Protection of equipment for water level 16' above grade and higher:
After 12' elevation, the cost of the station rises by $2 million for every 4' rise in water elevation.

Damage Estimate – 4' above grade:

Based upon a review of the damages associated Hurricanes Katrina and Rita, the following damages would occur at a "typical substation" with 4 feet of flooding/storm surge:

Relay		
Equipment/Design	-	$660,000
Electrical		
Transformer Panels	-	$40,000
HV Breaker Damage	-	$40,000
LV Breakers	-	$275,000
Circuit Switchers	-	$12,000
Motor Mech	-	$9,000
Lights	-	$5,000
Miscellaneous	-	$25,000
Control House	-	$72,000
Design	-	$45,000
Cleanup	-	$10,000
Sub-TOTAL	-	$533,000
Foundation / Site		
Cleanup	-	$7,000
Total Damage Cost Estimate w/ 4'of Water/Storm Surge		**$1,200,000**

Damage % Based Upon Typical Substation Cost

($1,200,000 / $5,500,000) x 100	**22 %**

Damage Estimate – 8' above grade:

Based upon a review of the Damages associated Hurricanes Katrina and Rita, the following Damages would occur at a "typical substation" with 8 feet of flooding/storm surge:

Relay		
Equipment/Design	-	$660,000
Electrical		
Transformer Panels	-	$40,000
HV Breaker Damage	-	$225,000
LV Breakers	-	$275,000
Circuit Switchers	-	$12,000
Motor Mech	-	$9,000
Lights	-	$5,000
Miscellaneous	-	$25,000
Control House	-	$72,000
Design	-	$45,000
Cleanup	-	$12,000
Sub-TOTAL	-	$720,000
Foundation / Site		
Cleanup	-	$20,000
Total Damage Cost Estimate w/ 8'of Water/Storm Surge		**$1,400,000**

DAMAGE % Based Upon Typical Substation Cost

($1,400,000 / $5,500,000) x 100	**25 %**

Damage Estimate – 12' above grade:

Based upon a review of the Damages associated Hurricanes Katrina and Rita, the following Damages would occur at a "typical substation" with 12 feet of flooding/storm surge:

Relay		
Equipment/Design	-	$660,000

Electrical		
Transformers	-	$1,800,000
HV Breaker Damage	-	$225,000
LV Breakers	-	$275,000
Circuit Switchers	-	$12,000
Motor Mech	-	$9,000
Lights	-	$5,000
Miscellaneous	-	$25,000
Control House	-	$72,000
Design	-	$45,000
Cleanup	-	$12,000
Sub-TOTAL	-	$2,480,000
Foundation / Site		
Cleanup	-	$60,000
Total Damage Cost Estimate w/ 12'of Water/Storm Surge		**$3,200,000**

DAMAGE % Based Upon Typical Substation Cost

($3,200,000 / $5,500,000) x 100	**58 %**

DAMAGE ESTIMATE – 16' ABOVE GRADE:

Based upon a review of the Damages associated Hurricanes Katrina and Rita, the following Damages would occur at a "typical substation" with 16 feet of flooding/storm surge:

Relay		
Equipment / Design	-	$660,000
Electrical		
Equipment / Structures	-	$3,670,000
Foundation/Site		
Foundation / Site Work	-	$1,090,000
SUBTOTAL	-	$5,500,000

CLEANUP / REMOVAL / ENVIRONMENT (10% of Total Cost)	$ 600,000
Total Damage Cost Estimate w/ 16'of Water/Storm Surge	**$6,100,000**

Damage % Based Upon Typical Substation Cost

($6,100,000 / $5,500,000) x 100	**110 %**

NOTE: All surge levels above 16 feet will result in the same Damage and repair cost values and percentages.

Appendix E

Transmission Line Hardening Base Estimates
Supporting Documentation

These costs do not include ROW acquisition, initial clearing, vegetation O&M, engineering, surveying, soil boring, routing consultations fees, corrosion mitigation, construction access roads, construction damages or permitting. These costs should be similar for all lines.

