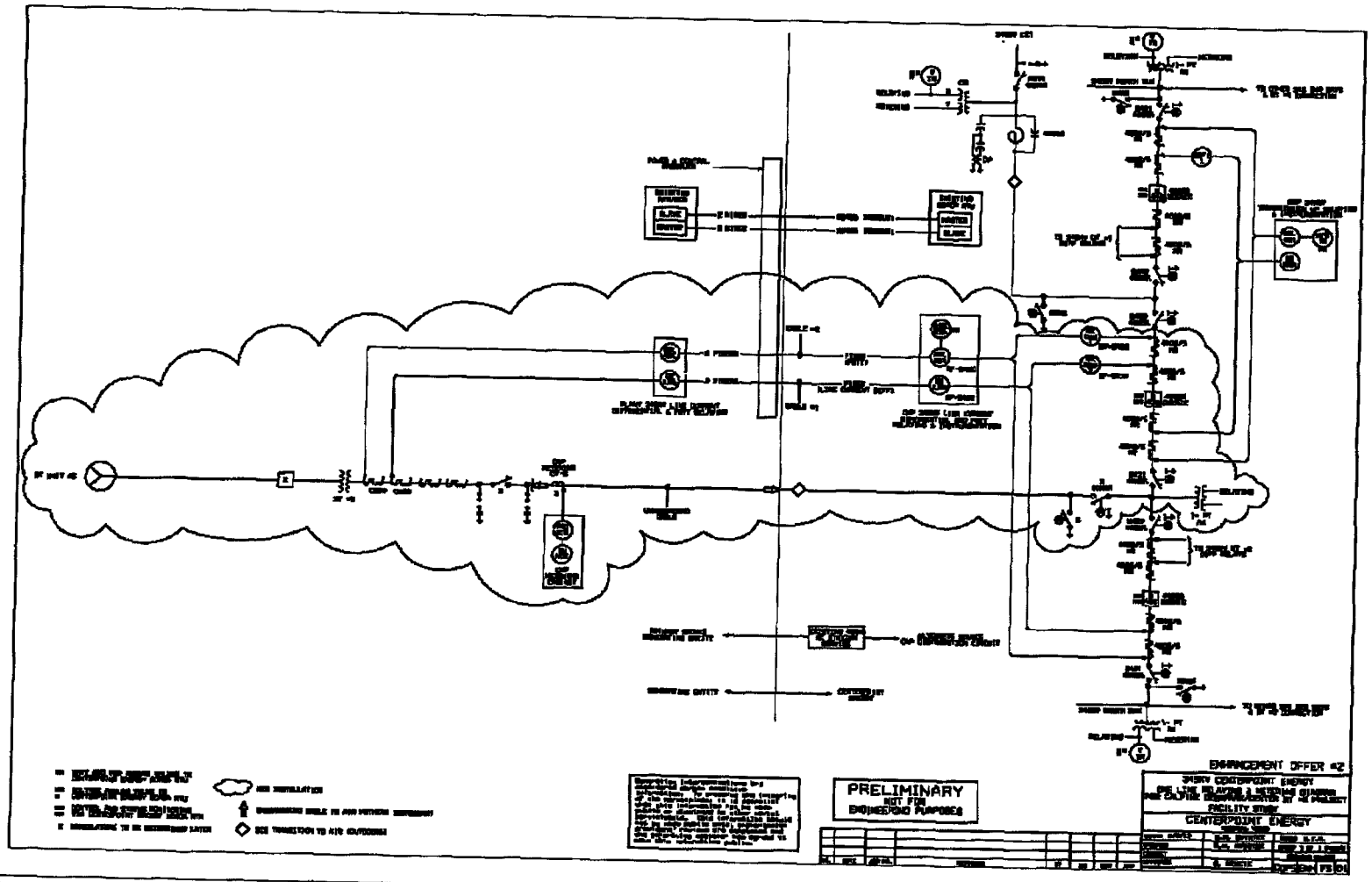
3. DPEC Enhanced Offer #1 DP



84

Generation interconnections are considered market sensitive information. To preserve the integrity of the marketplace, it is essential that this information not be made public or disclosed to other market participants. This information should not be made public until the reviews of the transmission service providers are completed and the generating customer has agreed to make this information public.

