Avoided Costs by Conservation Zone (9/30/2016 draft 2016 IRP), cost per therm

Year	Zone 1 Avoided Cost	Zone 2 Avoided Cost	Zone 3 Avoided Cost
2017	$ 0.542800	$ 0.494000	$ 0.522900
2018	$ 0.518900	$ 0.507000	$ 0.522100
2019	$ 0.525200	$ 0.490000	$ 0.512600
2020	$ 0.523200	$ 0.483400	$ 0.504500
2021	$ 0.536300	$ 0.494300	$ 0.511500
2022	$ 0.557300	$ 0.518800	$ 0.527300
2023	$ 0.557600	$ 0.503400	$ 0.518200
2024	$ 0.576600	$ 0.515900	$ 0.537100
2025	$ 0.580000	$ 0.523200	$ 0.537700
2026	$ 0.576600	$ 0.528400	$ 0.542700
2027	$ 0.591100	$ 0.539000	$ 0.554200
2028	$ 0.616300	$ 0.561800	$ 0.572500
2029	$ 0.628500	$ 0.551000	$ 0.571000
2030	$ 0.653400	$ 0.568700	$ 0.595700
2031	$ 0.668600	$ 0.605700	$ 0.609900
2032	$ 0.669400	$ 0.612300	$ 0.607400
2033	$ 0.694800	$ 0.641600	$ 0.635900
2034	$ 0.679800	$ 0.673500	$ 0.637600
2035	$ 0.691800	$ 0.675400	$ 0.646600
2036	$ 0.710600	$ 0.647200	$ 0.665400
2037	$ 0.717706	$ 0.653672	$ 0.672054
2037	$ 0.724883	$ 0.660209	$ 0.678775
2038	$ 0.732132	$ 0.666811	$ 0.685562
2039	$ 0.739453	$ 0.673479	$ 0.692418
2040	$ 0.746848	$ 0.680214	$ 0.699342
2041	$ 0.754316	$ 0.687016	$ 0.706336
2042	$ 0.761859	$ 0.693886	$ 0.713399
2043	$ 0.769478	$ 0.700825	$ 0.720533
2044	$ 0.777173	$ 0.707833	$ 0.727738
2045	$ 0.784944	$ 0.714911	$ 0.735016
2046	$ 0.792794	$ 0.722061	$ 0.742366
2047	$ 0.800722	$ 0.729281	$ 0.749789
2048	$ 0.808729	$ 0.736574	$ 0.757287
2049	$ 0.816816	$ 0.743940	$ 0.764860
2050	$ 0.824985	$ 0.751379	$ 0.772509
2051	$ 0.833234	$ 0.758893	$ 0.780234
2052	$ 0.841567	$ 0.766482	$ 0.788036
2053	$ 0.849982	$ 0.774147	$ 0.795917
2054	$ 0.858482	$ 0.781888	$ 0.803876
2055	$ 0.867067	$ 0.789707	$ 0.811914
2056	$ 0.875738	$ 0.797604	$ 0.820034
2057	$ 0.884495	$ 0.805580	$ 0.828234
2058	$ 0.893340	$ 0.813636	$ 0.836516
2059	$ 0.902273	$ 0.821772	$ 0.844881
2060	$ 0.911296	$ 0.829990	$ 0.853330
	$ 0.71931	**$ 0.65770**	**$ 0.67364**

Inflation Rate	1.000%		
Long Term Discount Rate (30yr mortgage rate)	3.520%	2035	2061
Revised Inflation Rate	0.000%	$ 0.65	$ 0.85
Years 21-45 Escalation =	1.00%		

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Category	1	2	3	4	5	6	7	8	9	10
IRP Annual Portfolio Cost Per Therm (PV)*	$ 0.505096	$ 0.48718	$ 0.46206	$ 0.43930	$ 0.43028	$ 0.42849	$ 0.40675	$ 0.40724	$ 0.39382	$ 0.38397
Nominal Cost Per Therm	$ 0.522900	$ 0.52	$ 0.51	$ 0.50	$ 0.51	$ 0.53	$ 0.52	$ 0.54	$ 0.54	$ 0.54
Verification	$ 0.505120	$ 0.49	$0.4621	$0.4393	$0.4303	$0.4285	$0.4068	$0.4072	$0.3938	$0.3840
Resource Portfolio Cost - % Change		-0.15%	-1.82%	-1.58%	1.39%	3.09%	-1.73%	3.65%	0.11%	0.93%
PV of Resource Portfolio Cost/Therm	$ 0.522900	$ 1.05	$ 1.56	$ 2.06	$ 2.57	$ 3.10	$ 3.62	$ 4.16	$ 4.69	$ 5.24
Portfolio Costs with 10% Conservation Credit	$ 0.575190	$1.15	$1.71	$2.27	$2.83	$3.41	$3.98	$4.57	$5.16	$5.76
Cost-Effectiveness Limit	$ 0.580942	$0.5834	$0.5826	$0.5813	$0.5833	$0.5886	$0.5917	$0.5975	$0.6028	$0.6082

* 2016 IRP Start - All Resources Medium Forecast Scenario Average Weather. 8.76% discount rate (CNGC weighted average cost of capital) utilized in Sendout Model.

PRELIMIINARY AVOIDED COST ESTIMATES
BASECASE - MEDIUM FORECAST - AVERAGE WEATHER
45 YEAR RESOURCE SUMMARY COSTS - MELDED COST PER THERM

	YEAR	IRP ANNUAL PORTFOLIO COST PER THERM (PV)*	NOMINAL COST PER THERM	RESOURCE PORTFOLIO COST - % CHANGE	PV OF RESOURCE PORTFOLIO COST/THERM	Non-Energy Benefits %	PORTFOLIO COSTS INCLUDING CONSERVATION CREDIT	COST-EFFECTIVENESS LIMIT
2017	1	$ 0.51	$ 0.52		$ 0.52	5%	$ 0.5490	$0.5719
2018	2	$ 0.49	$ 0.52	-0.15%	$ 1.05	5%	$ 1.0973	$0.5832
2019	3	$ 0.46	$ 0.51	-1.82%	$ 1.56	5%	$ 1.6355	$0.5912
2020	4	$ 0.44	$ 0.50	-1.58%	$ 2.06	5%	$ 2.1652	$0.5989
2021	**5**	**$ 0.43**	**$ 0.51**	**1.39%**	**$ 2.57**	7.5%	**$ 2.7666**	$0.6244
2022	6	$ 0.43	$ 0.53	3.09%	$ 3.10	7.5%	$ 3.3335	$0.6394
2023	7	$ 0.41	$ 0.52	-1.73%	$ 3.62	7.5%	$ 3.8905	$0.6523
2024	8	$ 0.41	$ 0.54	3.65%	$ 4.16	7.5%	$ 4.4679	$0.6683
2025	9	$ 0.39	$ 0.54	0.11%	$ 4.69	7.5%	$ 5.0459	$0.6839
2026	**10**	**$ 0.38**	**$ 0.54**	**0.93%**	**$ 5.24**	10.0%	**$ 5.7603**	$0.7162
2027	11	$ 0.38	$ 0.55	2.12%	$ 5.79	10%	$ 6.3699	$0.7338
2028	12	$ 0.38	$ 0.57	3.30%	$ 6.36	10%	$ 6.9996	$0.7532
2029	13	$ 0.36	$ 0.57	-0.26%	$ 6.93	10%	$ 7.6277	$0.7719
2030	14	$ 0.37	$ 0.60	4.33%	$ 7.53	10%	$ 8.2830	$0.7930
2031	15	$ 0.36	$ 0.61	2.38%	$ 8.14	12.5%	$ 9.1574	$0.8334
2032	16	$ 0.35	$ 0.61	-0.41%	$ 8.75	12.5%	$ 9.8407	$0.8552
2033	17	$ 0.35	$ 0.64	4.69%	$ 9.38	12.5%	$ 10.5561	$0.8792
2034	18	$ 0.34	$ 0.64	0.27%	$ 10.02	12.5%	$ 11.2734	$0.9029
2035	19	$ 0.34	$ 0.65	1.41%	$ 10.67	12.5%	$ 12.0008	$0.9270
2036	**20**	**$ 0.33**	**$ 0.67**	**2.91%**	**$ 11.33**	12.5%	**$ 12.7494**	$0.9523
2037	21	$ 0.33	$ 0.67	1.00%	$ 12.00	15%	$ 13.8056	$0.9995
2038	22	$ 0.32	$ 0.68	1.00%	$ 12.68	15%	$ 14.5862	$1.0258
2039	23	$ 0.31	$ 0.69	1.00%	$ 13.37	15%	$ 15.3746	$1.0523
2040	24	$ 0.30	$ 0.69	1.00%	$ 14.06	15%	$ 16.1709	$1.0791
2041	25	$ 0.29	$ 0.70	1.00%	$ 14.76	15%	$ 16.9751	$1.1062
2042	26	$ 0.29	$ 0.71	1.00%	$ 15.47	17.5%	$ 18.1741	$1.1583
2043	27	$ 0.28	$ 0.71	1.00%	$ 16.18	17.5%	$ 19.0123	$1.1866
2044	28	$ 0.27	$ 0.72	1.00%	$ 16.90	17.5%	$ 19.8589	$1.2153
2045	29	$ 0.27	$ 0.73	1.00%	$ 17.63	17.5%	$ 20.7140	$1.2443
2046	**30**	**$ 0.26**	**$ 0.74**	**1.00%**	**$ 18.36**	**17.5%**	**$ 21.5777**	$1.2737
2047	31	$ 0.25	$ 0.74	1.00%	$ 19.11	20%	$ 22.9276	$1.3313
2048	32	$ 0.25	$ 0.75	1.00%	$ 19.86	20%	$ 23.8274	$1.3621
2049	33	$ 0.24	$ 0.76	1.00%	$ 20.61	20%	$ 24.7361	$1.3934
2050	34	$ 0.24	$ 0.76	1.00%	$ 21.38	20%	$ 25.6539	$1.4251
2051	35	$ 0.23	$ 0.77	1.00%	$ 22.15	20%	$ 26.5809	$1.4572
2052	36	$ 0.22	$ 0.78	1.00%	$ 22.93	20%	$ 27.5172	$1.4897
2053	37	$ 0.22	$ 0.79	1.00%	$ 23.72	20%	$ 28.4629	$1.5228
2054	38	$ 0.21	$ 0.80	1.00%	$ 24.51	20%	$ 29.4180	$1.5562
2055	39	$ 0.21	$ 0.80	1.00%	$ 25.32	20%	$ 30.3826	$1.5902
2056	**40**	**$ 0.20**	**$ 0.81**	**1.00%**	**$ 26.13**	20%	**$ 31.3569**	$1.6246
2057	41	$ 0.20	$ 0.82	1.00%	$ 26.95	20%	$ 32.3410	$1.6594
2058	42	$ 0.19	$ 0.83	1.00%	$ 27.78	20%	$ 33.3348	$1.6948
2059	43	$ 0.19	$ 0.84	1.00%	$ 28.62	20%	$ 34.3387	$1.7306
2060	44	$ 0.18	$ 0.84	1.00%	$ 29.46	20%	$ 35.3525	$1.7670
2061	45	$ 0.18	$ 0.85	1.00%	$ 30.31	20%	$ 36.3765	$1.8038
		$ 0.31	$ 0.674	$ 0.01	$ 14.08			

