



PCDS Meeting

January 31, 2024

WECC Staff

Inflator/Deflator

Inflator/Deflator

- Can't use Moody's anymore. Only permission to use it in some form of CEC-related project.
- Previous version of Moody's Deflator (2021).
 - 2022-2024 dollars: multiplier of 1.072.
- CA Department of Finance (DOF) has a deflator (November 2023) (<https://dof.ca.gov/forecasting/economics/economic-forecasts-u-s-and-california/>).
 - 2022-2024\$: multiplier of 1.069.

Approval Item

Use California Department of Finance inflator/deflator.

Fuel Prices

Coal Percentage

75% Assumed Dispatch Share.

Breakdown of Coal Cost into Fixed and Variable Components	
Assumed Fixed Share:	25%
Assumed Dispatch Share:	75%

Fuel Prices

■ Natural Gas

- This cycle we have the March 2023 Draft IEPR from CEC (not sure when it will be finalized, others have been finalized around September October).
 - [Preliminary 2023 IEPR Electric Generation Price Model | California Energy Commission](#)

■ Uranium

- Last cycle—Used 0.72 from 2021, then inflated to 2022 dollars (0.7375564) 2024 dollars (0.788447792).
- [Nuclear Fuel | US-REGEN Documentation \(epri.com\)](#)—Around \$0.7/MMBTU

■ Coal and Other

- EIA 923 five-year average 2018–2022.