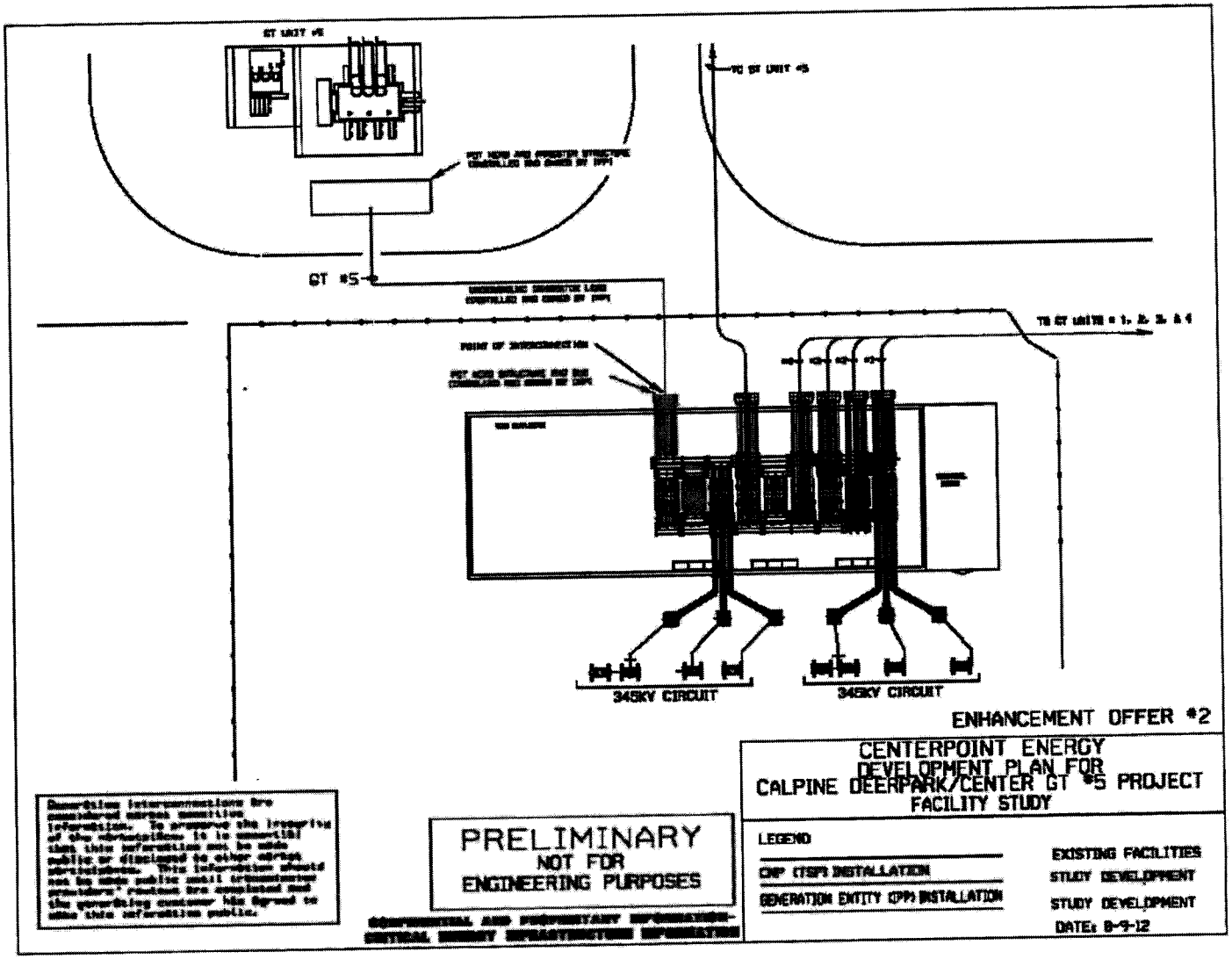
4. DPEC Enhanced Offer 2, R&M



Generation interconnections are considered market sensitive information. To preserve the integrity of the marketplace, it is essential that this information not be made public or disclosed to other market participants. This information should not be made public until the reviews of the transmission service providers are completed and the generating customer has agreed to make this information public.

85

5. DPEC Enhancement Offer 2, DP



88

Generation interconnections are considered market sensitive information. To preserve the integrity of the marketplace, it is essential that this information not be made public or disclosed to other market participants. This information should not be made public until the reviews of the transmission service providers are completed and the generating customer has agreed to make this information public.

Exhibit I
System Impact Study – March 27, 2001 Report

Update to Deer Park Energy Center (DPEC) Interconnection Study
March 27, 2001

The previous update of the Deer Park Energy Center interconnection study completed September 28, 2000 determined that the most reasonable and cost effective connection would be to loop 345 kV circuit 97 P.H. Robinson to Cedar Bayou into the new CENTER substation. All previous studies had modeled DPEC with 6 units totaling 1256 MW. Calpine has since indicated that the plant will be built with 5 units totaling 1050 MW with the possibility of adding a sixth unit some time in the future. Also, HL&P received updated DPEC generator data.

In light of these changes, HL&P decided to restudy the DPEC interconnection. The changes noted above do not affect the previous determination of the most reasonable and cost effective interconnection of this plant. However, some previously identified projects may now be unnecessary. Several other changes that have occurred since September have been included in the studies, such as Brazos Valley Energy signing an ERCOT ISO public commitment letter and being added to the base case. Also, the Sempra Montgomery and Sempra Cedar Bluff interconnection plans have changed, and additional transmission projects have been approved for construction (see Appendix A).