Inflation Rate 1.000%
Long Term Discount Rate (30yr 3.520%
Years 21-45 Escalation = 1.00% (EIA Inflation Rate)

Conservation Credit % attempts to recognize non-quantifiable benefits associated with conservation, including benefits of price certainty & hedge against future carbon costs

Inflation Rate
Long Term Discount Rate (30yr mortgage rate)
Revised Inflation Rate
Years 21-45 Escalation =

	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Category	11	12	13	14	15	16	17	18	19	20	21
IRP Annual Portfolio Cost Per Therm (PV)*	$ 0.37877	$ 0.37802	$ 0.36415	$ 0.36699	$ 0.36300	$ 0.34924	$ 0.35315	$ 0.34207	$ 0.33510	$ 0.33313	$ 0.33
Nominal Cost Per Therm	$ 0.55	$ 0.57	$ 0.57	$ 0.60	$ 0.61	$ 0.61	$ 0.64	$ 0.64	$ 0.65	$ 0.67	$ 0.67
Verification	$0.3788	$0.3780	$0.3642	$0.3670	$0.3630	$0.3492	$0.3532	$0.3421	$0.3351	$0.3331	$0.3250
Resource Portfolio Cost - % Change	2.12%	3.30%	-0.26%	4.33%	2.38%	-0.41%	4.69%	0.27%	1.41%	2.91%	1.00%
PV of Resource Portfolio Cost/Therm	$ 5.79	$ 6.36	$ 6.93	$ 7.53	$ 8.14	$ 8.75	$ 9.38	$ 10.02	$ 10.67	$ 11.33	$ 12.00
Portfolio Costs with 10% Conservation Credit	$6.37	$7.00	$7.63	$8.28	$8.95	$9.62	$10.32	$11.02	$11.73	$12.47	$13.21
Cost-Effectiveness Limit	$0.6144	$0.6219	$0.6286	$0.6370	$0.6458	$0.6538	$0.6632	$0.6722	$0.6812	$0.6908	$0.7003

* 2016 IRP Start - All Resources Medium Forecast

0.951219512

Inflation Rate
Long Term Discount Rate (30yr mortgage rate)
Revised Inflation Rate
Years 21-45 Escalation =

	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048
Category	22	23	24	25	26	27	28	29	30	31	32
IRP Annual Portfolio Cost Per Therm (PV)*	$ 0.32	$ 0.31	$ 0.30	$ 0.29	$ 0.29	$ 0.28	$ 0.27	$ 0.27	$ 0.26	$ 0.25	$ 0.25
Nominal Cost Per Therm	$ 0.68	$ 0.69	$ 0.69	$ 0.70	$ 0.71	$ 0.71	$ 0.72	$ 0.73	$ 0.74	$ 0.74	$ 0.75
Verification	$0.3171	$0.3094	$0.3018	$0.2945	$0.2873	$0.2803	$0.2735	$0.2669	$0.2604	$0.2540	$0.2478
Resource Portfolio Cost - % Change	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
PV of Resource Portfolio Cost/Therm	$ 12.68	$ 13.37	$ 14.06	$ 14.76	$ 15.47	$ 16.18	$ 16.90	$ 17.63	$ 18.36	$ 19.11	$ 19.86
Portfolio Costs with 10% Conservation Credit	$13.95	$14.71	$15.47	$16.24	$17.01	$17.80	$18.59	$19.39	$20.20	$21.02	$21.84
Cost-Effectiveness Limit	$0.7097	$0.7189	$0.7281	$0.7373	$0.7464	$0.7555	$0.7646	$0.7736	$0.7827	$0.7918	$0.8010

* 2016 IRP Start - All Resources Medium Forecast

Inflation Rate
Long Term Discount Rate (30yr mortgage rate)
Revised Inflation Rate
Years 21-45 Escalation =

	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059
Category	33	34	35	36	37	38	39	40	41	42	43
IRP Annual Portfolio Cost Per Therm (PV)*	$ 0.24	$ 0.24	$ 0.23	$ 0.22	$ 0.22	$ 0.21	$ 0.21	$ 0.20	$ 0.20	$ 0.19	$ 0.19
Nominal Cost Per Therm	$ 0.76	$ 0.76	$ 0.77	$ 0.78	$ 0.79	$ 0.80	$ 0.80	$ 0.81	$ 0.82	$ 0.83	$ 0.84
Verification	$0.2418	$0.2359	$0.2302	$0.2246	$0.2191	$0.2138	$0.2086	$0.2035	$0.1985	$0.1937	$0.1890
Resource Portfolio Cost - % Change	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
PV of Resource Portfolio Cost/Therm	$ 20.61	$ 21.38	$ 22.15	$ 22.93	$ 23.72	$ 24.51	$ 25.32	$ 26.13	$ 26.95	$ 27.78	$ 28.62
Portfolio Costs with 10% Conservation Credit	$22.67	$23.52	$24.37	$25.22	$26.09	$26.97	$27.85	$28.74	$29.65	$30.56	$31.48
Cost-Effectiveness Limit	$0.8101	$0.8193	$0.8285	$0.8378	$0.8471	$0.8565	$0.8659	$0.8754	$0.8850	$0.8946	$0.9043

* 2016 IRP Start - All Resources Medium Forecast

Inflation Rate
Long Term Discount Rate (30yr mortgage rate)
Revised Inflation Rate
Years 21-45 Escalation =

	2060	2061
Category	44	45
IRP Annual Portfolio Cost Per Therm (PV)*	$ 0.18	$ 0.18
Nominal Cost Per Therm	$ 0.84	$ 0.85
Verification	$0.1844	$0.1799
Resource Portfolio Cost - % Change	1.00%	1.00%
PV of Resource Portfolio Cost/Therm	$ 29.46	$ 30.31
Portfolio Costs with 10% Conservation Credit	$32.41	$33.35
Cost-Effectiveness Limit	$0.9140	$0.9238