Cost to build new wood pole line	$/mile	$174,166
Wood pole annual O&M	$/mile	$254
Cost to build new concrete line	$/mile	$197,860
Concrete Pole O&M	$/mile	$129
Cost to build new steel line	$/mile	$213,547
Steel Pole O&M	$/mile	$169
Removal cost	$/mile	$15,000
Average cost of repaired or replaced pole from Rita and Katrina	$/pole	$146,061
Average cost of line to current wind speed	$/mile	$188,751
Average cost of line to build to +10 mph	$/mile	$195,191
Average cost of line to build to +20 mph	$/mile	$201,631
Average cost of line to build to +30 mph	$/mile	$212,681
Cost to build Underground Line	$/mile	$4,500,000

Appendix F

SLOSH Model Maximum of Maximum (MOM) Report for Entergy Substations

Storm Category				Tropical Storm	Category 1	Category 2	Category 3	Category 4	Category 5
Annual probability of this category storm hitting Entergy territory:				54.8%	20.5%	12.3%	6.2%	2.7%	0.7%
Probability that the storm track is within 5 miles of substation (10 mile-wide window) to get M.O.M. inundation:				2.1739%	2.1739%	2.1739%	2.1739%	2.1739%	2.1739%
Annual probability of this level of inundation:				0.0119%	0.0045%	0.0027%	0.0013%	0.0006%	0.0002%
	LOCATION		Elev.	Inund. AGL	Inund. AGL	Inund. AGL	Inund. AGL	Inund. AGL	Inund. AGL
S6022906	DOW BRINE 34.5 KV	LA	-8			5.4	22.3	26.8	30.3
S1000348	AVENUE C	LA	-7			5.1	21.6	26.2	29.7
S1001240	UNIVERSITY CITY	LA	-4	3.5	9.2	14.9	19	24.7	29
S2002685	PARIS TAP	LA	-6			4.4	20.9	25.5	29
S1001239	SHERWOOD FOREST	LA	-7				21.4	25.5	28.3
S1001379	PONTCHARTRAIN PAR	LA	-6				20.8	25.1	28.3
S1000184	CLEARY	LA	-4			2.8	19.1	24.3	28.2
S1000937	PETERS ROAD	LA	-6	6.9	11.4	15.9	22.9	25.4	27.9
S1000675	LAKESHORE	LA	-4			3	18.7	23.8	27.5
S1000524	ALMONASTER	LA	-5				19.5	23.8	27.5
S1000522	PATERSON	LA	-5	7.3	12	16.7	20	23.7	27
S1001116	PONTCHARTRAIN	LA	-2			1.2	16.9	22.2	26.3
S1000680	SNAKEFARM	LA	-1				16.4	21.9	25.8
S1000362	PARADIS	LA	-1		3.1	9	14.6	20.2	25.5
S1001180	TEXACO PARADIS	LA	-1		3.5	8.9	14.9	20.4	25.5
S1000382	DUBOIN	LA	4		5.1	11.8	17.1	21.8	25.4
S1000217	TRICOU	LA	-3			3.7	17.7	21.8	25.3
S1000516	METAIRIE	LA	-2			0.4	17	21.7	25.2
S2002703	KENNER TAP 53007	LA	3		2.5	6.2	13.2	17	24.7
S1000205	JOLIET	LA	-2				17.2	21.8	24.6
S1000360	MIDTOWN	LA	-2				17.4	21.8	24.6
S1111120	LEBLANC 2 CO	LA	5		2.8	10.7	15.9	19.8	24.4
S6020026	SC METAIRIE - ELI	LA	-1				16.6	21.1	24.4
S6133484	SC METAIRIE - ENO	LA	-1				16.6	21.1	24.4
S1000203	HARVEY	LA	-2			11.7	18.9	21.8	24
S1000080	PARIS	LA	-1				15.8	20.5	24
S2002161	SC MAGNOLIA	LA	0				16.3	20.7	23.9
S1000207	KENNER	LA	4		1.5	5.2	12.2	16	23.7
S1000353	HOLIDAY [LPL]	LA	-2			11.7	19.3	21.7	23.7
S1000195	CURRAN	LA	-2				16.5	20.6	23.5
S1000505	DERBIGNY	LA	0				15.7	20.1	23.3
S1000961	MID COUNTY	TX	2				8.2	18.4	23.1
S1114263	LA CEMENT CO	LA	0	3.9	8.6	13.3	17.3	19.9	22.9
S1000235	ERATH	LA	6		2.1	9.5	14.6	18.3	22.9
S1000528	WAGGAMAN	LA	3			8.4	13.6	18.6	22.6
S1000359	MICHOUD SWITCHYAR	LA	0	3.5	8.8	14.1	17.5	19.4	22.5
S2001286	HOLLY (J.D.E.C)	LA	0		2.4	9.7	15.2	18.7	22.4
S1000673	DESTREHAN	LA	4			7.5	11.9	18.1	22.4
S1001283	DELCAMBRE RURAL	LA	7		1.5	8.4	13.6	17.7	22.4
S1000354	LABARRE (LPL)	LA	1				14.1	18.8	22.4
S1000034	BURAS	LA	-3	5.7	10.4	15.1	19.2	20.4	22.3
S1000529	WESTWEGO	LA	1			9.5	15.7	19.5	22.3
S1000355	LAPLACE	LA	5		0.9	6.9	11.6	17.5	22.2
S2000757	TEXAS ERATH (L-28	LA	5			9.5	14.4	18.2	22.2
S1000933	GULF OUTLET	LA	0				15.3	19.6	22.2
S1000210	LULING	LA	2			7.2	12.4	17.9	22.1
S1000508	GOODHOPE	LA	5			6.7	11.2	17.6	22
S1000370	AVERICO	LA	8					17.9	22
S1001054	TEXAS ERATH	LA	5		4	9.2	14.1	17.9	21.9
S1000199	DUBLIN	LA	3		2	5.7	13.2	17.5	21.7
S1059286	TEXACO HILLEBRAND	TX	5			6.3	11.7	16.4	21.6
S6018819	MOBIL BUILDING	LA	2				14	18.4	21.6
S6018820	ENTERGY BUILDING	LA	2				13.7	18.1	21.3
S1000521	OAKVILLE	LA	0			8.8	16.1	19.2	21.1
S1112987	KLONDIKE CO	LA	5			4.3	11.2	16.3	21.1
S1000215	PAUGER	LA	1				13.7	18	21.1
S1000935	NORCO NORTH 115KV	LA	6			5.7	10.2	16.6	21
S1000676	NASA	LA	2				13.4	18.2	21
S1000349	AVONDALE	LA	5		0.4	4.1	11.6	15.5	20.9
S6117510	ALLIGATOR BAYOU	TX	4				6.5	16.5	20.9
S1000396	LAWSON	TX	2			5.8	13.8	16.7	20.7
S1000265	ARCHIE	TX	2			5.8	13.8	16.7	20.7
S1115773	BAYOU FARM CO	TX	5			6.9	12.3	15.8	20.7
S1000655	CHALMETTE	LA	1				13.4	17.7	20.7
S1000507	GENTILLY	LA	2				13	17.8	20.6

