1	Q.	Upgrade Unit 1 Stack Breeching
2		In evaluating Alternative 3 the annual O&M cost was estimated to be \$49,391, using
3		the average of the 11-year maintenance history of the Unit 1 stack breeching as
4		shown in Table 1, page 9 of the report: "Upgrade Unit 1 Stack Breeching, Holyrood
5		Thermal Generating Station, July 2011".
6		Please provide a breakdown of the costs included in each of the alternatives
7		included in Table 2, page 21, of the report, including Alternatives 1, 3 and 7 from
8		the original table and also including the re-calculated Alternatives 1, 3 and 7 found
9		in the revised table filed in response to Request for Information PUB NLH 5.
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11		
12	A.	Table 1 below provides a breakdown of the cost included in each of the alternatives
13		included in Table 2, page 21, of the report, including Alternatives 1, 3, and 7 from
14		the original table. Re-calculated Alternatives 1, 3, and 7, based upon the
15		information filed in response to PUB-NLH-5 are also included in Table 1 below.
16		Attachments 1 and 2 provide details of the annual costs over the 11-year study
17		period for each alternative considered in the Cost Benefit Analysis. Attachment 1
18		provides details for the alternatives considered in Table 2, page 21, of the July 2011
19		report. Attachment 2 provides details for Alternatives 1, 3 and 7 that were
20		recalculated as requested under PUB-NLH-5.

Page 2 of 5

Table 1 – CPW Alternatives Cost Breakdown

Alternative	Cost Description	Cost
1	Capital:	0
	Operating & Maintenance (escalated @ 2.2% annually):	
	Year 2012	49,391
	Years 2013 to 2020 (annually)	25,695
	Forced Outage:	
	Incremental Cost Of Running Gas Turbines During Forced Outage	2,736,739
	Repair Cost (50% Replacement)	2,000,000
2	Capital:	
	Labour (Internal Hydro engineering, operations, and project management labour)	114,400
	Contract (labour & materials):	
	Remove internal insulating blocks and supply/install six inches of external insulation	461,328
	Install an ice protection shield	112,428
	Replacement of expansion joints and casing repairs	774,144
	Supply and install new East and West support structures. Includes additional cost to replace the breeching support structures with the existing breeching left in place. A temporary support structure will be required.	133,700
	Travel	2,000
	Other (Overheads, , AFUDC, Escalation, Contingency)	255,900
	Total Capital:	1,853,900
	Operating & Maintenance (escalated @ 2.2% annually):	4,000
3	Capital:	
	Labour (Internal Hydro engineering, operations, and project management labour)	114,400
	Contract (labour & materials):	
	Restore breeching casing with patch plates, restore the internal insulating liner, replace the expansion joints near the stack, replace the support structures, and coat the breeching exterior as required.	1,379,200
	Travel	2,000
	Other (Overheads, , AFUDC, Escalation, Contingency)	273,300

	Total Cavital	Page 3 of
	Total Capital:	1,768,900
	Operating & Maintenance (escalated @ 2.2% annually):	49,391
4	Capital:	
	Labour (Internal Hydro engineering, operations, and project management labour)	114,400
	Contract (labour & materials):	
	Completely remove internal insulating blocks and supply/install six inches of external insulation	534,728
	Install an ice protection shield	112,428
	Replacement of expansion joints and casing repairs	774,144
	Supply and install new East and West support structures. Includes additional cost to replace the breeching support structures with the existing breeching left in place. A temporary support structure will be required.	133,700
	Travel	2000
	Other (Overheads, , AFUDC, Escalation, Contingency)	263,600
	Total Capital:	1,935,000
	Operating & Maintenance (escalated @ 2.2% annually):	2,000
5	Capital:	
	Labour (Internal Hydro engineering, operations, and project management labour)	114,400
	Contract (labour & materials):	
	Install new ¼ inch thick Corten breeching complete with six inches of external insulation	2,687,461
	Install an ice protection shield	112,428
	Replace breeching support structures	80,671
	Travel	2,000
	Other (Overheads, , AFUDC, Escalation, Contingency)	518,640
	Total Capital:	3,515,600
	Operating & Maintenance (escalated @ 2.2% annually):	2,000
6	Capital:	
	Labour (Internal Hydro engineering, operations, and project management labour)	114,400
	Contract (labour & materials):	
	Remove internal insulating blocks and supply/install six inches of external insulation	461,300
	Install an ice protection shield	112,428