* 2016 IRP Start - All Resources Medium Forecast

Inflation Rate 1.000%
IRP Discount Rate = 3.520%
Revised Discount Rate= 0.000%
Years 21-45 Escalation = 1.000% (EIA Inflation Rate)

Category	2017 1	2018 2	2019 3	2020 4	2021 5	2022 6	2023 7	2024 8	2025 9	2026 10
IRP Annual Portfolio Cost Per Therm (PV)*	$ 0.51	$ 0.49	$ 0.46	$ 0.44	$ 0.43	$ 0.43	$ 0.41	$ 0.41	$ 0.39	$ 0.38
Nominal Cost Per Therm	$ 0.52	$ 0.52	$ 0.51	$ 0.50	$ 0.51	$ 0.53	$ 0.52	$ 0.54	$ 0.54	$ 0.54
Verification	$ 0.51	$ 0.49	$ 0.46	$ 0.44	$ 0.43	$ 0.43	$ 0.41	$ 0.41	$ 0.39	$ 0.38
Resource Portfolio Cost - % Change		-0.15%	-1.82%	-1.58%	1.39%	3.09%	-1.73%	3.65%	0.11%	0.93%
PV of Resource Portfolio Cost/Therm	$ 0.52	$ 1.05	$ 1.56	$ 2.06	$ 2.57	$ 3.10	$ 3.62	$ 4.16	$ 4.69	$ 5.24
Portfolio Costs with 10% Conservation Credit	$ 0.58	$1.15	$1.71	$2.27	$2.83	$3.41	$3.98	$4.57	$5.16	$5.76
Cost-Effectiveness Limit	$ 0.58	$0.5834	$0.5826	$0.5813	$0.5833	$0.5886	$0.5917	$0.5975	$0.6028	$0.6082

* 2016 IRP Start - All Resources Medium Forecast Scenario Average Weather. 8.76% discount rate (CNGC weighted average cost of capital) utilized in Sendout Model.

PRELIMIINARY AVOIDED COST ESTIMATES
BASECASE - MEDIUM FORECAST - AVERAGE WEATHER - with Carbon 1 Scenario
45 YEAR RESOURCE SUMMARY COSTS - MELDED COST PER THERM

	YEAR	IRP ANNUAL PORTFOLIO COST PER THERM (PV)*	NOMINAL COST PER THERM	RESOURCE PORTFOLIO COST - % CHANGE	PV OF RESOURCE PORTFOLIO COST/THERM	Non-Energy Benefits %		PORTFOLIO COSTS INCLUDING CONSERVATION CREDIT	COST-EFFECTIVENESS LIMIT
2017	1	$ 0.51	$ 0.52		$ 0.52	10.0%		$ 0.5752	$0.5992
2018	2	$ 0.49	$ 0.52	-0.15%	$ 1.05	10.0%		$ 1.1495	$0.6109
2019	3	$ 0.46	$ 0.51	-1.82%	$ 1.56	10.0%		$ 1.7134	$0.6194
2020	4	$ 0.44	$ 0.50	-1.58%	$ 2.06	10.0%		$ 2.2683	$0.6274
2021	**5**	**$ 0.43**	**$ 0.51**	**1.39%**	**$ 2.57**	10.0%		**$ 2.8310**	$0.6390
2022	6	$ 0.43	$ 0.53	3.09%	$ 3.10	10.0%		$ 3.4110	$0.6543
2023	7	$ 0.41	$ 0.52	-1.73%	$ 3.62	10.0%		$ 3.9810	$0.6674
2024	8	$ 0.41	$ 0.54	3.65%	$ 4.16	10.0%		$ 4.5718	$0.6838
2025	9	$ 0.39	$ 0.54	0.11%	$ 4.69	10.0%		$ 5.1633	$0.6998
2026	**10**	**$ 0.38**	**$ 0.54**	**0.93%**	**$ 5.24**	10.0%		**$ 5.7603**	$0.7162
2027	11	$ 0.38	$ 0.55	2.12%	$ 5.79	10.0%		$ 6.3699	$0.7338
2028	12	$ 0.38	$ 0.57	3.30%	$ 6.36	10.0%		$ 6.9996	$0.7532
2029	13	$ 0.36	$ 0.57	-0.26%	$ 6.93	10.0%		$ 7.6277	$0.7719
2030	14	$ 0.37	$ 0.60	4.33%	$ 7.53	10.0%		$ 8.2830	$0.7930
2031	15	$ 0.36	$ 0.61	2.38%	$ 8.14	10.0%		$ 8.9539	$0.8149
2032	16	$ 0.35	$ 0.61	-0.41%	$ 8.75	10.0%		$ 9.6220	$0.8362
2033	17	$ 0.35	$ 0.64	4.69%	$ 9.38	10.0%		$ 10.3215	$0.8596
2034	18	$ 0.34	$ 0.64	0.27%	$ 10.02	10.0%		$ 11.0229	$0.8828
2035	19	$ 0.34	$ 0.65	1.41%	$ 10.67	10.0%		$ 11.7341	$0.9064
2036	**20**	**$ 0.33**	**$ 0.67**	**2.91%**	**$ 11.33**	10.0%		**$ 12.4661**	$0.9311
2037	21	$ 0.33	$ 0.67	1.00%	$ 12.00	10.0%		$ 13.2053	$0.9561
2038	22	$ 0.32	$ 0.68	1.00%	$ 12.68	10.0%		$ 13.9520	$0.9812
2039	23	$ 0.31	$ 0.69	1.00%	$ 13.37	10.0%		$ 14.7061	$1.0066
2040	24	$ 0.30	$ 0.69	1.00%	$ 14.06	10.0%		$ 15.4678	$1.0322
2041	25	$ 0.29	$ 0.70	1.00%	$ 14.76	10.0%		$ 16.2370	$1.0581
2042	26	$ 0.29	$ 0.71	1.00%	$ 15.47	10.0%		$ 17.0140	$1.0843
2043	27	$ 0.28	$ 0.71	1.00%	$ 16.18	10.0%		$ 17.7988	$1.1108
2044	28	$ 0.27	$ 0.72	1.00%	$ 16.90	10.0%		$ 18.5913	$1.1377
2045	29	$ 0.27	$ 0.73	1.00%	$ 17.63	10.0%		$ 19.3919	$1.1649
2046	**30**	**$ 0.26**	**$ 0.74**	**1.00%**	**$ 18.36**	10.0%		**$ 20.2004**	$1.1924
2047	31	$ 0.25	$ 0.74	1.00%	$ 19.11	10.0%		$ 21.0170	$1.2203
2048	32	$ 0.25	$ 0.75	1.00%	$ 19.86	10.0%		$ 21.8417	$1.2486
2049	33	$ 0.24	$ 0.76	1.00%	$ 20.61	10.0%		$ 22.6748	$1.2773
2050	34	$ 0.24	$ 0.76	1.00%	$ 21.38	10.0%		$ 23.5161	$1.3063
2051	35	$ 0.23	$ 0.77	1.00%	$ 22.15	10.0%		$ 24.3659	$1.3357
2052	36	$ 0.22	$ 0.78	1.00%	$ 22.93	10.0%		$ 25.2241	$1.3656
2053	37	$ 0.22	$ 0.79	1.00%	$ 23.72	10.0%		$ 26.0910	$1.3959
2054	38	$ 0.21	$ 0.80	1.00%	$ 24.51	10.0%		$ 26.9665	$1.4265
2055	39	$ 0.21	$ 0.80	1.00%	$ 25.32	10.0%		$ 27.8507	$1.4576
2056	**40**	**$ 0.20**	**$ 0.81**	**1.00%**	**$ 26.13**	10.0%		**$ 28.7438**	$1.4892
2057	41	$ 0.20	$ 0.82	1.00%	$ 26.95	10.0%		$ 29.6459	$1.5212
2058	42	$ 0.19	$ 0.83	1.00%	$ 27.78	10.0%		$ 30.5569	$1.5536
2059	43	$ 0.19	$ 0.84	1.00%	$ 28.62	10.0%		$ 31.4771	$1.5864
2060	44	$ 0.18	$ 0.84	1.00%	$ 29.46	10.0%		$ 32.4065	$1.6197
2061	45	$ 0.18	$ 0.85	1.00%	$ 30.31	10.0%		$ 33.3451	$1.6535

Cascade's Long Term Real Discount Rate: 1.000%
IRP Discount Rate = 3.520%
Years 21-45 Escalation = 1.00% (EIA Inflation Rate)

