

PACIFICORP CLASS 2 DSM DECREMENT STUDY

This document presents the methodology and results of the Class 2 demand-side management (DSM) (energy efficiency) decrement study. For this analysis, the 2015 integrated resource plan (IRP) preferred portfolio (Case C05a-3Q) was used as the starting point to calculate the decrement value (“avoided cost”) of -various types of Class 2 DSM resources.

The avoided cost of a Class 2 DSM resource is defined as its contribution to the reduction of total system production costs. To align with the DSM costs applied for resource portfolio development in the 2015 IRP using the System Optimizer capacity expansion model (SO model), cost credits are also applied to the Class 2 DSM avoided cost values reflecting (1) the transmission and distribution (T&D) investment deferral benefit, and (2) the stochastic risk reduction benefit associated with resources that do not incur variable fuel costs that are subject to market volatility.

Determination of Avoided System Production Costs

To determine the Class 2 DSM avoided cost values, PacifiCorp defines seventeen shaped Class 2 DSM resource groups at the quantities in the 2015 IRP preferred portfolio. For the purpose of this document, a resource group is described as a collection of Class 2 DSM measures that have a similar hourly load profile. Consistent with the valuation of supply-side resources, the seventeen resource groups are designed to capture the value from Class 2 DSM resources based on the location, size and shape of hourly generation savings. The difference in total system production costs (present value revenue requirement (PVRR)) between a Base Case, where Class 2 DSM resources are available, and a Change Case, where a Class 2 DSM resource group is not available, indicates the value attributable to the DSM resource group. The cost credits mentioned above are then added separately outside of the model, thereby increasing Class 2 DSM resource value consistent with modeling assumptions applied when developing the 2015 IRP preferred portfolio.

The SO model is used to perform the studies to determine both the impact on resource portfolios and the impact on total system production costs. To incorporate the complementary nature of the resource groups, eighteen Change Cases capture the value of the individual resource groups – one for each of the seventeen resource groups, plus one that does not have any Class 2 DSM resources. The difference in PVRR (PVRR(d)) between the Base Case and the Change Case that excludes all Class 2 DSM resources determines the overall benefit of the Class 2 DSM resources selected in the 2015 IRP preferred portfolio. The overall benefit is then prorated among the seventeen Class 2 DSM resource groups based on their respective PVRR(d) relative to the Base Case.

For the Change Case that excludes all Class 2 DSM resources, the resource portfolio includes two 423 MW combined cycle combustion turbines (CCCTs) on the east side of the Company’s system in 2020 and 2025, respectively. These CCCT resources are incremental to the 423 MW CCCT added in 2028 in the preferred portfolio. A 635 MW CCCT is added in 2028, and additional CCCTs are added later in the study period. The resource portfolio also adds more Class 1 DSM and front office transactions (FOTs).

When each of the seventeen resource groups is removed from the portfolio, the lost capacity and energy are generally filled by FOTs, additional cost bundles of the remaining Class 2 DSM resource groups, and Class 1 DSM. For a resource group whose capacity and load factor are relatively large, such as commercial lighting on the east side of the Company's system, a CCCT may be added to fill the lost capacity and energy when the resource group is removed. For a small resource group¹, such as residential cooling on the west side of the Company's system, market purchases generally fill the lost energy and capacity when the resource group is removed. None of the seventeen resource group-specific Change Cases add additional CCCTs prior to 2028, which is the first year a CCCT is added in the 2015 IRP preferred portfolio.

The decrement value for Class 2 DSM resources are derived as if the resources were available to the Company at no cost. This is achieved by removing the cost of a resource group from the Base Case, which includes the generation savings from the resource, before comparing the Change Case against the Base Case to arrive at the PVR(d). By calculating the PVR(d) based on total system production costs, the changes in fixed costs due to differences in the resource portfolio and changes in variable costs due to re-dispatch of the respective resource portfolio are both captured in the PVR(d) for each of the resource groups. The PVR(d) of the system production costs, along with the T&D investment deferral credit and stochastic risk reduction credit, determines the total decrement value of each resource group.

Class 2 DSM Decrement Value Results

Table 1 reports the net present value (NPV) of levelized decrement values by Class 2 DSM resource group, along with a breakdown of the cost credits (T&D investment deferral, and stochastic risk reduction). Table 2 reports the annual nominal-dollar decrement values including reductions for cost credits.

As compared to the 2013 Class 2 DSM decrement study, the updated decrement values of many resource groups decreased while some others increased. The reduction in the decrement values mainly result from changes in the preferred portfolios between the two IRPs. A significant factor impacting a reduction in decrement values is the deferral of the first generating resource from 2024 in the 2013 IRP preferred portfolio to 2028 in the 2015 IRP preferred portfolio. Moreover, the costs of CCCTs in the 2015 IRP are slightly lower as compared to the 2013 IRP. Forecast market prices of natural gas and electricity for the 2015 IRP are significantly lower than prices used for the 2013 IRP. The decrement values of several resource groups (residential cooling and commercial cooling on the east side of the Company's system, and residential cooling, commercial cooling and residential heating on the west side of the Company's system) increased due to a refinement in methodology for the decrement study. The current methodology considers inputs specific to the resource group, as opposed to generic resources, such as capacity contribution, load factor and the hourly profile of the resource groups.

¹ Small resource groups are those with less than 50 gigawatt-hour of energy selected in the 2015 IRP preferred portfolio.

