

# Avoided Capacity Cost

## Introduction

The avoided capacity cost for future energy efficiency (“EE”) programs is a function of the year the program begins, the timing of the Companies’ need for new generating capacity, and the nature and duration of the program’s energy reductions. This assessment estimates the avoided capacity cost for two types of EE programs.<sup>1</sup> The first type of EE program is a dispatchable program, such as the Companies’ direct load control program. This program includes annual incentive payments and displaces the need for new capacity indefinitely. The second type of EE program is a one-time expense program. This program includes a one-time investment in an energy efficiency asset (e.g., high-efficiency lighting or insulation), and the capacity benefit extends through the life of the asset.

## Dispatchable Program

The avoided capacity cost for new dispatchable EE programs is primarily dependent on the year the program begins and the timing of the Companies’ need for new generating capacity. Because the duration of the program is assumed to extend through the life of the capacity that would be needed in the absence of the program, a dispatchable EE program is assumed to eliminate this need for capacity. In addition, because a dispatchable EE program includes annual incentive payments, the avoided capacity cost is higher for a dispatchable EE program that is added closer to the Companies’ need for capacity. If the Companies do not have a need for new capacity, the avoided capacity cost is zero; however, if the Companies have an immediate need for new capacity, the avoided capacity cost is approximately equal to the carrying cost of new capacity. If a dispatchable EE program is added after the year new capacity is needed, the avoided capacity cost will be significantly diminished, as it will then be a function of the Companies’ next need for capacity.

Table 1 and Table 2 demonstrate how the avoided capacity cost for new dispatchable EE programs changes with the year the program begins and the timing of the need for new capacity. A dispatchable program’s energy reductions can be peaking or intermediate in nature. Table 1 shows the avoided capacity cost for a dispatchable program based on the capital and fixed costs of a simple-cycle combustion turbine (“SCCT”), which is typically a peaking resource.<sup>2</sup> Based on the 2021 Plan load and current retirement assumptions, the Companies have a need for new capacity in 2028.<sup>3</sup> Therefore, if a new dispatchable EE program with peaking energy reductions begins in 2023, its avoided capacity cost in 2023 and subsequent years would be \$88/kW-yr. If another new dispatchable EE program with peaking energy reductions begins in 2024, its avoided capacity cost in 2024 and subsequent years would be \$95/kW-yr, and so on. If a dispatchable EE program with peaking energy reductions is added in 2028

<sup>1</sup> This analysis focuses only on avoided capacity cost. Avoided energy costs are not considered.

<sup>2</sup> The avoided capacity costs in this assessment assume program characteristics similar to and are computed based on the cost of generating resources evaluated in the Companies’ Analysis of 2020 Environmental Compliance Plan Projects in March 2020 and their Analysis of Generating Unit Retirement Years in October 2020. Table 7 shows capital and fixed costs assumptions for new capacity in this assessment. Before the Companies commit to building new capacity, the cost of new capacity is assessed against other market available alternatives to identify the lowest reasonable cost alternative.

<sup>3</sup> See Table 9 for the Companies’ current retirement assumptions.

(i.e., the year of capacity need), its avoided capacity cost in 2028 and subsequent years is approximately equal to the carrying cost of the new peaking capacity that would have been added in 2028 (\$128/kW-yr).

**Table 1 – Avoided Capacity Cost for Dispatchable Programs with Peaking Energy Reductions (\$/kW-yr)**

		First Year of New Dispatchable Program													
		2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Year of Capacity Need	2023	117													
	2024	110	119												
	2025	104	112	121											
	2026	98	106	114	123										
	2027	93	100	108	116	125									
	2028	88	95	102	110	118	128								
	2029	83	90	96	104	112	120	130							
	2030	79	85	91	98	106	114	123	132						
	2031	75	80	86	93	100	107	116	125	135					
	2032	71	76	82	88	95	102	109	118	127	137				
	2033	67	72	78	83	90	96	104	111	120	129	139			
	2034	64	69	74	79	85	91	98	105	113	122	132	142		
	2035	61	65	70	75	80	86	93	100	107	115	124	134	145	
	2036	58	62	66	71	76	82	88	94	102	109	118	127	136	147