		Page 4 of
	Replacement of expansion joints and casing repairs	774,144
	Refurbish the East support structure and replace the West support structure. Includes additional cost to replace/refurbish the breeching support structures with the existing breeching left in place. A temporary support structure will be required.	154,128
	Travel	2,000
	Other (Overheads, , AFUDC, Escalation, Contingency)	258,100
	Total Capital:	1,876,500
	Operating & Maintenance (escalated @ 2.2% annually):	4,000
7	Capital:	
	Labour (Internal Hydro engineering, operations, and project management labour)	114,400
	Contract (labour & materials):	
	Restore breeching casing with patch plates, restore the internal insulating liner, replace the expansion joints near the stack, replace the support structures, and coat the breeching exterior as required.	1,399,628
	Travel	2,000
	Other (Overheads, , AFUDC, Escalation, Contingency)	276,172
	Total Capital:	1,792,200
	Operating & Maintenance (escalated @ 2.2% annually):	49,391
1 (Re-calculated)	Capital	0
	Operating & Maintenance (escalated @ 2.2% annually):	
	Year 2012	46,663
	Years 2013 to 2020	24,331
	Forced Outage:	
	Incremental Cost Of Running Gas Turbines During Forced Outage	2,736,739
	Repair Cost (50% Replacement)	2,000,000
3 (Re-calculated)	Capital:	
	Labour (Internal Hydro engineering, operations, and project management labour)	114,400

PUB-NLH-6
Holyrood (HTGS) Stack Breeching and Fuel Tank Refurbishment
Page 5 of 5

_		Page 5 of 5
	Restore breeching casing with patch plates, restore the internal insulating liner, replace the expansion joints near the stack, replace the support structures, and coat the breeching exterior as required.	1,379,200
	Travel	2,000
	Other (Overheads, , AFUDC, Escalation, Contingency)	273,300
	Total Capital:	1,768,900
	Operating & Maintenance (escalated @ 2.2% annually):	46,663
7 (Re-calculated)	Capital:	
	Labour (Internal Hydro engineering, operations, and project management labour)	114,400
	Contract (labour & materials):	
	Restore breeching casing with patch plates, restore the internal insulating liner, replace the expansion joints near the stack, replace the support structures, and coat the breeching exterior as required.	1,399,628
	Travel	2,000
	Other (Overheads, , AFUDC, Escalation, Contingency)	276,172
	Total Capital:	1,792,200
	Operating & Maintenance (escalated @ 2.2% annually)	46,663

PUB 6 - Attachment 1

Holyrood - Upgra	ade Stack Breeching										
	Alternative Comparison Cumulative Net Present Value										
То 1	The Year										
	2020	<u></u>									
Alternatives	Cumulative Net Present Value (CPW)	CPW Difference between Alternative and the Least Cost Alternative									
1. Status Quo	4,070,371	2,190,241									
2. Refurbish - Option 1	1,880,130	0									
3. Refurbish - Option 2	2,092,783	212,653									
4. Refurbish - Option 3	1,948,115	67,985									
5. Replace - Option 4	3,528,715	1,648,585									
6. Refurbish - Option 5	1,902,730	22,600									
7. Refurbish - Option 6	2,116,083	235,953									