Natural Gas

	1.069	January	February	March	April	May	June	July	August	September	October	November	December	2034 Average	2032 Average (2024\$)
NG_Alberta_NOVA	Burner Tip Price 2024\$	4.573244	4.477772	4.128899	4.062351	4.195803	4.29835	4.33055	4.298715	4.355901587	4.331974	4.534868	4.569412	4.346486557	3.879548522
NG_AZ_Opal Kern	Burner Tip Price 2024\$	5.447849	5.338537	4.941608	4.865256	5.015886	5.131396	5.167064	5.130095	5.194083258	5.166087	5.395203	5.433443	5.185542284	3.75885477
NG_AZ_North	Burner Tip Price 2024\$	5.818935	5.691261	5.224506	5.135524	5.314168	5.451461	5.49462	5.45209	5.528688002	5.496739	5.768332	5.814634	5.515913022	3.774444442
NG_AZ_North-South	Burner Tip Price 2024\$	5.639771	5.525301	5.105181	5.025503	5.187081	5.311413	5.350888	5.313094	5.382738483	5.354484	5.600063	5.642429	5.369828848	3.726372937
NG_AZ/Cal_Blythe	Burner Tip Price 2024\$	5.539981	5.419101	4.975286	4.891156	5.061928	5.19335	5.235116	5.195241	5.268885564	5.239089	5.498635	5.543461	5.255102542	3.82313472
NG_BC_Sumas	Burner Tip Price 2024\$	4.480772	4.387335	4.045874	3.980745	4.111373	4.211752	4.243275	4.212124	4.268104917	4.244693	4.443291	4.47711	4.258870665	3.878516224
NG_BC_Westcoast	Burner Tip Price 2024\$	4.543333	4.449896	4.108436	4.043307	4.173934	4.274313	4.305837	4.274685	4.330666394	4.307254	4.505853	4.539671	4.321432142	3.660589884
NG_Cal_Kern	Burner Tip Price 2024\$	5.498299	5.37775	4.93679	4.85279	5.021683	5.151506	5.192378	5.152274	5.22474758	5.194643	5.4514	5.495251	5.212459189	4.62822481
NG_Cal_PG&E BB	Burner Tip Price 2024\$	7.08449	6.960969	6.509809	6.423695	6.596173	6.728689	6.770248	6.729016	6.802878908	6.771871	7.034107	7.078689	6.790886089	5.704064005
NG_Cal_PG&E LT	Burner Tip Price 2024\$	8.31818	8.188411	7.714586	7.624106	7.805174	7.944274	7.98786	7.944511	8.0220173	7.989403	8.264706	8.311461	8.00955745	5.704064005
NG_Cal_Rosarito	Burner Tip Price 2024\$	5.666103	5.545223	5.101408	5.017278	5.18805	5.319472	5.361239	5.321363	5.395007661	5.365211	5.624757	5.669584	5.381224639	3.956320271
NG_Cal_SDG&E	Burner Tip Price 2024\$	7.261232	7.127479	6.636513	6.543417	6.732276	6.877606	6.923764	6.879618	6.961036632	6.928039	7.215078	7.264618	6.945889755	5.663228472
NG_Cal_SoCalGas	Burner Tip Price 2024\$	7.267782	7.134029	6.643064	6.549967	6.738826	6.884156	6.930315	6.886168	6.967586905	6.934589	7.221628	7.271168	6.952440028	5.75334241
NG_Colorado_Cheyenne	Burner Tip Price 2024\$	4.875132	4.77398	4.404578	4.334056	4.475252	4.583728	4.617735	4.58396	4.644414314	4.619009	4.833686	4.870166	4.634641347	3.671229552
NG_Colorado_WhiteR	Burner Tip Price 2024\$	4.063894	3.981704	3.681926	3.624601	3.739003	3.826858	3.85431	3.826788	3.875685784	3.854952	4.028907	4.058352	3.868081798	3.433084057
NG_Idaho_Opal	Burner Tip Price 2024\$	5.364628	5.255316	4.858386	4.782034	4.932664	5.048174	5.083842	5.046874	5.110861608	5.082865	5.311981	5.350222	5.102320634	3.671259841
NG_Montana	Burner Tip Price 2024\$	4.875132	4.77398	4.404578	4.334056	4.475252	4.583728	4.617735	4.58396	4.644414314	4.619009	4.833686	4.870166	4.634641347	3.671229552
NG_Nevada_North	Burner Tip Price 2024\$	5.635597	5.517902	5.088891	5.006785	5.170379	5.295987	5.335171	5.295705	5.365569646	5.335817	5.584582	5.626608	5.354916013	3.624187495
NG_Nevada_South	Burner Tip Price 2024\$	5.447849	5.338537	4.941608	4.865256	5.015886	5.131396	5.167064	5.130095	5.194083258	5.166087	5.395203	5.433443	5.185542284	3.75885477
NG_New Mexico_North	Burner Tip Price 2024\$	5.622259	5.506488	5.081126	5.000571	5.164387	5.290484	5.330629	5.292501	5.363212888	5.334748	5.583709	5.626799	5.349742794	3.635527714
NG_New Mexico_South	Burner Tip Price 2024\$	5.733289	5.615374	5.181376	5.099376	5.266878	5.395883	5.437133	5.398455	5.47092459	5.442113	5.696645	5.740928	5.456531184	3.631924026
NG_Oregon_Sumas	Burner Tip Price 2024\$	5.817161	5.695844	5.252263	5.167715	5.33752	5.468026	5.509067	5.468668	5.541490203	5.511147	5.769299	5.81333	5.52929419	3.937004243
NG_Oregon_Malin	Burner Tip Price 2024\$	5.52744	5.405944	4.962389	4.877675	5.047146	5.177331	5.21811	5.177511	5.250040427	5.219491	5.477164	5.520907	5.238429056	3.359355305
NG_Washington_Oregon	Burner Tip Price 2024\$	5.168559	5.060749	4.666697	4.591553	4.74233	4.858197	4.894601	4.85867	4.923299716	4.896301	5.12553	5.164584	4.912589179	3.748844654
NG_Oregon_OR and WA	Burner Tip Price 2024\$	5.248704	5.140894	4.746842	4.671698	4.822474	4.938342	4.974746	4.938814	5.003444574	4.976446	5.205675	5.244729	4.992734037	3.579425258
NG_Utah_Opal Kern	Burner Tip Price 2024\$	5.34854	5.239228	4.842299	4.765947	4.916577	5.032087	5.067755	5.030786	5.09477427	5.066778	5.295894	5.334134	5.086233296	3.654327059
NG_Washington_Sumas	Burner Tip Price 2024\$	5.817161	5.695844	5.252263	5.167715	5.33752	5.468026	5.509067	5.468668	5.541490203	5.511147	5.769299	5.81333	5.52929419	3.937004243
NG_Washington_King	Burner Tip Price 2024\$	5.171825	5.064014	4.669963	4.594819	4.745595	4.861463	4.897866	4.861935	4.926565511	4.899567	5.128796	5.16785	4.915854974	3.582862716
NG_Oregon_Washington	Burner Tip Price 2024\$	5.338398	5.230587	4.836535	4.761391	4.912168	5.028035	5.064439	5.028508	5.093137818	5.066139	5.295368	5.334422	5.08242728	3.659469127
NG_West Texas_Waha	Burner Tip Price 2024\$	5.651514	5.533599	5.099601	5.017601	5.185104	5.314109	5.355359	5.316681	5.389150263	5.360339	5.614871	5.659153	5.374756857	3.545620092
NG_Wyoming	Burner Tip Price 2024\$	4.875132	4.77398	4.404578	4.334056	4.475252	4.583728	4.617735	4.58396	4.644414314	4.619009	4.833686	4.870166	4.634641347	3.671229552