Conservation Credit % attempts to recognize non-quantifiable benefits associated with conservation, including benefits of price certainty & hedge against future carbon costs
Carbon estimated at $15/ton, applies to Natural Gas 2021

Inflation Rate
IRP Discount Rate =
Revised Discount Rate=
Years 21-45 Escalation =

Category	2027 11	2028 12	2029 13	2030 14	2031 15	2032 16	2033 17	2034 18	2035 19	2036 20	2037 21
IRP Annual Portfolio Cost Per Therm (PV)*	$ 0.38	$ 0.38	$ 0.36	$ 0.37	$ 0.36	$ 0.35	$ 0.35	$ 0.34	$ 0.34	$ 0.33	$ 0.33
Nominal Cost Per Therm	$ 0.55	$ 0.57	$ 0.57	$ 0.60	$ 0.61	$ 0.61	$ 0.64	$ 0.64	$ 0.65	$ 0.67	$ 0.67
Verification	$ 0.38	$ 0.38	$ 0.36	$ 0.37	$ 0.36	$ 0.35	$ 0.35	$ 0.34	$ 0.34	$ 0.33	$ 0.33
Resource Portfolio Cost - % Change	2.12%	3.30%	-0.26%	4.33%	2.38%	-0.41%	4.69%	0.27%	1.41%	2.91%	1.00%
PV of Resource Portfolio Cost/Therm	$ 5.79	$ 6.36	$ 6.93	$ 7.53	$ 8.14	$ 8.75	$ 9.38	$ 10.02	$ 10.67	$ 11.33	$ 12.00
Portfolio Costs with 10% Conservation Credit	$6.37	$7.00	$7.63	$8.28	$8.95	$9.62	$10.32	$11.02	$11.73	$12.47	$13.21
Cost-Effectiveness Limit	$0.6144	$0.6219	$0.6286	$0.6370	$0.6458	$0.6538	$0.6632	$0.6722	$0.6812	$0.6908	$0.7003

* 2016 IRP Start - All Resources Medium Forecast Scenario

Inflation Rate
IRP Discount Rate =
Revised Discount Rate=
Years 21-45 Escalation =

Category	2038 22	2039 23	2040 24	2041 25	2042 26	2043 27	2044 28	2045 29	2046 30	2047 31	2048 32
IRP Annual Portfolio Cost Per Therm (PV)*	$ 0.32	$ 0.31	$ 0.30	$ 0.29	$ 0.29	$ 0.28	$ 0.27	$ 0.27	$ 0.26	$ 0.25	$ 0.25
Nominal Cost Per Therm	$ 0.68	$ 0.69	$ 0.69	$ 0.70	$ 0.71	$ 0.71	$ 0.72	$ 0.73	$ 0.74	$ 0.74	$ 0.75
Verification	$ 0.32	$ 0.31	$ 0.30	$ 0.29	$ 0.29	$ 0.28	$ 0.27	$ 0.27	$ 0.26	$ 0.25	$ 0.25
Resource Portfolio Cost - % Change	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
PV of Resource Portfolio Cost/Therm	$ 12.68	$ 13.37	$ 14.06	$ 14.76	$ 15.47	$ 16.18	$ 16.90	$ 17.63	$ 18.36	$ 19.11	$ 19.86
Portfolio Costs with 10% Conservation Credit	$13.95	$14.71	$15.47	$16.24	$17.01	$17.80	$18.59	$19.39	$20.20	$21.02	$21.84
Cost-Effectiveness Limit	$0.7097	$0.7189	$0.7281	$0.7373	$0.7464	$0.7555	$0.7646	$0.7736	$0.7827	$0.7918	$0.8010

* 2016 IRP Start - All Resources Medium Forecast Scenario

Inflation Rate
IRP Discount Rate =
Revised Discount Rate=
Years 21-45 Escalation =

Category	2049 33	2050 34	2051 35	2052 36	2053 37	2054 38	2055 39	2056 40	2057 41	2058 42	2059 43
IRP Annual Portfolio Cost Per Therm (PV)*	$ 0.24	$ 0.24	$ 0.23	$ 0.22	$ 0.22	$ 0.21	$ 0.21	$ 0.20	$ 0.20	$ 0.19	$ 0.19
Nominal Cost Per Therm	$ 0.76	$ 0.76	$ 0.77	$ 0.78	$ 0.79	$ 0.80	$ 0.80	$ 0.81	$ 0.82	$ 0.83	$ 0.84
Verification	$ 0.24	$ 0.24	$ 0.23	$ 0.22	$ 0.22	$ 0.21	$ 0.21	$ 0.20	$ 0.20	$ 0.19	$ 0.19
Resource Portfolio Cost - % Change	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
PV of Resource Portfolio Cost/Therm	$ 20.61	$ 21.38	$ 22.15	$ 22.93	$ 23.72	$ 24.51	$ 25.32	$ 26.13	$ 26.95	$ 27.78	$ 28.62
Portfolio Costs with 10% Conservation Credit	$22.67	$23.52	$24.37	$25.22	$26.09	$26.97	$27.85	$28.74	$29.65	$30.56	$31.48
Cost-Effectiveness Limit	$0.8101	$0.8193	$0.8285	$0.8378	$0.8471	$0.8565	$0.8659	$0.8754	$0.8850	$0.8946	$0.9043

* 2016 IRP Start - All Resources Medium Forecast Scenario

Inflation Rate
IRP Discount Rate =
Revised Discount Rate=
Years 21-45 Escalation =

Category	2060 44	2061 45
IRP Annual Portfolio Cost Per Therm (PV)*	$ 0.18	$ 0.18
Nominal Cost Per Therm	$ 0.84	$ 0.85
Verification	$ 0.18	$ 0.18
Resource Portfolio Cost - % Change	1.00%	1.00%
PV of Resource Portfolio Cost/Therm	$ 29.46	$ 30.31
Portfolio Costs with 10% Conservation Credit	$32.41	$33.35
Cost-Effectiveness Limit	$0.9140	$0.9238

* 2016 IRP Start - All Resources Medium Forecast Scenario

Inflation Rate 1.000%
IRP Discount Rate = 3.520%
Years 21-45 Escalation = 1.000% (EIA Inflation Rate)

	2017	2018	2019	2020	2021	2022	2023	2024	2025
Category	1	2	3	4	5	6	7	8	9
IRP Annual Portfolio Cost Per Therm (PV)*	$ 0.51	$ 0.49	$ 0.46	$ 0.44	$ 0.43	$ 0.43	$ 0.41	$ 0.41	$ 0.39
Nominal Cost Per Therm	$ 0.52	$ 0.52	$ 0.51	$ 0.50	$ 0.51	$ 0.53	$ 0.52	$ 0.54	$ 0.54
Verification	$ 0.51	$ 0.49	$ 0.46	$ 0.44	$ 0.43	$ 0.43	$ 0.41	$ 0.41	$ 0.39
Resource Portfolio Cost - % Change		-0.15%	-1.82%	-1.58%	1.39%	3.09%	-1.73%	3.65%	0.11%
PV of Resource Portfolio Cost/Therm	$ 0.52	$ 1.05	$ 1.56	$ 2.06	$ 2.57	$ 3.10	$ 3.62	$ 4.16	$ 4.69
Portfolio Costs with 10% Conservation Credit	$ 0.58	$1.15	$1.71	$2.27	$2.83	$3.41	$3.98	$4.57	$5.16
Cost-Effectiveness Limit	$ 0.58	$0.5834	$0.5826	$0.5813	$0.5833	$0.5886	$0.5917	$0.5975	$0.6028

* 2016 IRP Start - All Resources Medium Forecast Scenario Average Weather. 8.76% discount rate (CNGC weighted average cost of capital) utilized in Sendout Model.