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5	1. Status Q	uo	•	Note: Costs	ara chawa	ac nacitiva v	aluaci Panati	ts as negative	ualuac							
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8			Current Year 2011													
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15								Year (if applicable)]						
16 17								Cost (if applicable)	\$ -	1						
18		Replacement Year (if applicable) Project cost in Ending (E) or Beginning (B) Year \$\$ More Material O&M costs - Escalation based on mixture of Materials & Labour Less Labour														
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22			Annual O&M	Annual Fuel	Annual Fuel	Other	Total	Benefit 1	Benefit 2		P.W.	Cumulative				
24		Year	Cost	Price	Cost	Cost	Costs	(specify)	(specify)	NET	January	Present				
25 20		,	\$	(if applicable)	\$	\$	\$	\$	5	\$	2011	Worth				
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28	1	2012	50,478		-	4.002.55	50,478	-	-	50,478	43,680	43,680				
29 30	3	2013 2014	26,839			4,821,250	4,848,089	-	-	4,848,089	3,902,520	3,946,200				
31	4	2014	27,429 28,032		-	-	27,429 28,032	-		27,429 28,032	20,539 19,526	3,966,739 3,986,265				
32	5	2015	28,649		ļ -		28,649	-		28,032	19,526	4,004,829				
33	6	2017	29,279		-	-	29,279	-	- 1	29,279	17,648	4,004,829				
34	7	2018	29,924		-	-	29,924	-	-	29,924	16,778	4,039,255				
35	8	2019	30,582		-	-	30,582	-	-	30,582	15,951	4,055,206				
36	9	2020	31,255			-	31,255	-	-	31,255	15,165	4,070,371				
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27	0	2011			-	l .	1,853,900	-1	-	1,853,900	1,853,900	1,853,900
28	1	2012	4,088		-		4,088	-	- 1	4,088	3,537	1,857,437
29	2	2013	4,178			-	4,178		-	4,178	3,363	1,860,801
30	3	2014	4,270		-	-	4,270			4,270	3,197	1,863,998
31	4	2015	4,364				4,364		-	4,364	3,040	1,867,037
32	5	2016	4,460				4,460	-		4,460	2,890	1,869,927
33 34	6 7	2017 2018	4,558 4,658		-		4,558 4,658		-	4,558 4,658	2,747 2,612	1,872,675 1,875,286
35	8	2019	4,761			<u> </u>	4,761		-	4,761	2,483	1,875,286
36	9	2020	4,865			-	4,865	-		4,865	2,361	1,880,130
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27	0	2011				-	1,768,900	-		1,768,900	1,768,900	1,768,900
28	1	2012	50,478		-		50,478	-	<u> </u>	50,478	43,680	1,812,580
29	2	2013	51,588			-	51,588		-	51,588	41,526	1,854,106
30 31	3 4	2014	52,723		-		52,723		-	52,723	39,479	1,893,585
32	5	2015 2016	53,883 55,068				53,883			53,883	37,533	1,931,118
33	6	2016	56,280		-		55,068 56,280		-	55,068	35,682	1,966,800
34	7	2017	57,518		-		56,280		· · · · · · · · · · · · · · · · · · ·	56,280 57,518	33,923 32,250	2,000,723
35	8	2019	58,783				58,783			58,783	30,660	2,032,974
36	9	2020	60,077				60,077			60,077	29,149	2,063,634 2,092,783
37			33,577							30,077	23,143	2,032,783
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10						Project cost in	Enging (E) or Be	ginning (B) Year \$\$	More Materia	al						