Table 2 shows the avoided capacity cost for a dispatchable program based on the capital and fixed costs of a natural gas combined cycle unit (“NGCC”), which is typically a baseload or intermediate resource. If a dispatchable EE program with intermediate energy reductions is added in 2028 (i.e., the year of capacity need), its avoided capacity cost in 2028 and subsequent years is approximately equal to the carrying cost of the new intermediate capacity that would have been added in 2028 (\$165/kW-yr).

**Table 2 – Avoided Capacity Cost for Dispatchable Programs with Intermediate Energy Reductions (\$/kW-yr)**

		First Year of New Dispatchable Program													
		2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Year of Capacity Need	2023	151													
	2024	143	154												
	2025	136	146	156											
	2026	129	138	148	159										
	2027	123	131	141	151	162									
	2028	116	125	134	143	154	165								
	2029	111	118	127	136	146	156	168							
	2030	105	113	121	129	138	148	159	171						
	2031	100	107	115	123	131	141	151	162	174					
	2032	95	102	109	117	125	134	143	154	165	177				
	2033	90	97	103	111	119	127	136	146	156	168	180			
	2034	86	92	98	105	113	121	129	139	149	159	171	183		
	2035	82	87	93	100	107	115	123	132	141	151	162	174	186	
	2036	78	83	89	95	102	109	117	125	134	143	154	165	177	190

## One-Time Expense Program

The avoided capacity cost for new one-time expense programs is primarily dependent on the timing of the Companies’ need for new generating capacity, the nature and duration of the program’s energy reductions, and the year the program begins. Because the duration of the program’s energy reductions is limited to the life of the energy efficiency asset, a one-time expense program typically only defers the need for new capacity and does not eliminate it altogether.

A one-time expense program’s energy reductions can be peaking or intermediate in nature (e.g., the energy reductions associated with a one-time investment in high-efficiency lighting or insulation may more closely resemble intermediate generating capacity, while the energy reductions associated with an investment in high-efficiency air conditioning units may more closely resemble peaking capacity). Table 3 shows how the avoided capacity cost for one-time expense programs changes with the timing and duration of the program, assuming the program’s energy reductions are typically peaking in nature. The year of capacity need is assumed to be 2028, as with the Companies’ 2021 Plan load and current retirement assumptions. If a new one-time expense program begins in 2023 and provides energy reductions for one to five years, its avoided capacity cost would be zero because the program would end before the Companies’ next capacity need in 2028. If a new one-time expense program begins in 2023 and affects load in mostly peak hours for 12 years, its avoided capacity cost in years 2023 through 2034 would be \$44/kW-yr. Likewise, if a new one-time expense program begins in 2028 and affects load in mostly peak hours for 15 years, its avoided capacity cost in years 2028 through 2042 would be \$96/kW-yr.

**Table 3 – Avoided Capacity Cost for One-Time Expense Programs with Peaking Energy Reductions, Assuming 2028 Capacity Need (\$/kW-yr)**

		First Year of New One-Time Expense Program													
		2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Duration of New Program (years)	1	0	0	0	0	0	86	0	0	0	0	0	96	0	0
	2	0	0	0	0	42	87	0	0	0	0	47	97	0	49
	3	0	0	0	27	56	88	0	0	0	30	63	98	32	66
	4	0	0	20	41	64	89	0	0	22	45	71	99	48	75
	5	0	15	31	49	69	89	0	17	35	55	76	100	58	81
	6	12	25	40	55	72	90	14	28	44	61	80	100	65	85
	7	21	33	46	60	75	91	23	37	51	66	83	101	70	88
	8	28	39	50	63	77	92	31	43	56	70	85	102	74	90
	9	33	43	54	66	79	92	37	48	60	73	87	103	77	92
	10	37	47	57	68	80	93	42	52	64	76	89	103	80	94
	11	41	50	60	70	81	94	46	56	67	78	91	104	82	96
	12	44	53	62	72	83	94	49	59	69	80	92	105	85	97
	13	47	55	64	74	84	95	52	61	71	82	93	106	86	98
	14	49	57	66	75	85	96	55	64	73	83	95	106	88	100
	15	51	59	67	76	86	96	57	66	75	85	96	107	90	101