Coal Prices

Currently in 2032 ADS (2022\$)	Inflator to 2022\$	1	1.069807481	1.117834801	1.132874901	1.152987476			Assumed Fixed Share:	0.25
		2022	2021	2020	2019	2018	Average		Assumed Dispatch Share:	0.75
		Fuel Cost	Fuel Cost	Fuel Cost	Fuel Cost	Fuel Cost		1.069		
Currently in 2032 ADS (2022\$)		\$/MMBTU	\$/MMBTU	\$/MMBTU	\$/MMBTU	\$/MMBTU	Average 2022\$	Average 2024\$		
2.06 Coal_Apache		2.99	2.95	2.99	3.06	3.14	3.03	3.24		2.43
1.53 Coal_Bonanza		2.38	2.46	2.67	2.14	2.76	2.48	2.65		1.99
1.68 Coal_Cholla		2.87	2.68	2.55	2.60	2.56	2.65	2.84		2.13
1.06 Coal_Colstrip		1.24	1.23	1.26	1.21	1.19	1.23	1.31		
1.05 Coal_Comache		1.54	1.52	1.56	1.58	1.60	1.56	1.67		1.25
1.98 Coal_Coronado		3.05	2.71	2.61	2.99	3.10	2.89	3.09		2.32
1.71 Coal_Craig		2.49	2.03	2.37	2.64	2.43	2.39	2.56		1.92
0.73 Coal_Dave_Johnston		1.12	1.10	1.11	1.10	1.13	1.11	1.19		0.89
0.52 Coal_Dry_Fork		0.85	0.85	0.94	0.76	0.84	0.85	0.91		0.68
2.13 Coal_Four_Corners		3.70	3.32	3.14	3.24	3.36	3.35	3.59		2.69
1.73 Coal_Hayden		2.17	2.17	2.15	2.57	2.61	2.33	2.49		1.87
1.35 Coal_Hunter		1.82	1.82	2.01	2.04	2.05	1.95	2.08		1.56
1.49 Coal_Huntington		2.11	2.07	2.21	2.23	2.25	2.17	2.32		1.74
1.67 Coal_Intermountain		2.38	2.40	2.53	2.46	2.60	2.47	2.64		1.98
2.12 Coal_Jim_Bridger		2.50	2.85	3.09	3.03	3.33	2.96	3.17		2.37
0.80 Coal_Laramie_River		1.24	1.23	1.26	1.21	1.19	1.23	1.31		0.98
1.67 Coal_Naughton		2.35	2.78	2.73	2.71	2.57	2.63	2.81		2.11
0.66 Coal_Neil_Simpson		0.99	0.99	1.02	1.06	0.98	1.01	1.08		0.81
1.17 Coal_Nixon		1.78	1.74	1.79	1.79	1.75	1.77	1.89		1.42
0.93 Coal_Pawnee		1.40	1.33	1.37	1.40	1.40	1.38	1.47		1.10
1.00 Coal_Rawhide		1.65	1.44	1.48	1.52	1.53	1.52	1.63		1.22
1.41 Coal_San_Juan		0.92	2.07	2.48	2.26	2.32	2.01	2.15		1.61
1.31 Coal_Springerville1-2		2.73	2.32	2.20	2.25	2.28	2.36	2.52		1.89
1.71 Coal_Springerville3-4		2.73	2.32	2.20	2.25	2.28	2.36	2.52		1.89
1.26 Coal_Springerville		2.73	2.32	2.20	2.25	2.28	2.36	2.52		1.89
1.49 Coal_Sunnyside		1.49	1.49	1.49	1.49	1.49	1.49	1.59		1.19
2.25 Coal_Valmy		3.29	2.50	2.61	3.13	3.54	3.01	3.22		2.42
0.65 Coal_Wygen		0.99	0.99	1.02	1.06	0.98	1.01	1.08		0.81
0.90 Coal_Wyodak		1.32	1.30	1.36	1.31	1.38	1.33	1.43		1.07
1.32 Coal_Alberta		1.32	1.32	1.32	1.32	1.32	1.32	1.41		1.06
3.11 Coal_CA_South		3.11	3.11	3.11	3.11	3.11	3.11	3.33		2.50