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24		Year	Cost	Price	Cost	Cost	Costs	(specify)	(specify)	NET	January	Present				
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27	0	2011			-	*	1,935,000	-	-	2,000,000	1,935,000	1,935,000				
28	1	2012	2,044		-		2,044	-	-	2,044	1,769	1,936,769				
29 30	2 3	2013 2014	2,089 2,135			-	2,089		-	2,089	1,682	1,938,450				
31	4	2014	2,133		-	-	2,135	-		2,135	1,599 1,520	1,940,049 1,941,569				
32	5	2016	2,230		-	-	2,182	-	-	2,182	1,520	1,941,569				
33	6	2017	2,279			-	2,279	-	-	2,279	1,374	1,944,387				
34	7	2018	2,329		-	-	2,329	-			1,306	1,945,693				
35	8	2019	2,380				2,380	-	-	2,380	1,242	1,946,935				
36 37	9	2020	2,433		-	-	2,433	-		2,433	1,180	1,948,115				
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5	5. Replace			-								
6			_	Note: Costs	are shown i	as positive v	alues; Benefi	ts as negative	<u>values</u>			
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8 9				***************************************				Current Year resent Worth Year	2011 2011			
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11								Discount Rate	7.5%			
12							Total In-s	ervice Project Cost				
13								In-service Year	2011			
14 15						Other Project		rvice (if applicable)				
16								Year (if applicable) Cost (if applicable)	\$ -			
17								Year (if applicable)				
18						Project cost in		ginning (B) Year \$\$				
									More Material			
19			L		O&M costs -	Escalation base	d on mixture of t	Materials & Labour	Less Labour			
20 21												
22	А	В	c	D	E	F	G	н		J		ı.
23			Annual O&M	Annual Fuel	Annual Fuel	Other	Total	Benefit 1	Benefit 2		P.W.	Cumulative
24		Year	Cost	Price	Cost	Cost	Costs	(specify)	(specify)	NET	January	Present
25 20		r	\$	(if applicable)	\$	\$	\$	\$	\$	\$	2011	Worth
27	0	2011			-		3,515,600	-	-	3,515,600	3,515,600	3,515,600
28	1	2012	2,044			-	2,044		-	2,044	1,769	3,517,369
29	2	2013	2,089		-	-	2,089	·		2,089	1,682	3,519,050
30	3	2014	2,135		-	-	2,135	-		2,135	1,599	3,520,649
31 32	4 5	2015 2016	2,182		-	-	2,182		-	2,182	1,520	3,522,169
33	6	2016	2,230 2,279		-	ļ	2,230 2,279	-		2,230	1,445	3,523,614
34	7	2018	2,329				2,279	-		2,279 2,329	1,374 1,306	3,524,987
35	8	2019	2,380				2,323			2,329	1,306	3,526,293 3,527,535
36	9	2020	2,433		-		2,433	-		2,433	1,180	3,528,715
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2	PROJECT	COST / BENEF	IT ANALYSIS T	EMPLATE													
3		Upgrade Stack Br	eeching	-													
5	6. Refurbish 6. Refurbish			-													
6	b. Returbisi	1 - Option 5		Note: Costs	are shown a	is positive v	ialues: Benefi	ts as neaative	values								
7	Note: Costs are shown as positive values; Benefits as negative values																
8		[Current Year	2011	7							
9							ρ	resent Worth Year	2011]							
10							Numbe	er of Years in Study		_							
11							7	Discount Rate		_							
13							Total in-s	ervice Project Cost In-service Year		4							
14		1				Other Project	t Cost after In-sei	vice (if applicable		4							