Table 4 shows how the avoided capacity cost for one-time expense programs changes with the timing and duration of the program, assuming the program's energy reductions are typically intermediate in nature. Capital and fixed expenses of a natural gas combined cycle unit ("NGCC"), which is typically a baseload or intermediate resource, are used to calculate avoided capacity costs. The year of capacity need is assumed to be 2028, as with the Companies' 2021 Plan load and current retirement assumptions.

**Table 4 – Avoided Capacity Cost for One-Time Expense Programs with Intermediate Energy Reductions, Assuming 2028 Capacity Need (\$/kW-yr)**

		First Year of New One-Time Expense Program													
		2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Duration of New Program	1	0	0	0	0	0	122	0	0	0	0	0	135	0	0
	2	0	0	0	0	59	123	0	0	0	0	65	136	0	69
	3	0	0	0	38	79	124	0	0	0	42	88	137	44	93
	4	0	0	28	57	90	125	0	0	31	64	100	139	67	105
	5	0	21	44	69	96	126	0	24	49	77	107	140	81	113
	6	17	36	56	78	101	127	19	40	62	86	112	141	91	118
	7	30	46	64	84	105	128	33	51	71	93	116	142	98	123
	8	39	54	71	89	108	129	43	60	79	98	120	143	104	126
	9	47	61	76	93	110	130	52	67	84	103	123	144	108	129
	10	53	66	80	96	113	131	59	73	89	106	125	145	112	132
	11	58	70	84	99	114	131	64	78	93	110	127	146	115	134
	12	62	74	87	101	116	132	69	82	97	112	129	147	118	136
	13	66	78	90	103	118	133	73	86	100	115	131	148	121	139
	14	69	80	92	105	119	134	77	89	103	117	132	149	124	141
	15	72	83	95	107	121	135	80	92	105	119	134	151	127	143

To demonstrate how the avoided capacity cost changes with the year of capacity need, Table 5 shows the avoided capacity cost for one-time expense programs with peaking energy reductions, assuming the year of capacity need is 2026.

**Table 5 – Avoided Capacity Cost for One-Time Expense Programs with Peaking Energy Reductions, Assuming 2026 Capacity Need (\$/kW-yr)**

		First Year of New One-Time Expense Program													
		2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Duration of New Program	1	0	0	0	83	0	0	0	0	0	0	0	96	0	0
	2	0	0	40	84	0	0	0	0	0	0	47	97	0	49
	3	0	26	54	85	0	0	0	0	0	30	63	98	32	66
	4	19	39	62	86	0	0	0	0	22	45	71	99	48	75
	5	30	48	66	86	0	0	0	17	35	55	76	100	58	81
	6	38	53	69	87	0	0	14	28	44	61	80	100	65	85
	7	44	57	72	88	0	11	23	37	51	66	83	101	70	88
	8	49	61	74	88	9	20	31	43	56	70	85	102	74	90
	9	52	63	76	89	17	26	37	48	60	73	87	103	77	92
	10	55	66	77	90	23	32	42	52	64	76	89	103	80	94
	11	58	68	79	90	28	37	46	56	67	78	91	104	82	96
	12	60	69	80	91	32	40	49	59	69	80	92	105	85	97
	13	62	71	81	92	36	44	52	61	71	82	93	106	86	98
	14	63	72	82	92	39	47	55	64	73	83	95	106	88	100
	15	65	74	83	93	42	49	57	66	75	85	96	107	90	101

Table 6 shows the avoided capacity cost for one-time expense programs with intermediate energy reductions, assuming the year of capacity need is 2026.