Table 1 – Net Present Value of Levelized Class 2 DSM Avoided Costs and Credits, 2015-2033

Resource	Location	Load Factors	Cost Credits (\$/MWh)			Total Avoided Costs (\$/MWh)
			T&D Deferral Credit	Stochastic Risk Reduction	Total Credits	
Residential Cooling	East	9%	71.58	0.00	71.58	173.48
Residential Lighting	East	47%	13.01	2.11	15.12	66.03
Residential Whole House	East	31%	19.69	2.56	22.25	66.64
Commercial Cooling	East	14%	43.55	3.45	47.00	115.53
Commercial Lighting	East	53%	11.61	2.49	14.10	66.51
Water Heating	East	53%	11.72	0.00	11.72	59.90
Plug Loads	East	71%	8.65	0.00	8.65	52.85
Industrial	East	40%	15.35	2.31	17.67	67.07
Residential Cooling *	West	4%	137.64	0.00	137.64	202.21
Residential Heating	West	17%	37.08	0.59	37.67	101.97
Residential Lighting	West	45%	13.63	1.72	15.35	69.22
Commercial Cooling	West	13%	49.22	0.00	49.22	120.53
Residential Whole House	West	64%	9.65	0.00	9.65	58.36
Commercial Lighting	West	46%	13.40	0.30	13.71	67.24
Water Heating	West	53%	11.74	2.36	14.10	70.27
Plug Loads *	West	61%	10.15	0.00	10.15	64.42
Industrial	West	44%	13.86	2.23	16.10	70.49

* Small resource groups

Table 2 – Annual Nominal Class 2 DSM Avoided Costs, 2015-2033

	Load Factors	Decrement Values (Nominal \$/MWh)									
		2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
EAST											
Residential Cooling	9%	151.42	159.00	163.13	162.74	170.12	174.85	161.59	177.67	176.53	168.74
Residential Lighting	47%	49.81	52.16	54.06	56.19	58.62	61.07	62.22	65.16	66.33	68.96
Residential Whole House	31%	49.06	51.62	53.60	55.19	57.89	60.84	61.85	68.58	68.93	70.61
Commercial Cooling	14%	90.48	94.86	98.34	102.18	106.37	110.01	109.49	114.68	117.31	120.12
Commercial Lighting	53%	47.32	49.55	51.55	54.09	56.66	59.83	62.09	65.36	67.57	69.52
Water Heating	53%	42.01	45.53	48.46	49.32	53.11	55.92	52.57	55.14	57.84	61.53
Plug Loads	71%	34.24	36.40	38.44	41.02	42.76	45.49	50.02	56.37	62.25	56.82
Industrial	40%	50.00	52.89	54.52	57.14	59.06	61.51	65.21	68.47	70.60	72.20
WEST											
Residential Cooling	4%	178.92	180.68	183.90	187.88	191.61	194.54	198.92	203.60	207.13	208.94
Residential Heating	17%	86.65	91.13	93.73	92.78	95.34	98.58	95.21	98.69	103.89	102.49
Residential Lighting	45%	51.29	54.05	56.25	58.47	60.83	63.13	66.45	70.54	74.15	73.49
Commercial Cooling	13%	77.08	87.08	94.07	101.37	114.48	122.79	113.07	121.53	132.15	120.18
Residential Whole House	64%	34.49	40.04	45.02	45.49	51.58	56.92	51.94	57.10	63.98	57.41
Commercial Lighting	46%	47.72	52.03	54.46	56.17	59.57	63.45	62.51	65.85	70.01	69.57
Water Heating	53%	49.00	53.52	56.42	57.63	61.15	64.45	63.25	68.24	73.85	75.99
Plug Loads	61%	46.48	48.47	50.96	54.00	56.92	59.82	62.47	64.96	67.55	70.12
Industrial	44%	51.03	54.08	56.41	58.64	61.04	64.12	66.62	70.80	74.28	76.27

Table 2 – Annual Nominal Class 2 DSM Avoided Costs, 2015-2033 (Continued)

	Load Factors	Decrement Values (Nominal \$/MWh)								
		2025	2026	2027	2028	2029	2030	2031	2032	2033
EAST										
Residential Cooling	9%	183.79	173.88	173.54	186.97	184.13	183.73	189.50	231.09	227.02
Residential Lighting	47%	71.92	74.26	76.27	82.12	83.61	84.28	86.91	94.21	93.99
Residential Whole House	31%	74.60	76.30	78.52	83.46	84.86	86.74	87.75	93.46	94.48
Commercial Cooling	14%	124.47	128.51	129.90	138.38	139.72	139.94	142.03	157.29	155.62
Commercial Lighting	53%	72.56	75.25	77.02	83.25	85.30	94.37	96.55	103.00	103.75
Water Heating	53%	66.81	69.31	71.26	79.07	79.68	78.87	83.28	92.38	93.18
Plug Loads	71%	60.09	61.77	64.38	69.48	71.56	73.99	76.14	78.14	79.60
Industrial	40%	74.28	76.03	78.06	81.18	83.13	84.58	86.75	91.24	91.25
WEST										
Residential Cooling	4%	213.35	219.25	220.23	222.44	225.10	228.77	231.17	230.62	231.87
Residential Heating	17%	104.94	105.98	109.61	117.20	117.14	118.55	120.64	132.05	135.07
Residential Lighting	45%	75.40	78.16	80.36	85.66	87.65	88.52	92.03	93.63	94.72
Commercial Cooling	13%	124.68	130.37	133.65	155.85	153.84	153.53	162.15	191.44	189.47
Residential Whole House	64%	60.03	63.71	66.47	79.24	79.44	84.56	84.13	101.96	101.37
Commercial Lighting	46%	72.57	76.44	78.37	84.24	85.63	87.06	89.93	99.54	99.98
Water Heating	53%	80.00	82.45	84.32	94.64	94.90	89.51	91.98	98.12	99.24
Plug Loads	61%	71.71	75.68	77.69	79.24	81.30	83.71	85.06	86.71	88.28
Industrial	44%	78.87	81.92	83.83	87.40	89.00	90.32	92.47	100.40	100.80