15		İ						Year (if applicable		1							
16		[Cost (if applicable)		3							
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10		}				Project cost in	Ending (E) or Beg	ginning (B) Year \$\$	More Materia	1							
19					O&M costs - I	Escalation base	d on mixture of N	Materials & Labour									
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22 23	<u>^</u>	В	C D E F G H I J K L Annual O&M Annual Fuel Annual Fuel Other Total Benefit 1 Benefit 2 P.W. Cumulative														
24	,	rear	Cost	Price	Cost	Cost	Total Costs	(specify)	Benefit 2 (specify)	NET	P.W. January	Cumulative Present					
24 25	<u> </u>		\$	(if applicable)	\$	\$	\$	\$	\$	\$	2011	Worth					
27	0	2011	•	Ī	-		1,876,500	-	_	1,876,500	1,876,500	1,876,500					
28	1	2012	4,088			-	4,088	-	-	4,088	3,537	1,880,037					
29	2	2013	4,178		-	-	4,178	-	-	4,178	3,363	1,883,401					
30	3	2014	4,270		-	-	4,270	*	-	4,270	3,197	1,886,598					
31	4	2015	4,364		-	-	4,364	-	-	4,364	3,040	1,889,637					
32	5	2016	4,460				4,460	-	-	4,460	2,890	1,892,527					
33	6	2017	4,558		-		4,558			4,558	2,747	1,895,275					
34	7	2018	4,658				4,658			4,658	2,612	1,897,886					
35	8	2019	4,761		-	-	4,761		-	4,761	2,483	1,900,369					
36 37	9	2020	4,865				4,865			4,865	2,361	1,902,730					
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5		h - Option 6	_	-										
6	1			Note: Costs	are shown	as positive v	values; Benet	its as negative	<u>values</u>					
7	1					***************************************		Current Yea	r 2011	٦				
9							F	Present Worth Yea		-				
10				Number of Years in Study 9										
11				Discount Rate 7.5%										
13			 	Total In-service Project Cost \$ 1,792,200 In-service Year 2011										
14				Other Project Cost after In-service (if applicable)										
15 16				Other Project Year (if applicable) Replacement Cost (if applicable) \$ -										
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18						Project cost in		ginning (B) Year \$\$		1				
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23 24		Year	Annual O&M Cost	Annual Fuel Price	Annual Fuel Cost	Other Cost	Total Costs	Benefit 1 (specify)	Benefit 2 (specify)	NET	P.W.	Cumulative		
25 20	L		\$	(if applicable)	\$	\$	\$	(specify) \$	(specify) \$	\$	January 2011	Present Worth		
27	0	2011			-		1,792,200	-	-	1,792,200	1,792,200	1,792,200		
28	1	2012	50,478		-		50,478		-	50,478	43,680	1,835,880		
29	2	2013	51,588		-		51,588	-		51,588	41,526	1,877,406		
30	3	2014	52,723		-		52,723	-	ļ	52,723	39,479	1,916,885		
31 32	5	2015 2016	53,883 55,068		-	-	53,883		<u> </u>	53,883	37,533	1,954,418		
33	6	2016	56,280	~-~~	-	 	55,068 56,280	-		55,068 56,280	35,682 33,923	1,990,100 2,024,023		
34	7	2018	57,518		-	-	57,518	_	-	57,518	32,250	2,024,023		
35	8	2019	58,783		+	Ī -	58,783	*	-	58,783	30,660	2,086,934		
36	9	2020	60,077		•	-	60,077		-	60,077	29,149	2,116,083		
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PUB 6 - Attachment 2