Load Flow Analysis:

Three study base cases were created to model different market scenarios. In the first case, the additional generation from all eight merchant plants is modeled as delivered to the HLPT control area displacing existing Reliant Energy generation. The second case models the power delivered from the eight merchant plants, 50% to HLPT and 50% to remaining ERCOT control areas. The third case models all output of the eight merchant plants exported to all ERCOT control areas outside of HLPT.

HL&P is considering the placement of a phase-shifting transformer at its Eastside substation to reduce and control the flow on underground cables in the Downtown Houston area. Since the flows on peripheral circuits are significantly affected by whether this transformer is placed in service or not, both situations were considered in this study. For a common comparison, studies were performed with and without the phase shifting transformer for DPEC at 1256 MW and 1050 MW. Appendix B shows the single contingency overloading problems resulting from the interconnection of DPEC in combination with seven other generating plants in the 2001 – 2002 time frame. The projects that were listed in the 'Loop ckt 97 to Calpine Deer Park' cost estimate from the September 28, 2000 report are included in the Appendix B results. Additional projects are shown where lowering the DPEC output from 1256 MW to 1050 MW eliminated the overload. Also, additional projects are shown where connecting the phase-shifting transformer either caused or eliminated an overload.

In the table of results, only the highest loading of the three market scenarios is shown. It is readily apparent from this analysis that the HL&P transmission system has multiple reliability concerns due to the interconnection of all seven plants over a two-year

time period. In fact, there are even more reliability concerns than this analysis shows. HL&P has been studying generating plants on an on-going basis, and some transmission system improvements have already been previously identified. For the purpose of this analysis, HL&P assumed such improvements have already been made. A listing of these previously identified improvements are shown in Appendix A. Some overloaded circuits have been left out of the table of results because they were judged to have been effected by the increase in export more than the addition of DPEC.

Short Circuit Analysis:

Short circuit study indicates that with only 5 units totaling 1050 MW connected to CENTER substation, the substation has a three phase fault duty of 15.5 GVA and a single phase fault duty of 15.0 GVA. As with previous studies, no neighboring substations saw an increase above 95% of its fault duty rating.

Stability Analysis:

Stability studies with new generator data show that the DPEC units will be stable for a three-phase, thirteen cycle fault at CENTER substation with subsequent trippingof either the transmission line from CENTER to Cedar Bayou or the transmission line from CENTER to P.H. Robinson. The critical fault clearing time of thirteen cycles should be adequate for normal clearing or breaker failure cleared by breaker failure protection schemes. No out-of-step conditions were detected in other generating units for this fault duration at CENTER substation. Stability studies were also performed at nearby generating units to determine the impact of DPEC generation on their stability margins. All nearby generating units' stability margins remain unchanged with the addition of the DPEC units.

Results:

The DPEC interconnection cost from the September 28, 2000 study report was estimated at $98 million. As shown in Appendix C, the cost to interconnect 1050 MW of generation at DPEC is estimated at $78 million. The decrease in cost is associated with two major projects that are no longer necessary, upgrading ckt 97 Cedar Bayou – P.H. Robinson and upgrading ckt 74 King – Tomball. Ckt 97 is currently rated for 906 MVA and can be thermally uprated for 1088 MVA continuous operation for a minimal cost of $60,000. With the output of the DPEC plant at 1256 MVA, then the loss of one of the circuits out of CENTER would obviously lead to an overloading situation. However, with the plant at only 1050 MW, then the same loss would only result in a thermally uprated circuit loaded at 94% of its rating. The elimination of the ckt 74 project is due in most part to the change in the interconnection plan of the Sempra Montgomery plant. This elimination took place without DPEC reducing its output to 1050 MW. Two estimates are shown: one without a phase-shifting transformer at Eastside, and one with. These two estimates are very close in estimated cost with the option without the phase-shifting transformer coming in a little bit lower. HL&P will perform additional studies

outside this study to determine if the phase-shifting transformer is the preferable option to the upgrades along the University – Eastside – Polk – Garrott path.

These studies were performed using the 2003 ERCOT base case released in March 2000 and the set of assumptions listed above, the results of these studies indicate transmission reliability concerns and transmission projects that are reasonably anticipated based on the information available at the time the studies are performed. Consequently, transmission projects necessary to fully integrate the plant may vary based upon fundamental changes in anticipated system conditions and more detailed analysis, particularly with regard to changes in expected new generating projects.

In particular, ERCOT recently released a new set of future year cases. These new cases model a market dispatch scenario that is very different from previous cases such as the 2003 ERCOT base case used in this study. Initial study on these new cases are yielding results that may indicate additional transmission system problems than those shown in this study due to these differences in dispatch.