**Table 6 – Avoided Capacity Cost for One-Time Expense Programs with Intermediate Energy Reductions, Assuming 2026 Capacity Need (\$/kW-yr)**

		First Year of New One-Time Expense Program													
		2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Duration of New Program	1	0	0	0	117	0	0	0	0	0	0	0	135	0	0
	2	0	0	57	118	0	0	0	0	0	0	65	136	0	69
	3	0	37	76	119	0	0	0	0	0	42	88	137	44	93
	4	27	55	87	120	0	0	0	0	31	64	100	139	67	105
	5	43	67	93	121	0	0	0	24	49	77	107	140	81	113
	6	54	75	98	122	0	0	19	40	62	86	112	141	91	118
	7	62	81	101	123	0	16	33	51	71	93	116	142	98	123
	8	68	86	104	124	13	28	43	60	79	98	120	143	104	126
	9	73	89	107	125	24	37	52	67	84	103	123	144	108	129
	10	78	93	109	126	32	45	59	73	89	106	125	145	112	132
	11	81	95	111	127	39	51	64	78	93	110	127	146	115	134
	12	84	98	112	128	45	57	69	82	97	112	129	147	118	136
	13	87	100	114	129	50	61	73	86	100	115	131	148	121	139
	14	89	102	115	130	55	66	77	89	103	117	132	149	124	141
	15	91	103	116	130	59	69	80	92	105	119	134	151	127	143

## Assumptions

### New Capacity Costs

Table 7 shows the costs of new capacity used to determine avoided capacity costs. In evaluating avoided capacity cost, the Companies assumed the life of the new EE program is equal to that of the capacity being displaced.

**Table 7 – New Capacity Costs (2019 Dollars)**

	SCCT	1x1 NGCC
Capital (\$/kW)	586	1,062
Capital Escalation Rate	1.65%	1.66%
Fixed Costs (\$/kW-yr) <sup>4</sup>	35.4	29.9
Fixed Costs Escalation Rate	2.0%	2.0%
Life (Years)	30	40

### Key Financial Inputs

Table 8 shows the key financial inputs used to determine avoided capacity costs.

**Table 8 – Key Financial Inputs**

Input	Value
Return on Equity	10.0%
Cost of Debt	4.02%
Capital Structure	
Debt	46.6%
Equity	53.4%
Tax Rate	24.95%
Revenue Requirement Discount Rate	6.75%

### Retirement Assumptions

Table 9 shows the Companies' current retirement assumptions used in this assessment.

**Table 9 – Current Retirement Assumptions**

Units Assumed Retired	Assumed Retirement Year
Zorn 1	2022
Mill Creek 1	2025
Haefling 1-2, Paddy's Run 11-12	2026
Brown 3, Mill Creek 2	2028
Ghent 1-2	2034
Ghent 3-4	2037
Mill Creek 3-4	2039
Trimble County 1	2045
Trimble County 2	2066

<sup>4</sup> Fixed costs include fixed operating and maintenance costs as well as costs associated with reserving firm gas-line capacity.

#### Reserve Margin Considerations

The Companies carry generating resources in excess of their forecasted peak demand to account for the uncertainty in peak demand due to weather and the uncertainty in generating unit availability. The Companies' minimum target reserve margin, calculated as  $(\text{Capacity} - \text{Forecasted Peak Demand}) / (\text{Forecasted Peak Demand})$ , is 17%. The avoided capacity costs for one-time expense programs were computed with the assumption that a 1 MW reduction from the program would enable the Companies to avoid building 1.17 MW of new generating capacity. Because dispatchable programs contain the risk of communications equipment failure, the avoided capacity costs for dispatchable programs were computed with the assumption that a 1 MW reduction from the program would enable the Companies to avoid building 1.085 MW of new generating capacity.