Other Fuel Prices

Reached out to NWPCC, they are looking into it.

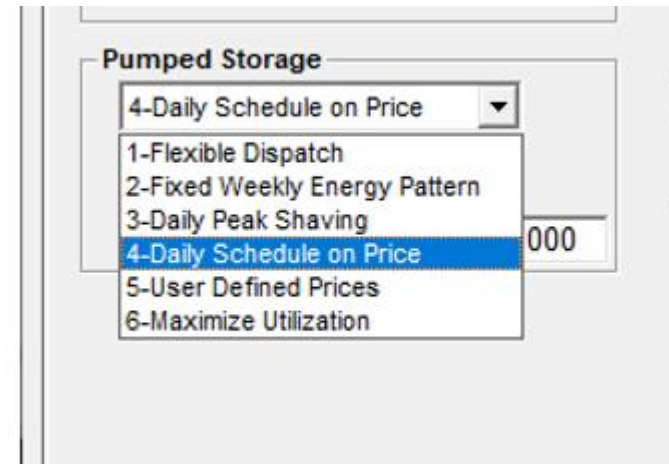
Approval Item

- Coal—Five-year (2018–2022) average based of EIA 923, assume Dispatch Share of 75%.
- Natural Gas—2023 IEPR (make mapping available)
- Other Fuels—Use values from 2032 case, inflate to 2024 dollars. Update later if information is available.

BTM Energy Storage

BTM Energy Storage

- Can do Capacity Factor in the Pumped Storage Monthly Variable Schedule table.
- Can define BTM PSH as option 3 and utility scale PSH is using option 4.
- Option 3 will reduce runtime.



Pumped Storage Options 3 and 4

- PSH option 3 is based on regional load or load–wind–solar, not by price signal. It is fixed based peak shaving and valley filling logic on the (net) load shape.
- PSH option 4 is based on bus LMP price. It will generate at high price and pump at low price.
- Only option 4 is on price.

Approval Item

- California Only
 - V1—Use PSH option 4 for BTM Energy Storage model as a resource. Find/Use capacity from the CEC hourly shapes. (Example 10 MW capacity, four-hour battery = 40 MWh).
 - V2—Look at Capacity Factor and hourly shape from CEC, compare CEC Capacity Factors to output from PCM, reassess decision for V2 (battery technology, four-hour battery?).