Appendix A

Previously identified projects already modeled in the study cases:

1. Reconductor King – North Belt 345 kV corridor with 3-959 ACSS conductor
2. Reconductor ckt 97 North Belt – T.H. Wharton with 3-959 ACSS conductor
3. Reconductor Cedar Bayou – King 345 kV corridor with 2-1433 ACSS conductor
4. Addition of a 3rd 600 MVA autotransformer at North Belt
5. Build Oasis substation creating P.H. Robinson – Oasis, W.A. Parish – Oasis, and two DOW – Oasis 345 kV circuits
6. Upgrade the underground cable to 600 MVA on ckt 91 Eastside – Polk
7. Reconductor ckt 91 Eastside – University with 2-959 ACSS conductor
8. Reconductor ckt 66 Humble – Treaschwig with 2-959 ACSS conductor
9. Reconductor ckt 66 Humble – Kingwood with 2-959 ACSS conductor
10. Reconductor ckt 66 Atascocita – Kingwood with 2-959 ACSS conductor
11. Reconductor ckt 08 LYCHEM – Lyondell – Explorer – Uvalde – Greens Bayou East
12. Reconductor ckt 09 and 21 Todd – White Oak North with 2-959 ACSS conductor
13. Thermally uprate ckt 53 Alvin Auto – Hastings Switchrack
14. Bundle ckt 12 Bringhurst – Clinton
15. Reconductor ckt 66 Crosby – Atascocita with 2-959 ACSS conductor
16. Reconductor ckt 86 Crosby – Newport with 2-959 ACSS conductor
17. Bundle ckt 86 Newport – King tap
18. Reconductor ckt 66 Treaschwig – Westfield with 2-959 ACSS conductor
19. Reconductor ckt 03 Greens Bayou West – Liberty – White Oak North with 2-959 ACSS conductor
20. Reconductor ckt 06 Garden – Holmes with 2-959 ACSS conductor
21. Thermally uprate ckt 06 Garden – Drouet – Pasadena
22. Upgrade ckt 09 Bellaire – San Felipe to 422 MVA
23. Reconductor ckt 21 T.H. Wharton – CAMRON with 2-959 ACSS conductor
24. Thermally uprate ckt 24 T.H. Wharton – Satsuma tap
25. Reconductor ckt 40 Hyde Park – Dunlavy with 1-1433 ACSS conductor
26. Bundle ckt 33 Harrisburg – Clinton
27. Reconductor ckt 37 Bellaire – Kirby with 2-959 ACSS conductor
28. Reconductor ckt 67 North Belt – Drilco – Inteq – Intercontinental with 2-959 ACSS conductor
29. Reconductor ckt 70 Mag Park – Cougar – University with 2-959 ACSS conductor
30. Reconductor ckt 70 Deepwater – Mag Park with 2-959 ACSS conductor
31. Reconductor ckt 70 Deepwater – LYDELL with 2-959 ACSS conductor
32. Upgrade ckt 70 Greens Bayou West – LYDELL to 422 MVA
33. Reconductor ckt 73 Flewellen – O'Brien with 2-959 ACSS conductor
34. Thermally uprate ckt 83 Cedar Bayou East – Decker
35. Thermally uprate ckt 94 Greens Bayou East – Parkway tap
36. Upgrade ckt 94 Parkway tap – Humble to 422 MVA
37. Thermally uprate ckt 97 P.H. Robinson – Cedar Bayou

Appendix B

Single Contingency Results:

Line segment	CKT	Rating MVA	Merchant 8: DPEC @ 1256 MW	Merchant 8: DPEC @ 1050 MW	Merchant 8: DPEC @ 1256 MW. Phase shifter @ Eastside	Merchant 8: DPEC @ 1050 MW. Phase shifter @ Eastside
Cedar Bayou - CENTER	97	1088	112.3%	93.8%	112.3%	93.8%
CENTER - PHR	97	1088	112.2%	93.8%	112.2%	93.8%
SMTHRS - WAP - Bellaire	98?	906	100.4%	95.3%	101.7%	96.6%
King - North Belt	97	2390	89.0%	87.5%	90.6%	89.0%
North Belt - THW	97	2390	81.4%	78.7%	84.0%	80.8%
King - Kuydal tap	74	1376	97.2%	95.5%	99.3%	96.9%
Kuydal tap - Tomball	74	1376	< 95%	< 95%	96.8%	< 95%
PHR - Oasis	99	906	152.6%	139.0%	155.6%	143.1%
Greens Bayou Auto #2	A2	600	140.9%	139.2%	136.1%	134.3%
Greens Bayou Auto #1	A1	400	175.3%	173.6%	177.3%	175.6%
Cedar Bayou Auto #1	A1	400	113.4%	109.4%	113.1%	109.1%
Cedar Bayou A2	A2	400	109.2%	105.4%	108.9%	105.1%
Cedar Bayou A3	A3	600	101.6%	95.0%	101.4%	< 95%
Bellaire Auto #5	A5	600	98.7%	97.5%	102.6%	101.4%
Eastside - Polk	91	478	120.2%	116.6%	< 95%	< 95%
Eastside - University	91	478	129.9%	126.3%	< 95%	< 95%
Austin - Garrott	90	257	142.9%	140.5%	< 95%	< 95%
Austin - Polk	90	257	151.0%	148.5%	100.8%	99.1%
Mag Park - Cougar - University	70	478	113.3%	113.2%	< 95%	< 95%
Airline - Hardy	21	351	135.7%	132.1%	130.8%	127.0%
Airline - White Oak N	21	304	135.7%	131.7%	130.2%	126.0%
Greens Bayou East - Liberty	21	351	97.0%	96.6%	102.8%	102.2%
Liberty - Northside	21	304	105.5%	105.0%	112.2%	111.5%
Northside - Gable	21	304	98.0%	97.5%	104.7%	104.0%
Gable - Franklin	21	304	109.1%	107.7%	118.7%	116.9%
Franklin - Crockett	21	304	< 95%	< 95%	100.7%	98.8%
Downtown - Crockett	91	304	111.0%	110.4%	110.9%	110.4%
Northside - Crockett	91	304	< 95%	< 95%	103.9%	101.8%
Hardy - Northside	91	304	98.8%	96.6%	111.1%	109.0%
Greens Bayou - Liberty	03	478	113.4%	111.5%	122.4%	120.0%
Liberty - White Oak N	03	478	107.6%	105.8%	116.6%	114.2%
Greens Bayou - Parkway	95	351	120.3%	119.1%	125.1%	123.8%
Parkway - Glenwood	95	304	131.9%	130.5%	137.5%	136.0%
Glenwood - Bertwood	95	304	122.6%	121.2%	128.1%	126.6%
Bertwood - Hardy	95	304	115.0%	113.7%	120.6%	119.1%
Greens Bayou W - Oates	08	351	116.0%	116.1%	97.1%	97.7%
ANBUSH - Oates	08	351	111.3%	111.5%	< 95%	< 95%
ANBUSH - Clinton	08	351	105.2%	105.3%	< 95%	< 95%
Clinton - NINTH	08	304	117.7%	117.9%	95.8%	96.7%
NINTH - Mag Park	08	304	114.3%	114.5%	< 95%	< 95%
Holmes - Plaza	06	304	113.3%	111.8%	121.0%	118.9%
Plaza - Grant	08	304	141.6%	135.5%	163.3%	155.9%
Bellaire - Brays	09	351	105.3%	103.9%	108.3%	106.9%

Greens Bayou East - Witter	21	176	105.2%	102.7%	104.4%	102.0%
PASGEN - College tap	06	422	104.3%	104.0%	105.9%	105.5%
King tap - Lockwood/Scenic tap	86	176	124.1%	122.4%	127.3%	125.5%
Lockwood/Scenic tap - Greens	86	181	98.9%	97.4%	102.0%	100.4%
North Belt - Lauder	95	351	99.0%	98.1%	103.2%	102.3%
North Belt - Hidden	67	362	115.0%	112.8%	116.8%	114.3%
Hidden - Gears	67	362	107.6%	105.4%	109.4%	107.0%
North Belt - Hidden	95	351	115.9%	113.6%	117.7%	115.2%
Hidden - Gears	95	362	103.4%	101.3%	105.3%	102.8%
THW West - Fairbanks	81	308	101.3%	100.9%	101.5%	101.1%
THW East - Bammel	81	436	110.8%	106.6%	108.9%	106.6%
Addicks - Campbell	09	176	105.4%	103.1%	108.2%	105.6%
Todd - Campbell	09	176	119.0%	116.6%	121.8%	119.1%
Todd - Campbell	21	176	121.9%	119.5%	124.6%	122.0%
Westwood - Jeanetta	25	362	95.7%	< 95%	100.3%	98.8%
Baytown - ROHMAS	88	211	104.0%	100.8%	103.3%	100.2%
Fairmont - NASA	06	287	106.0%	103.0%	106.4%	103.6%
Alvin Auto - Friendswood	05	211	114.4%	109.9%	122.4%	117.4%
PHR South - Webster tap	93	422	119.0%	115.6%	120.3%	116.9%
Webster - Webster distrib tap	93	422	112.6%	109.2%	113.8%	110.4%
PHR South - Pilgrim tap	06	351	98.2%	< 95%	104.1%	100.0%
Greens Bayou - Oates	38	88	102.0%	102.0%	103.8%	103.8%
Heights - White Oak	34	88	101.1%	99.9%	101.8%	100.7%
HOC - Garden	19	88	99.8%	97.6%	117.5%	114.7%

Appendix C

Cost Estimate for DPEC Interconnection: No Phase Shifting Transformer at Eastside