Alternative Cumulative N To T	Holyrood - Upgrade Stack Breeching Alternative Comparison Cumulative Net Present Value To The Year 2020								
Alternatives	Cumulative Net Present Value (CPW)	CPW Difference between Alternative and the Least Cost Alternative							
1. Status Quo 3. Refurbish - Option 2	4,060,220 2,074,894	1,985,326 0							
7. Refurbish - Option 6	2,098,194	23,300							

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		COST / BENEF Upgrade Stack Br		CIVIPLAIE								
	1. Status Qu		eeciang	-								
5	1. Status Qu		***************************************	-								
6				Note: Costs	are shown	as positive ve	alues; Benefi	ts as negative	<u>values</u>			
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8 9							D	Current Year resent Worth Year		1		
10		Ì						r of Years in Study				
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12							Total In-s	ervice Project Cost				
13								In-service Year	2011			
14 15						Other Project		vice (if applicable) Year (if applicable)				
16								Cost (if applicable)	· s	•		
17								Year (if applicable)		1		
18						Project cost in	Ending (E) or Beg	ginning (B) Year \$\$				
					0014	P f - K b		*- *	More Material			
19		Į.			O&M costs -	Escalation based	on mixture of P	/laterials & Labour	Less Labour]		
20 21												
22	А	В	С	D	E	F	G	н		J	к	L
23			Annual O&M	Annual Fuel	Annual Fuel	Other	Total	Benefit 1	Benefit 2		P.W.	Cumulative
24	,	Year	Cost \$	Price	Cost \$	Cost \$	Costs \$	(specify) \$	(specify) \$	NET \$	January 2011	Present Worth
25 20 27			7	(if applicable)		1 3	7	, , , , , , , , , , , , , , , , , , ,		<u> </u>	2011	Words
	0	2011			<u> </u>		-	-	-			
28	1	2012	47,690		-	4.001.055	47,690	-		47,690	41,267	41,267
29 30	2	2013	25,414		 	4,821,250	4,846,664 25,973	-	-	4,846,664 25,973	3,901,373 19,449	3,942,641 3,962,089
31	3 4	2014 2015	25,973 26,544			 	25,973 26,544			26,544	18,490	3,962,089
32	5	2015	27,128			 	27,128	-		27,128	17,578	3,998,157
33	6	2017	27,725			<u> </u>	27,725	-	-	27,725	16,711	4,014,869
34	7	2018	28,335			-	28,335	-		28,335	15,888	4,030,756
35	8	2019	28,958		-	-	28,958	-	-	28,958	15,104	4,045,860
36	9	2020	29,596		-	-	29,596		-	29,596	14,360	4,060,220
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5	3. Refurbish			-								
6				Note: Costs	are shown o	as positive v	<u>alues; Beneți</u>	ts as negative	<u>values</u>			
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11								Discount Rate	7.5%	1		
12							Total In-s	ervice Project Cost				
13 14						Other Deniest	Cast offer in	In-service Year	2011	-		
15						Other Project		rvice (if applicable) Year (if applicable)		1		
16								Cost (if applicable)	\$ -			
17								Year (if applicable)				
18						Project cost in	Ending (E) or Be	ginning (B) Year \$\$	More Material			
19					O&M costs -	Escalation hase	d on mixture of t	Materials & Labour		j.		
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23 24		Year	Annual O&M Cost	Annual Fuel Price	Annual Fuel Cost	Other Cost	Total Costs	Benefit 1 (specify)	Benefit 2 (specify)	NET	P.W. January	Cumulative Present
25			\$	(if applicable)	\$	\$	\$	(specify) \$	\$	\$	2011	Worth
27	0	2011	······································		_		1,768,900	-	-	1,768,900	1,768,900	1,768,900
28	1	2012	47,690		-		47,690	-	-	47,690	41,267	1,810,167
29	2	2013	48,739		-	-	48,739	~	-	48,739	39,233	1,849,400
30	3	2014	49,811			-	49,811	-	-	49,811	37,299	1,886,699
31	4	2015	50,907			-	50,907	-		50,907	35,460	1,922,158
32	5	2016	52,027		-	-	52,027	-	-	52,027	33,711	1,955,870
33	6	2017	53,171		-	-	53,171		-	53,171	32,049	1,987,919
34	7	2018	54,341		-	-	54,341	-	-	54,341	30,469	2,018,388
35 36	8 9	2019 2020	55,537 56,758		-	-	55,537 56,758			55,537 56,758	28,967	2,047,355 2,074,894
37		2020	36,738				36,736	-	<u>-</u>	36,738	27,539	2,074,834
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6				Note: Costs	<u>are shown a</u>	s positive va	ilues; Beneti	ts as negative	<u>values</u>			
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9								Current Year resent Worth Year	2011 2011			
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11								Discount Rate	7.5%			
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23		v	Annual O&M	Annual Fuel	Annual Fuel	Other	Total	Benefit 1	Benefit 2		P.W.	Cumulative
24		Year	Cost \$	Price (if applicable)	Cost \$	Cost \$	Costs \$	(specify) \$	(specify) \$	NET \$	January 2011	Present Worth
25	<u> </u>	<u> </u>		,					· · · · · · · · · · · · · · · · · · ·			
27	0	2011				-	1,792,200	-	-	1,792,200	1,792,200	1,792,200
28	1	2012	47,690		-		47,690	-	-	47,690	41,267	1,833,467
29	2	2013	48,739				48,739	-		48,739	39,233	1,872,700
30	3	2014	49,811			-	49,811	-	-	49,811	37,299	1,909,999
31	4	2015	50,907			-	50,907	-		50,907	35,460	1,945,458
32	5	2016	52,027				52,027	-		52,027	33,711	1,979,170
33	6	2017	53,171				53,171	-	-	53,171	32,049	2,011,219
34 35	7 8	2018 2019	54,341				54,341	~		54,341	30,469	2,041,688
			55,537				55,537		-	55,537	28,967	2,070,655
36 37	9	2020	56,758				56,758	-		56,758	27,539	2,098,194
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