PRELIMIINARY AVOIDED COST ESTIMATES
BASECASE - MEDIUM FORECAST - AVERAGE WEATHER - Carbon 2 scenario
45 YEAR RESOURCE SUMMARY COSTS - MELDED COST PER THERM

	YEAR	IRP ANNUAL PORTFOLIO COST PER THERM (PV)*	NOMINAL COST PER THERM	RESOURCE PORTFOLIO COST - % CHANGE	PV OF RESOURCE PORTFOLIO COST/THERM	Non-Energy Benefits %		PORTFOLIO COSTS INCLUDING CONSERVATION CREDIT
2017	1	$ 0.51	$ 0.52		$ 0.52	20%		$ 0.6275
2018	2	$ 0.49	$ 0.52	-0.15%	$ 1.05	20%		$ 1.2540
2019	3	$ 0.46	$ 0.51	-1.82%	$ 1.56	20%		$ 1.8691
2020	4	$ 0.44	$ 0.50	-1.58%	$ 2.06	20%		$ 2.4745
2021	**5**	**$ 0.43**	**$ 0.51**	**1.39%**	**$ 2.57**	20%		**$ 3.0883**
2022	6	$ 0.43	$ 0.53	3.09%	$ 3.10	20%		$ 3.7211
2023	7	$ 0.41	$ 0.52	-1.73%	$ 3.62	20%		$ 4.3429
2024	8	$ 0.41	$ 0.54	3.65%	$ 4.16	20%		$ 4.9874
2025	9	$ 0.39	$ 0.54	0.11%	$ 4.69	20%		$ 5.6327
2026	**10**	**$ 0.38**	**$ 0.54**	**0.93%**	**$ 5.24**	20%		**$ 6.2839**
2027	11	$ 0.38	$ 0.55	2.12%	$ 5.79	20%		$ 6.9490
2028	12	$ 0.38	$ 0.57	3.30%	$ 6.36	20%		$ 7.6360
2029	13	$ 0.36	$ 0.57	-0.26%	$ 6.93	20%		$ 8.3212
2030	14	$ 0.37	$ 0.60	4.33%	$ 7.53	20%		$ 9.0360
2031	15	$ 0.36	$ 0.61	2.38%	$ 8.14	20%		$ 9.7679
2032	16	$ 0.35	$ 0.61	-0.41%	$ 8.75	20%		$ 10.4968
2033	17	$ 0.35	$ 0.64	4.69%	$ 9.38	20%		$ 11.2598
2034	18	$ 0.34	$ 0.64	0.27%	$ 10.02	20%		$ 12.0250
2035	19	$ 0.34	$ 0.65	1.41%	$ 10.67	20%		$ 12.8009
2036	**20**	**$ 0.33**	**$ 0.67**	**2.91%**	**$ 11.33**	20%		**$ 13.5994**
2037	21	$ 0.33	$ 0.67	1.00%	$ 12.00	20%		$ 14.4058
2038	22	$ 0.32	$ 0.68	1.00%	$ 12.68	20%		$ 15.2204
2039	23	$ 0.31	$ 0.69	1.00%	$ 13.37	20%		$ 16.0430
2040	24	$ 0.30	$ 0.69	1.00%	$ 14.06	20%		$ 16.8739
2041	25	$ 0.29	$ 0.70	1.00%	$ 14.76	20%		$ 17.7131
2042	26	$ 0.29	$ 0.71	1.00%	$ 15.47	20%		$ 18.5607
2043	27	$ 0.28	$ 0.71	1.00%	$ 16.18	20%		$ 19.4168
2044	28	$ 0.27	$ 0.72	1.00%	$ 16.90	20%		$ 20.2815
2045	29	$ 0.27	$ 0.73	1.00%	$ 17.63	20%		$ 21.1547
2046	**30**	**$ 0.26**	**$ 0.74**	**1.00%**	**$ 18.36**	20%		**$ 22.0368**
2047	31	$ 0.25	$ 0.74	1.00%	$ 19.11	20%		$ 22.9276
2048	32	$ 0.25	$ 0.75	1.00%	$ 19.86	20%		$ 23.8274
2049	33	$ 0.24	$ 0.76	1.00%	$ 20.61	20%		$ 24.7361
2050	34	$ 0.24	$ 0.76	1.00%	$ 21.38	20%		$ 25.6539
2051	35	$ 0.23	$ 0.77	1.00%	$ 22.15	20%		$ 26.5809
2052	36	$ 0.22	$ 0.78	1.00%	$ 22.93	20%		$ 27.5172
2053	37	$ 0.22	$ 0.79	1.00%	$ 23.72	20%		$ 28.4629
2054	38	$ 0.21	$ 0.80	1.00%	$ 24.51	20%		$ 29.4180
2055	39	$ 0.21	$ 0.80	1.00%	$ 25.32	20%		$ 30.3826
2056	**40**	**$ 0.20**	**$ 0.81**	**1.00%**	**$ 26.13**	20%		**$ 31.3569**
2057	41	$ 0.20	$ 0.82	1.00%	$ 26.95	20%		$ 32.3410
2058	42	$ 0.19	$ 0.83	1.00%	$ 27.78	20%		$ 33.3348
2059	43	$ 0.19	$ 0.84	1.00%	$ 28.62	20%		$ 34.3387
2060	44	$ 0.18	$ 0.84	1.00%	$ 29.46	20%		$ 35.3525
2061	45	$ 0.18	$ 0.85	1.00%	$ 30.31	20%		$ 36.3765

Cascade's Long Term Real Discount Rate: 1.000%
IRP Discount Rate = 3.520%
Years 21-45 Escalation = 1.00% (EIA Inflation Rate)

Conservation Credit % attempts to recognize non-quantifiable benefits associated with conservation, including benefits of price certainty & hedge against future carbon costs
Carbon estimated at $20/ton, applies to Natural Gas 2021

Inflation Rate
IRP Discount Rate =
Years 21-45 Escalation =

Category		2026 10
IRP Annual Portfolio Cost Per Therm (PV)*	$	0.38
Nominal Cost Per Therm	$	0.54
Verification	$	0.38
Resource Portfolio Cost - % Change		0.93%
PV of Resource Portfolio Cost/Therm	$	5.24
Portfolio Costs with 10% Conservation Credit		$5.76
Cost-Effectiveness Limit		$0.6082

* 2016 IRP Start - All Resources Medium Forecast Scenari

COST-EFFECTIVENESS LIMIT
$0.6536
$0.6665
$0.6757
$0.6844
$0.6970
$0.7138
$0.7281
$0.7460
$0.7634
$0.7813
$0.8005
$0.8217
$0.8421
$0.8651
$0.8890
$0.9122
$0.9378
$0.9631
$0.9888
$1.0158
$1.0430
$1.0704
$1.0981
$1.1261
$1.1543
$1.1829
$1.2118
$1.2411
$1.2708
$1.3008
$1.3313
$1.3621
$1.3934
$1.4251
$1.4572
$1.4897
$1.5228
$1.5562
$1.5902
$1.6246
$1.6594
$1.6948
$1.7306
$1.7670
$1.8038

Inflation Rate
IRP Discount Rate =
Years 21-45 Escalation =

Category	2027 11	2028 12	2029 13	2030 14	2031 15	2032 16	2033 17	2034 18	2035 19	2036 20
IRP Annual Portfolio Cost Per Therm (PV)*	$ 0.38	$ 0.38	$ 0.36	$ 0.37	$ 0.36	$ 0.35	$ 0.35	$ 0.34	$ 0.34	$ 0.33
Nominal Cost Per Therm	$ 0.55	$ 0.57	$ 0.57	$ 0.60	$ 0.61	$ 0.61	$ 0.64	$ 0.64	$ 0.65	$ 0.67
Verification	$ 0.38	$ 0.38	$ 0.36	$ 0.37	$ 0.36	$ 0.35	$ 0.35	$ 0.34	$ 0.34	$ 0.33
Resource Portfolio Cost - % Change	2.12%	3.30%	-0.26%	4.33%	2.38%	-0.41%	4.69%	0.27%	1.41%	2.91%
PV of Resource Portfolio Cost/Therm	$ 5.79	$ 6.36	$ 6.93	$ 7.53	$ 8.14	$ 8.75	$ 9.38	$ 10.02	$ 10.67	$ 11.33
Portfolio Costs with 10% Conservation Credit	$6.37	$7.00	$7.63	$8.28	$8.95	$9.62	$10.32	$11.02	$11.73	$12.47
Cost-Effectiveness Limit	$0.6144	$0.6219	$0.6286	$0.6370	$0.6458	$0.6538	$0.6632	$0.6722	$0.6812	$0.6908

* 2016 IRP Start - All Resources Medium Forecast Scenari

Inflation Rate
IRP Discount Rate =
Years 21-45 Escalation =

Category	2037 21	2038 22	2039 23	2040 24	2041 25	2042 26	2043 27	2044 28	2045 29	2046 30
IRP Annual Portfolio Cost Per Therm (PV)*	$ 0.33	$ 0.32	$ 0.31	$ 0.30	$ 0.29	$ 0.29	$ 0.28	$ 0.27	$ 0.27	$ 0.26
Nominal Cost Per Therm	$ 0.67	$ 0.68	$ 0.69	$ 0.69	$ 0.70	$ 0.71	$ 0.71	$ 0.72	$ 0.73	$ 0.74
Verification	$ 0.33	$ 0.32	$ 0.31	$ 0.30	$ 0.29	$ 0.29	$ 0.28	$ 0.27	$ 0.27	$ 0.26
Resource Portfolio Cost - % Change	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
PV of Resource Portfolio Cost/Therm	$ 12.00	$ 12.68	$ 13.37	$ 14.06	$ 14.76	$ 15.47	$ 16.18	$ 16.90	$ 17.63	$ 18.36
Portfolio Costs with 10% Conservation Credit	$13.21	$13.95	$14.71	$15.47	$16.24	$17.01	$17.80	$18.59	$19.39	$20.20
Cost-Effectiveness Limit	$0.7003	$0.7097	$0.7189	$0.7281	$0.7373	$0.7464	$0.7555	$0.7646	$0.7736	$0.7827