Project	Transmission Cost	Substation Cost	Total Cost
Build a double ckt 345 kV line from CENTER to DuPont corner and loop into ckt 97 PHR – Cedar Bayou	$35,000,000		$35,000,000
Thermally uprate ckt 97 Cedar Bayou – PHR to 90C normal rating of 1088 MVA	$60,000		$60,000
Upgrade ckt 99 PHR – Oasis with ACSS conductor	$4,900,000		$4,900,000
Replace 2000 Amp equipment limiting ckt 99 PHR – Oasis with 4000 Amp equipment		$264,000	$264,000
Add a 3rd autotransformer at Greens Bayou in parallel with Auto #2		$6,200,000	$6,200,000
Add a 4th autotransformer at Greens Bayou in parallel with Auto #1		$4,500,000	$4,500,000
Add a 4th autotransformer at Cedar Bayou		$4,400,000	$4,400,000
Replace 2000 Amp equipment limiting ckt 91 Eastside – Polk with 3000 Amp equipment		$605,000	$605,000
Replace 2000 Amp equipment limiting ckt 91 Eastside – University with 3000 Amp equipment		$407,000	$407,000
Upgrade ckt 90 Garrott – Austin – Polk to 478 MVA normal rating	$7,600,000		$7,600,000
Replace 2000 Amp equipment limiting ckt 70 Mag Park – Cougar – University with 3000 Amp equipment		$715,000	$715,000
Move Cougar connection from ckt 70 to ckt 91 PHR – University	$100,000		$100,000
Thermally uprate ckt 08 Greens Bayou West – Oates	$150,000		$150,000
Thermally uprate ckt 08 ANBUSH – Oates	$50,000		$50,000
Thermally uprate ckt 08 ANBUSH – Clinton	$100,000		$100,000
Thermally uprate ckt 08 Clinton – NINTH	$50,000		$50,000
Thermally uprate ckt 08 NINTH – Mag Park	$50,000		$50,000
Upgrade ckt 21 Airline – White Oak North with ACSS conductor	$485,000		$485,000
Upgrade ckt 21 Airline – Hardy with ACSS conductor	$375,000		$375,000
Thermally uprate ckt 95 Greens Bayou East – Parkway	$30,000		$30,000
Upgrade ckt 95 Parkway – Glenwood to 422 MVA	$670,000		$670,000
Upgrade ckt 95 Glenwood – Bertwood with ACSS conductor	$1,200,000		$1,200,000
Upgrade ckt 95 Bertwood – Hardy with ACSS conductor	$1,350,000		$1,350,000
Replace 2000 Amp equipment limiting ckt 03 Greens Bayou West – Liberty with 3000 Amp equipment		$44,000	$44,000