CO₂ Prices

Alberta Applied CO₂

- 2032 AB Cogens not hourly shape:
 - MuskegG2_2
 - ElmworthG10_10
- Need to fix for 2034, all others are hourly shape
- Alberta CO₂ prices applied
 - ST-NatGas
 - CT-NatGas-Industrial
 - Bio-ST
 - ICE-NatGas
 - CT-AB-Cogen (we will change to hourly shape)
 - CCWhole-NatGas-Industrial
 - CCWhole-NatGas-Aero
 - CCPart-Steam
 - ST-WasteHeat
 - CT-NatGas-Aero

British Columbia Applied CO₂

- CT-NatGas-Industrial
- CCWhole-NatGas-Industrial

California

- California—\$97.16/metric ton (2024 dollars)
 - 2023 Price \$29.84/metric ton
 - Last cycle \$62.697/metric ton
- 2023 IEPR Preliminary GHG Allowance Price Scenario (2023)
 - <https://efiling.energy.ca.gov/GetDocument.aspx?tn=252692&DocumentContentId=87771> (2023)

Alberta

- Alberta
 - Last cycle \$50/long ton
 - 2023 Price \$65/long ton
 - 2030 Price \$170/long ton
 - [Fuel Charge Rates for Listed Provinces and Territories for 2023 to 2030 - Canada.ca](#) (2021)

Fuel Charge Rates

“The fuel charge rates reflect a carbon pollution price of \$65 per tonne of carbon dioxide equivalent (CO₂e) in 2023 (the price currently reaches \$50 per tonne in 2022), which will rise by \$15 per tonne annually to reach \$170 per tonne in 2030. These rates are based on global warming factors and emissions factors used by Environment and Climate Change Canada to report Canada's emissions to the United Nations Framework Convention on Climate Change. Rate changes come into effect on April 1 of each year listed in the table.

The rates for gasoline and light fuel oil continue to take into account the average renewable content of these fuels.”

British Columbia

- British Columbia
 - Last cycle \$50/long ton
 - 2023 price \$65/long ton
 - [British Columbia's Carbon Tax - Province of British Columbia \(gov.bc.ca\)](https://www2.gov.bc.ca/gov/content/tax/carbon-tax)

Washington and Oregon

- Washington
 - Last cycle—Did not model
 - 2023 price \$48.5/metric ton
 - [Washington Holds First Carbon Auction, Determining Price of \\$48.50 per Ton | South Seattle Emerald](#) (2023)
- Oregon
 - Last cycle—Did not model
 - 2020 Price \$40/metric ton
 - 2040 Price \$110/metric ton
 - [Report Template \(oregon.gov\)](#) (2020)

Washington and Oregon CO₂

- Assume a GHG emission price for thermal generation located in Washington and Oregon that is equal to the California price
- Don't apply emission hurdle rates for flow into those states
- California—\$97.16/metric ton (2024 dollars)

GV Representation

	CO2 Cost		Convert to Pounds		Convert to USD from CD		GV Modeled CO2 Cost	
	CO2	CO2			As of January 26, 2024			
	Cost	Units			0.7429432	US\$/C\$		
California	97.157	\$/Metric Ton	2,204.62	LB/Mton			0.044070	\$/LB CO2
British Columbia	95.622	\$/Long Ton	2,240.00	LB/Long Ton	0.74294317	US\$/C\$	0.031715	\$/LB CO2
Alberta	95.622	\$/Long Ton	2,240.00	LB/Long Ton	0.74294317	US\$/C\$	0.031715	\$/LB CO2
Washington	97.157	\$/Metric Ton	2,204.62	LB/Mton			0.044070	\$/LB CO2
Oregon	97.157	\$/Metric Ton	2,204.62	LB/Mton			0.044070	\$/LB CO2

Approval Item

- V1—Use California value (Converted for Canada) for California, Washington, Oregon, Alberta, British Columbia
- V1—Make all CO₂ prices independent so they can be adjusted independently if needed
- V2—Check CO₂ target for Washington on the output to make sure they are close to the target
- V2—Evaluate Washington/Oregon performance and re-evaluate (Look at COI and PCDS flows also)

Dispatch Price and VOM

- Reached out to Intertek
 - They have new data coming out this week.

Update BC Hydro Data

Emailed BC Hydro for updated hydro data