* 2016 IRP Start - All Resources Medium Forecast Scenari

Inflation Rate
IRP Discount Rate =
Years 21-45 Escalation =

	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056
Category	31	32	33	34	35	36	37	38	39	40
IRP Annual Portfolio Cost Per Therm (PV)*	$ 0.25	$ 0.25	$ 0.24	$ 0.24	$ 0.23	$ 0.22	$ 0.22	$ 0.21	$ 0.21	$ 0.20
Nominal Cost Per Therm	$ 0.74	$ 0.75	$ 0.76	$ 0.76	$ 0.77	$ 0.78	$ 0.79	$ 0.80	$ 0.80	$ 0.81
Verification	$ 0.25	$ 0.25	$ 0.24	$ 0.24	$ 0.23	$ 0.22	$ 0.22	$ 0.21	$ 0.21	$ 0.20
Resource Portfolio Cost - % Change	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
PV of Resource Portfolio Cost/Therm	$ 19.11	$ 19.86	$ 20.61	$ 21.38	$ 22.15	$ 22.93	$ 23.72	$ 24.51	$ 25.32	$ 26.13
Portfolio Costs with 10% Conservation Credit	$21.02	$21.84	$22.67	$23.52	$24.37	$25.22	$26.09	$26.97	$27.85	$28.74
Cost-Effectiveness Limit	$0.7918	$0.8010	$0.8101	$0.8193	$0.8285	$0.8378	$0.8471	$0.8565	$0.8659	$0.8754

* 2016 IRP Start - All Resources Medium Forecast Scenari

Inflation Rate
IRP Discount Rate =
Years 21-45 Escalation =

	2057	2058	2059	2060	2061
Category	41	42	43	44	45
IRP Annual Portfolio Cost Per Therm (PV)*	$ 0.20	$ 0.19	$ 0.19	$ 0.18	$ 0.18
Nominal Cost Per Therm	$ 0.82	$ 0.83	$ 0.84	$ 0.84	$ 0.85
Verification	$ 0.20	$ 0.19	$ 0.19	$ 0.18	$ 0.18
Resource Portfolio Cost - % Change	1.00%	1.00%	1.00%	1.00%	1.00%
PV of Resource Portfolio Cost/Therm	$ 26.95	$ 27.78	$ 28.62	$ 29.46	$ 30.31
Portfolio Costs with 10% Conservation Credit	$29.65	$30.56	$31.48	$32.41	$33.35
Cost-Effectiveness Limit	$0.8850	$0.8946	$0.9043	$0.9140	$0.9238

* 2016 IRP Start - All Resources Medium Forecast Scenari

Inflation Rate 1.000%
IRP Discount Rate = 3.520%
Years 21-45 Escalation = 1.000% (EIA Inflation Rate)

Category	2017 1	2018 2	2019 3	2020 4	2021 5	2022 6	2023 7	2024 8	2025 9	2026 10
IRP Annual Portfolio Cost Per Therm (PV)*	$ 0.51	$ 0.49	$ 0.46	$ 0.44	$ 0.43	$ 0.43	$ 0.41	$ 0.41	$ 0.39	$ 0.38
Nominal Cost Per Therm	$ 0.52	$ 0.52	$ 0.51	$ 0.50	$ 0.51	$ 0.53	$ 0.52	$ 0.54	$ 0.54	$ 0.54
Verification	$ 0.51	$ 0.49	$ 0.46	$ 0.44	$ 0.43	$ 0.43	$ 0.41	$ 0.41	$ 0.39	$ 0.38
Resource Portfolio Cost - % Change		-0.15%	-1.82%	-1.58%	1.39%	3.09%	-1.73%	3.65%	0.11%	0.93%
PV of Resource Portfolio Cost/Therm	$ 0.52	$ 1.05	$ 1.56	$ 2.06	$ 2.57	$ 3.10	$ 3.62	$ 4.16	$ 4.69	$ 5.24
Portfolio Costs with 10% Conservation Credit	$ 0.58	$1.15	$1.71	$2.27	$2.83	$3.41	$3.98	$4.57	$5.16	$5.76
Cost-Effectiveness Limit	$ 0.58	$0.5834	$0.5826	$0.5813	$0.5833	$0.5886	$0.5917	$0.5975	$0.6028	$0.6082

* 2016 IRP Start - All Resources Medium Forecast Scenario Average Weather. 8.76% discount rate (CNGC weighted average cost of capital) utilized in Sendout Model.

PRELIMIINARY AVOIDED COST ESTIMATES
BASECASE - MEDIUM FORECAST - AVERAGE WEATHER - Carbon 3 scenario
45 YEAR RESOURCE SUMMARY COSTS - MELDED COST PER THERM

	YEAR	IRP ANNUAL PORTFOLIO COST PER THERM (PV)*	NOMINAL COST PER THERM	RESOURCE PORTFOLIO COST - % CHANGE	PV OF RESOURCE PORTFOLIO COST/THERM	Non-Energy Benefits %		PORTFOLIO COSTS INCLUDING CONSERVATION CREDIT	COST-EFFECTIVENESS LIMIT
2017	1	$ 0.51	$ 0.52		$ 0.52	30%		$ 0.6798	$0.7081
2018	2	$ 0.49	$ 0.52	-0.15%	$ 1.05	30%		$ 1.3585	$0.7220
2019	3	$ 0.46	$ 0.51	-1.82%	$ 1.56	30%		$ 2.0249	$0.7320
2020	4	$ 0.44	$ 0.50	-1.58%	$ 2.06	30%		$ 2.6807	$0.7415
2021	**5**	**$ 0.43**	**$ 0.51**	**1.39%**	**$ 2.57**	30%		**$ 3.3457**	$0.7551
2022	6	$ 0.43	$ 0.53	3.09%	$ 3.10	30%		$ 4.0312	$0.7733
2023	7	$ 0.41	$ 0.52	-1.73%	$ 3.62	30%		$ 4.7048	$0.7888
2024	8	$ 0.41	$ 0.54	3.65%	$ 4.16	30%		$ 5.4031	$0.8081
2025	9	$ 0.39	$ 0.54	0.11%	$ 4.69	30%		$ 6.1021	$0.8271
2026	**10**	**$ 0.38**	**$ 0.54**	**0.93%**	**$ 5.24**	30%		**$ 6.8076**	$0.8464
2027	11	$ 0.38	$ 0.55	2.12%	$ 5.79	30%		$ 7.5280	$0.8672
2028	12	$ 0.38	$ 0.57	3.30%	$ 6.36	30%		$ 8.2723	$0.8901
2029	13	$ 0.36	$ 0.57	-0.26%	$ 6.93	30%		$ 9.0146	$0.9123
2030	14	$ 0.37	$ 0.60	4.33%	$ 7.53	30%		$ 9.7890	$0.9371
2031	15	$ 0.36	$ 0.61	2.38%	$ 8.14	30%		$ 10.5819	$0.9631
2032	16	$ 0.35	$ 0.61	-0.41%	$ 8.75	30%		$ 11.3715	$0.9882
2033	17	$ 0.35	$ 0.64	4.69%	$ 9.38	30%		$ 12.1982	$1.0159
2034	18	$ 0.34	$ 0.64	0.27%	$ 10.02	30%		$ 13.0270	$1.0433
2035	19	$ 0.34	$ 0.65	1.41%	$ 10.67	30%		$ 13.8676	$1.0712
2036	**20**	**$ 0.33**	**$ 0.67**	**2.91%**	**$ 11.33**	30%		**$ 14.7326**	$1.1004
2037	21	$ 0.33	$ 0.67	1.00%	$ 12.00	30%		$ 15.6063	$1.1299
2038	22	$ 0.32	$ 0.68	1.00%	$ 12.68	30%		$ 16.4887	$1.1596
2039	23	$ 0.31	$ 0.69	1.00%	$ 13.37	30%		$ 17.3799	$1.1896
2040	24	$ 0.30	$ 0.69	1.00%	$ 14.06	30%		$ 18.2801	$1.2199
2041	25	$ 0.29	$ 0.70	1.00%	$ 14.76	30%		$ 19.1892	$1.2505
2042	26	$ 0.29	$ 0.71	1.00%	$ 15.47	30%		$ 20.1075	$1.2815
2043	27	$ 0.28	$ 0.71	1.00%	$ 16.18	30%		$ 21.0349	$1.3128
2044	28	$ 0.27	$ 0.72	1.00%	$ 16.90	30%		$ 21.9716	$1.3445
2045	29	$ 0.27	$ 0.73	1.00%	$ 17.63	30%		$ 22.9176	$1.3767
2046	**30**	**$ 0.26**	**$ 0.74**	**1.00%**	**$ 18.36**	30%		**$ 23.8732**	$1.4092
2047	31	$ 0.25	$ 0.74	1.00%	$ 19.11	30%		$ 24.8382	$1.4422
2048	32	$ 0.25	$ 0.75	1.00%	$ 19.86	30%		$ 25.8130	$1.4756
2049	33	$ 0.24	$ 0.76	1.00%	$ 20.61	30%		$ 26.7974	$1.5095
2050	34	$ 0.24	$ 0.76	1.00%	$ 21.38	30%		$ 27.7918	$1.5438
2051	35	$ 0.23	$ 0.77	1.00%	$ 22.15	30%		$ 28.7960	$1.5786
2052	36	$ 0.22	$ 0.78	1.00%	$ 22.93	30%		$ 29.8103	$1.6139
2053	37	$ 0.22	$ 0.79	1.00%	$ 23.72	30%		$ 30.8348	$1.6497
2054	38	$ 0.21	$ 0.80	1.00%	$ 24.51	30%		$ 31.8695	$1.6859
2055	39	$ 0.21	$ 0.80	1.00%	$ 25.32	30%		$ 32.9145	$1.7227
2056	**40**	**$ 0.20**	**$ 0.81**	**1.00%**	**$ 26.13**	30%		**$ 33.9700**	$1.7599
2057	41	$ 0.20	$ 0.82	1.00%	$ 26.95	30%		$ 35.0360	$1.7977
2058	42	$ 0.19	$ 0.83	1.00%	$ 27.78	30%		$ 36.1127	$1.8360
2059	43	$ 0.19	$ 0.84	1.00%	$ 28.62	30%		$ 37.2002	$1.8749
2060	44	$ 0.18	$ 0.84	1.00%	$ 29.46	30%		$ 38.2986	$1.9142
2061	45	$ 0.18	$ 0.85	1.00%	$ 30.31	30%		$ 39.4079	$1.9541