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Appendix G

Adapting EVAL to this Study

EVAL is Entergy's standard valuation model used to evaluate regulated capital investment projects. EVAL considers capital structure of the operating company, state and federal tax effects, depreciation, incremental capital and O&M expenses, incremental revenue streams, and state regulated rates of return. The EVAL model calculates Net Present Value of Revenue Requirement (NPV-RR) and other key financial metrics. NPV-RR is a summary of the burden on rate payers for prudent utility investments. The lower the NPV-RR, the lower the burden will be on rate payers.

According to the Capital Funding Project Approval Policy Section 6.2.1, "...EVAL must be used to complete the analysis for investments in the domestic utility business above $500,000." If a business unit wants to use an alternative model, the project team must submit a business case to and receive approval from the CFO-Utility Operations. Entergy used EVAL to estimate the NPV of the proposed transmission hardening strategy.

EVAL was designed to calculate the NPV-RR for projects with up to 10 years of capital investments, coupled with 65 years of incremental revenue and O&M costs / savings. This hardening study compared projects with

1) initial capital hardening investments with one set of damage probabilities and capital repair costs, against
2) other alternatives with a different set of capital repair costs.

The stream of capital repair costs could extend for the life of the alternative (much longer than 10 years). Therefore, EVAL was not initially designed for this type of project comparison.

Instead of re-writing the EVAL financial model (which is quite complex in its present form and invited error) a shortcut was devised. Capital investments were modeled in EVAL each year for 10 years and the NPV-RR results were plotted against the inputs. O&M expenses were also modeled in EVAL for 10 years and the NPV-RR results were plotted against the inputs. The net result of the entire EVAL model for capital and O&M can be simulated with a pair of exponential equations for each legal entity. The results were tested and found to be scalable.

This allows capital repair costs to be modeled for years 10-45 without modifying (and potentially corrupting) the EVAL spreadsheet. The derivation of the equations also facilitated the financial analysis by reducing the time needed for entering cost inputs for hardening scenarios.