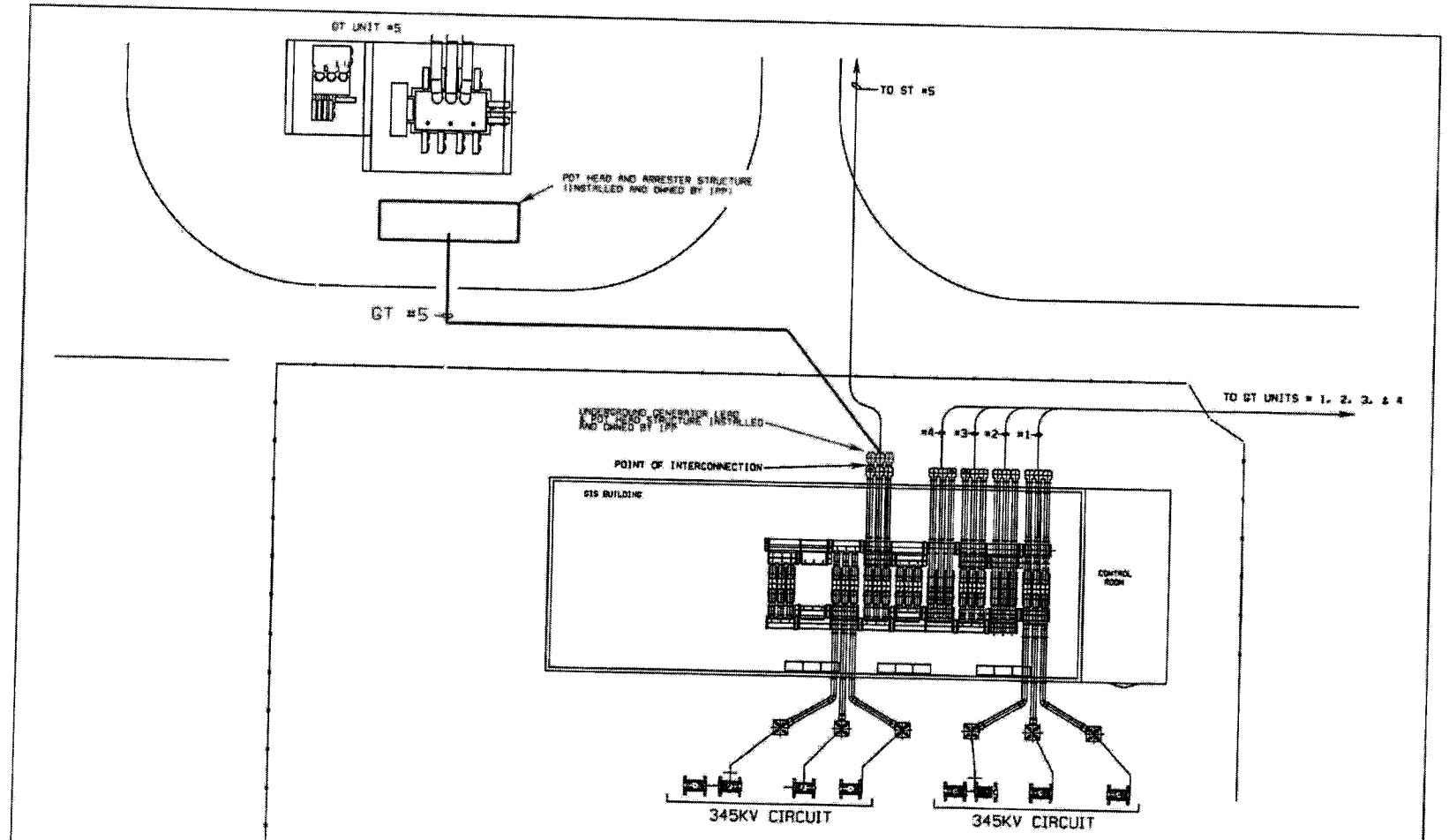
Replace 2000 Amp equipment limiting ckt 03 Liberty – White Oak North with 3000 Amp equipmnet		$220,000	$220,000
Thermally uprate ckt 21 Liberty – Northside	$500,000		$500,000
Thermally uprate ckt 21 Gable - Franklin	$420,000		$420,000
Thermally uprate ckt 67 North Belt – Hidden Valley tap	$100,000		$100,000
Thermally uprate ckt 95 North Belt – Hidden Valley tap	$100,000		$100,000
Thermally uprate ckts 67 and 95 Hidden Valley tap – Gears tap	$50,000		$50,000
Thermally uprate ckt 91 Downtown – Crockett	$100,000		$100,000
Upgrade ckt 06 PASGEN – College tap with ACSS conductor	$685,000		$685,000
Thermally uprate ckt 06 Holmes – Plaza	$925,000		$925,000
Upgrade ckt 08 Plaza – Grant with ACSS conductor	$725,000		$725,000
Thermally uprate ckt 09 Todd – Campbell	$50,000		$50,000
Thermally uprate ckt 09 Addicks – Campbell	$100,000		$100,000
Thermally uprate ckt 21 Todd – Campbell	$50,000		$50,000
Bundle ckt 86 King tap – Lockwood tap	$400,000		$400,000
Replace 1200 Amp equipment limiting ckt 06 Fairmont – NASA		$33,000	$33,000
Bundle ckt 05 Alvin Auto – Friendswood	$1,800,000		$1,800,000
Upgrade ckt 93 PHR South – Webster with ACSS conductor	$2,000,000		$2,000,000
Upgrade ckt 88 Baytown – ROHMAS to at least 230 MVA	$120,000		$120,000
Thermally uprate ckt 09 Bellaire – Brays	$100,000		$100,000
Thermally uprate ckt 21 Greens Bayou East – Witter tap	$175,000		$175,000
Upgrade ckt 81 THW – Bammel tap with ACSS conductor	$100,000		$100,000
Thermally uprate ckt 38 Greens Bayou – Oates tap	$100,000		$100,000
Total	**$60,770,000**	**$17,388,000**	**$78,158,000**