Cascade's Long Term Real Discount Rate: 1.000%
IRP Discount Rate = 3.520%
Years 21-45 Escalation = 1.00% (EIA Inflation Rate)

Conservation Credit % attempts to recognize non-quantifiable benefits associated with conservation, including benefits of price certainty & hedge against future carbon costs
Carbon estimated at $30/ton, applies to Natural Gas 2021

Inflation Rate
IRP Discount Rate =
Years 21-45 Escalation =

Category	2027 11	2028 12	2029 13	2030 14	2031 15	2032 16	2033 17	2034 18	2035 19	2036 20	2037 21
IRP Annual Portfolio Cost Per Therm (PV)*	$ 0.38	$ 0.38	$ 0.36	$ 0.37	$ 0.36	$ 0.35	$ 0.35	$ 0.34	$ 0.34	$ 0.33	$ 0.33
Nominal Cost Per Therm	$ 0.55	$ 0.57	$ 0.57	$ 0.60	$ 0.61	$ 0.61	$ 0.64	$ 0.64	$ 0.65	$ 0.67	$ 0.67
Verification	$ 0.38	$ 0.38	$ 0.36	$ 0.37	$ 0.36	$ 0.35	$ 0.35	$ 0.34	$ 0.34	$ 0.33	$ 0.33
Resource Portfolio Cost - % Change	2.12%	3.30%	-0.26%	4.33%	2.38%	-0.41%	4.69%	0.27%	1.41%	2.91%	1.00%
PV of Resource Portfolio Cost/Therm	$ 5.79	$ 6.36	$ 6.93	$ 7.53	$ 8.14	$ 8.75	$ 9.38	$ 10.02	$ 10.67	$ 11.33	$ 12.00
Portfolio Costs with 10% Conservation Credit	$6.37	$7.00	$7.63	$8.28	$8.95	$9.62	$10.32	$11.02	$11.73	$12.47	$13.21
Cost-Effectiveness Limit	$0.6144	$0.6219	$0.6286	$0.6370	$0.6458	$0.6538	$0.6632	$0.6722	$0.6812	$0.6908	$0.7003

* 2016 IRP Start - All Resources Medium Forecast Scenario

Inflation Rate
IRP Discount Rate =
Years 21-45 Escalation =

Category	2038 22	2039 23	2040 24	2041 25	2042 26	2043 27	2044 28	2045 29	2046 30	2047 31	2048 32
IRP Annual Portfolio Cost Per Therm (PV)*	$ 0.32	$ 0.31	$ 0.30	$ 0.29	$ 0.29	$ 0.28	$ 0.27	$ 0.27	$ 0.26	$ 0.25	$ 0.25
Nominal Cost Per Therm	$ 0.68	$ 0.69	$ 0.69	$ 0.70	$ 0.71	$ 0.71	$ 0.72	$ 0.73	$ 0.74	$ 0.74	$ 0.75
Verification	$ 0.32	$ 0.31	$ 0.30	$ 0.29	$ 0.29	$ 0.28	$ 0.27	$ 0.27	$ 0.26	$ 0.25	$ 0.25
Resource Portfolio Cost - % Change	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
PV of Resource Portfolio Cost/Therm	$ 12.68	$ 13.37	$ 14.06	$ 14.76	$ 15.47	$ 16.18	$ 16.90	$ 17.63	$ 18.36	$ 19.11	$ 19.86
Portfolio Costs with 10% Conservation Credit	$13.95	$14.71	$15.47	$16.24	$17.01	$17.80	$18.59	$19.39	$20.20	$21.02	$21.84
Cost-Effectiveness Limit	$0.7097	$0.7189	$0.7281	$0.7373	$0.7464	$0.7555	$0.7646	$0.7736	$0.7827	$0.7918	$0.8010

* 2016 IRP Start - All Resources Medium Forecast Scenario

Inflation Rate
IRP Discount Rate =
Years 21-45 Escalation =

Category	2049 33	2050 34	2051 35	2052 36	2053 37	2054 38	2055 39	2056 40	2057 41	2058 42	2059 43
IRP Annual Portfolio Cost Per Therm (PV)*	$ 0.24	$ 0.24	$ 0.23	$ 0.22	$ 0.22	$ 0.21	$ 0.21	$ 0.20	$ 0.20	$ 0.19	$ 0.19
Nominal Cost Per Therm	$ 0.76	$ 0.76	$ 0.77	$ 0.78	$ 0.79	$ 0.80	$ 0.80	$ 0.81	$ 0.82	$ 0.83	$ 0.84
Verification	$ 0.24	$ 0.24	$ 0.23	$ 0.22	$ 0.22	$ 0.21	$ 0.21	$ 0.20	$ 0.20	$ 0.19	$ 0.19
Resource Portfolio Cost - % Change	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
PV of Resource Portfolio Cost/Therm	$ 20.61	$ 21.38	$ 22.15	$ 22.93	$ 23.72	$ 24.51	$ 25.32	$ 26.13	$ 26.95	$ 27.78	$ 28.62
Portfolio Costs with 10% Conservation Credit	$22.67	$23.52	$24.37	$25.22	$26.09	$26.97	$27.85	$28.74	$29.65	$30.56	$31.48
Cost-Effectiveness Limit	$0.8101	$0.8193	$0.8285	$0.8378	$0.8471	$0.8565	$0.8659	$0.8754	$0.8850	$0.8946	$0.9043

* 2016 IRP Start - All Resources Medium Forecast Scenario

Inflation Rate
IRP Discount Rate =
Years 21-45 Escalation =

Category	2060 44	2061 45
IRP Annual Portfolio Cost Per Therm (PV)*	$ 0.18	$ 0.18
Nominal Cost Per Therm	$ 0.84	$ 0.85
Verification	$ 0.18	$ 0.18
Resource Portfolio Cost - % Change	1.00%	1.00%
PV of Resource Portfolio Cost/Therm	$ 29.46	$ 30.31
Portfolio Costs with 10% Conservation Credit	$32.41	$33.35
Cost-Effectiveness Limit	$0.9140	$0.9238