Cost Estimate for DPEC Interconnection: Phase Shifting Transformer at Eastside

Project	Transmission Cost	Substation Cost	Total Cost
Build a double ckt 345 kV line from CENTER to DuPont corner and loop into ckt 97 PHR – Cedar Bayou	$35,000,000		$35,000,000
Thermally uprate ckt 97 Cedar Bayou – PHR to 90C normal rating of 1088 MVA	$60,000		$60,000
Upgrade ckt 99 PHR – Oasis with ACSS conductor	$4,900,000		$4,900,000
Replace 2000 Amp equipment limiting ckt 99 PHR – Oasis with 4000 Amp equipment		$264,000	$264,000
Add a 3rd autotransformer at Greens Bayou in parallel with Auto #2		$6,200,000	$6,200,000
Add a 4th autotransformer at Greens Bayou in parallel with Auto #1		$4,500,000	$4,500,000
Add a 4th autotransformer at Cedar Bayou		$4,400,000	$4,400,000
Add an autotransformer parallel with Bellaire auto #5		$4,600,000	$4,600,000
Add a phase shifting transformer at Eastside, including a spare transformer		$4,000,000	$4,000,000
Upgrade ckt 21 Airline – White Oak North with ACSS conductor	$485,000		$485,000
Upgrade ckt 21 Airline – Hardy with ACSS conductor	$375,000		$375,000
Upgrade ckt 95 Greens Bayou East – Parkway with ACSS conductor	$160,000		$160,000
Upgrade ckt 95 Parkway – Glenwood to 422 MVA	$670,000		$670,000
Upgrade ckt 95 Glenwood – Bertwood with ACSS conductor	$1,200,000		$1,200,000
Upgrade ckt 95 Bertwood – Hardy with ACSS conductor	$1,350,000		$1,350,000
Replace 2000 Amp equipment limiting ckt 03 Greens Bayou West – Liberty with 3000 Amp equipment		$44,000	$44,000
Replace 2000 Amp equipment limiting ckt 03 Liberty – White Oak North with 3000 Amp equipmnet		$220,000	$220,000
Thermally uprate ckt 21 Greens Bayou – Liberty tap	$150,000		$150,000
Thermally uprate ckt 21 Liberty – Northside	$500,000		$500,000
Thermally uprate ckt 21 Northside – Gable	$50,000		$50,000
Thermally uprate ckt 21 Gable - Franklin	$420,000		$420,000
Thermally uprate ckt 67 North Belt – Hidden Valley tap	$100,000		$100,000
Thermally uprate ckt 95 North Belt – Hidden Valley tap	$100,000		$100,000
Thermally uprate ckts 67 and 95 Hidden Valley tap – Gears tap	$50,000		$50,000
Thermally uprate ckt 91 Downtown – Crockett	$100,000		$100,000
Thermally uprate ckt 91 Crockett – Hardy	$200,000		$200,000

Upgrade ckt 06 PASGEN – College tap with ACSS conductor	$685,000		$685,000
Thermally uprate ckt 06 Holmes – Plaza	$925,000		$925,000
Upgrade ckt 08 Plaza – Grant with ACSS conductor	$725,000		$725,000
Thermally uprate ckt 09 Todd – Campbell	$50,000		$50,000
Thermally uprate ckt 09 Addicks – Campbell	$100,000		$100,000
Bundle ckt 21 Todd – Campbell	$200,000		$200,000
Bundle ckt 86 King tap – Lockwood tap	$400,000		$400,000
Thermally uprate ckt 86 Lockwood/Scenic tap – Greens tap	$50,000		$50,000
Replace 1200 Amp equipment limiting ckt 06 Fairmont – NASA		$33,000	$33,000
Bundle ckt 05 Alvin Auto – Friendswood	$1,800,000		$1,800,000
Upgrade ckt 93 PHR South – Webster with ACSS conductor	$2,000,000		$2,000,000
Thermally uprate ckt 06 PHR – Pilgrim tap	$510,000		$510,000
Upgrade ckt 88 Baytown – ROHMAS to at least 230 MVA	$120,000		$120,000
Thermally uprate ckt 09 Bellaire – Brays	$100,000		$100,000
Thermally uprate ckt 21 Greens Bayou East – Witter tap	$175,000		$175,000
Upgrade ckt 81 THW – Bammel tap with ACSS conductor	$100,000		$100,000
Thermally uprate ckt 95 North Belt – Lauder tap	$50,000		$50,000
Thermally uprate ckt 38 Greens Bayou – Oates tap	$100,000		$100,000
Thermally uprate ckt 34 Heights – White Oak	$300,000		$300,000
Thermally uprate ckt 19 HOC - Garden	$200,000		$200,000
Total	**$54,460,000**	**$24,261,000**	**$78,721,000**

Exhibit J
Attached Drawings


GT UNIT #5
TO ST #5
POT HEAD AND ARRESTER STRUCTURE (INSTALLED AND OWNED BY IPP)
GT #5
TO GT UNITS # 1, 2, 3, & 4
UNDERGROUND GENERATOR LEADS AND POT HEAD STRUCTURE INSTALLED AND OWNED BY IPP
POINT OF INTERCONNECTION
#4
#3
#2
#1
GIS BUILDING
CONTROL ROOM
345KV CIRCUIT
345KV CIRCUIT
BASIC OFFER
CENTERPOINT ENERGY
DEVELOPMENT PLAN FOR
CALPINE DEERPARK/CENTER GT #5 PROJECT
STANDARD GENERATOR INTERCONNECTION AGREEMENT
LEGEND
CNP (TSP) INSTALLATION
EXISTING FACILITIES
GENERATION ENTITY (IPP) INSTALLATION
DEVELOPMENT
DEVELOPMENT
DATE: 2-13-13
Generation interconnections are considered market sensitive information. To preserve the integrity of the marketplace, it is essential that this information not be made public or disclosed to other market participants. This information should not be made public until transmission providers' reviews are completed and the generating customer has agreed to make this information public.
PRELIMINARY
NOT FOR
ENGINEERING PURPOSES
CONFIDENTIAL AND PROPRIETARY INFORMATION-
CRITICAL ENERGY INFRASTRUCTURE INFORMATION