* 2016 IRP Start - All Resources Medium Forecast Scenario

SYSTEM AVOIDED COSTS LAYERS (dollars in therms)

	Total Avoided Cost	Commodity	Transport Fixed	Transport Commodity	Storage Fixed	Storage Commodity
2017	$ 0.522900	$ 0.334058	$ 0.167166	$ 0.003215	$ 0.016891	$ 0.001570
2018	$ 0.522100	$ 0.333547	$ 0.166910	$ 0.003210	$ 0.016865	$ 0.001568
2019	$ 0.512600	$ 0.327478	$ 0.163873	$ 0.003152	$ 0.016558	$ 0.001539
2020	$ 0.504500	$ 0.322303	$ 0.161284	$ 0.003102	$ 0.016296	$ 0.001515
2021	$ 0.511500	$ 0.326775	$ 0.163522	$ 0.003145	$ 0.016522	$ 0.001536
2022	$ 0.527300	$ 0.336869	$ 0.168573	$ 0.003242	$ 0.017033	$ 0.001583
2023	$ 0.518200	$ 0.331056	$ 0.165663	$ 0.003186	$ 0.016739	$ 0.001556
2024	$ 0.537100	$ 0.343130	$ 0.171706	$ 0.003302	$ 0.017349	$ 0.001613
2025	$ 0.537700	$ 0.343513	$ 0.171897	$ 0.003306	$ 0.017369	$ 0.001615
2026	$ 0.542700	$ 0.346708	$ 0.173496	$ 0.003337	$ 0.017530	$ 0.001630
2027	$ 0.554200	$ 0.354054	$ 0.177172	$ 0.003407	$ 0.017902	$ 0.001664
2028	$ 0.572500	$ 0.365745	$ 0.183023	$ 0.003520	$ 0.018493	$ 0.001719
2029	$ 0.571000	$ 0.364787	$ 0.182543	$ 0.003511	$ 0.018444	$ 0.001715
2030	$ 0.595700	$ 0.380567	$ 0.190439	$ 0.003663	$ 0.019242	$ 0.001789
2031	$ 0.609900	$ 0.389639	$ 0.194979	$ 0.003750	$ 0.019701	$ 0.001831
2032	$ 0.607400	$ 0.388042	$ 0.194180	$ 0.003734	$ 0.019620	$ 0.001824
2033	$ 0.635900	$ 0.406249	$ 0.203291	$ 0.003910	$ 0.020541	$ 0.001910
2034	$ 0.637600	$ 0.407335	$ 0.203834	$ 0.003920	$ 0.020596	$ 0.001915
2035	$ 0.646600	$ 0.413085	$ 0.206712	$ 0.003975	$ 0.020886	$ 0.001942
2036	$ 0.665400	$ 0.425095	$ 0.212722	$ 0.004091	$ 0.021494	$ 0.001998
2037	$ 0.672054	$ 0.429346	$ 0.214849	$ 0.004132	$ 0.021709	$ 0.002018
2038	$ 0.678775	$ 0.433640	$ 0.216998	$ 0.004173	$ 0.021926	$ 0.002038
2039	$ 0.685562	$ 0.437976	$ 0.219168	$ 0.004215	$ 0.022145	$ 0.002059
2040	$ 0.692418	$ 0.442356	$ 0.221359	$ 0.004257	$ 0.022366	$ 0.002079
2041	$ 0.699342	$ 0.446779	$ 0.223573	$ 0.004300	$ 0.022590	$ 0.002100
2042	$ 0.706336	$ 0.451247	$ 0.225809	$ 0.004343	$ 0.022816	$ 0.002121
2043	$ 0.713399	$ 0.455760	$ 0.228067	$ 0.004386	$ 0.023044	$ 0.002142
2044	$ 0.720533	$ 0.460317	$ 0.230347	$ 0.004430	$ 0.023275	$ 0.002164
2045	$ 0.727738	$ 0.464920	$ 0.232651	$ 0.004474	$ 0.023507	$ 0.002185
2046	$ 0.735016	$ 0.469570	$ 0.234977	$ 0.004519	$ 0.023742	$ 0.002207
2047	$ 0.742366	$ 0.474265	$ 0.237327	$ 0.004564	$ 0.023980	$ 0.002229
2048	$ 0.749789	$ 0.479008	$ 0.239700	$ 0.004610	$ 0.024220	$ 0.002252
2049	$ 0.757287	$ 0.483798	$ 0.242097	$ 0.004656	$ 0.024462	$ 0.002274
2050	$ 0.764860	$ 0.488636	$ 0.244518	$ 0.004703	$ 0.024706	$ 0.002297
2051	$ 0.772509	$ 0.493522	$ 0.246963	$ 0.004750	$ 0.024954	$ 0.002320
2052	$ 0.780234	$ 0.498458	$ 0.249433	$ 0.004797	$ 0.025203	$ 0.002343
2053	$ 0.788036	$ 0.503442	$ 0.251927	$ 0.004845	$ 0.025455	$ 0.002366
2054	$ 0.795917	$ 0.508477	$ 0.254447	$ 0.004893	$ 0.025710	$ 0.002390
2055	$ 0.803876	$ 0.513561	$ 0.256991	$ 0.004942	$ 0.025967	$ 0.002414
2056	$ 0.811914	$ 0.518697	$ 0.259561	$ 0.004992	$ 0.026226	$ 0.002438
2057	$ 0.820034	$ 0.523884	$ 0.262157	$ 0.005042	$ 0.026489	$ 0.002462
2058	$ 0.828234	$ 0.529123	$ 0.264778	$ 0.005092	$ 0.026754	$ 0.002487
2059	$ 0.836516	$ 0.534414	$ 0.267426	$ 0.005143	$ 0.027021	$ 0.002512
2060	$ 0.844881	$ 0.539758	$ 0.270100	$ 0.005195	$ 0.027291	$ 0.002537
2061	$ 0.853330	$ 0.545156	$ 0.272801	$ 0.005246	$ 0.027564	$ 0.002562

Avoided costs are the unit cost to serve the next unit of demand with a supply-side resource option.

- • Cascade's SENDOUT® model produces a marginal cost report which shows the daily incremental cost to serve the next unit of demand.
- The computed marginal cost includes
  - price of natural gas
  - fixed and variable transportation charges
  - fixed and variable charges related to storage
- Distribution costs are not currently included in Cascade's avoided cost.
- The draft 2016 IRP cost effectiveness tests use the avoided costs from the most developed (as of September 2012) IRP for the base case portfolio resources.

The high and low natural gas price sensitivities that are being developed for the 2016 IRP are used to scale the base case avoided cost up or down to produce the high and low avoided cost sensitivities.

For many years, The Northwest Power and Conservation Council (NPCC) has utilized a 10% cost advantage for electric utilities acquiring conservation resources to realize the benefits of not using supply side resources. Such electric utility benefits include reduced fish and wildlife impacts, load stability, load predictability and improved air quality. As discussed in Section 6, when calculating the avoided cost figures, the company includes an incremental cost advantage for conservation resources. Historically, Cascade has included the 10% cost advantage for conservation resources which was consistent with regon's requirements for gas utilities for mandated residential weatherization programs. For this plan, the company developed a graduated scale ranging from 5% for short-term measures up to a 20% factor for longer-lived measures. The use of a graduated scale is an attempt to recognize non-quantifiable benefits associated with conservation, such as price certainty and a hedge value against future carbon costs.
At the time of this writing, specific details on the level of carbon allowances and how they may be allocated to the gas utilities under a cap and trade program are still unknown.

Admin Adder	5.00%
Conservation Credit	10.00%
Electric: Carbon Adder	20.00%
Gas: Carbon Adder	10.00%

To develop avoided cost figures associated with the reduction of incremental natural gas usage, a demand forecast, existing and future supply-side resources and demand-side resources are required. Cascade utilizes SENDOUT® model results to produce avoided costs, using the Marginal Cost of Gas report, with the Company's 3.52%)discount rate across the planning horizon. Starting with year 21 we assume and apply a flat price forecast with the the DSM discount applied through the end of the 45 year period.

The Company assumes the Expected Average Cost as the appropriate data set for the analysis of avoided costs and calculation of the cost-effectiveness limits (CELs). However, Appendix H includes tables that provide the avoided costs and CEL calculations expected minimum and expected maximum Monte-Carlo results as well as the various Carbon Cost scenarios included in the Plan. This will allow the company to further analyze its Conservation potential curves and the magnitude of the measures that could be deemed cost-effective depending on the outcome of the Carbon Cost proposals.