

Eastern Montana	Fuel	Nameplate Capacity (Nominal)	Design Life	Capital Cost ²	Fixed O&M (Yr 1)	Variable O&M (Yr 1) ³	Net Heat Rate Winter (HHV) ¹
Technology	(Type)	(MW)	(Years)	(\$/kW)	(\$/kW-yr)	(\$/MWH)	(Btu/kWH)
Combustion Turbine - Dry Cooling							
Simple Cycle 1x0 CT - 50 MW Frame	NG	51.4	30	\$1,361	\$12.52	\$8.30	9,970
Simple Cycle 1x0 CT - 25 MW Aeroderivative	NG	30.5	30	\$1,547	\$19.03	\$5.37	9,921
Simple Cycle 1x0 CT - 50 MW Aeroderivative	NG	49.6	30	\$1,276	\$12.78	\$4.05	9,369
Simple Cycle 1x0 CT - 50 MW Aeroderivative (NG / Fuel Oil) ⁴	NG / Fuel Oil	49.4	30	\$1,425	\$13.19	\$4.80	9,407
Simple Cycle 1x0 CT - 50 MW Aeroderivative (NG/LNG) ⁴	NG / LNG	49.6	30	\$1,700	\$13.26	\$4.37	9,399
Combined Cycle 2x1 CT - Frame/Industrial CT	NG	140.2	30	\$1,259	\$24.49	\$5.99	7,213
Combined Cycle 2x1 CT - Frame/Industrial CT w/ DB - Unfired	NG	140.6	30	\$1,312	\$24.50	\$6.00	7,192
Combined Cycle 2x1 CT - Frame/Industrial CT w/ DB - Fired	NG	159.6	30	\$1,157	\$21.60	\$5.31	7,530
Reciprocating Internal Combustion Engine							
Simple Cycle 1x0 RICE - 18 MW Class NG Only	NG	19.4	30	\$1,833	\$23.07	\$4.64	8,318
Simple Cycle 1x0 RICE - 18 MW Class NG Only (NG / LNG) ⁴	NG / LNG	19.4	30	\$2,149	\$23.43	\$4.99	8,356
Simple Cycle 1x0 RICE - 18 MW Class Dual Fuel	NG	17.9	30	\$2,017	\$25.10	\$5.73	8,505
Simple Cycle 1x0 RICE - 18 MW Dual Fuel (NG / Fuel Oil) ⁴	NG / Fuel Oil	17.4	30	\$2,075	\$29.45	\$7.38	8,545
Simple Cycle 1x0 RICE - 9 MW Class NG Only	NG	9.6	30	\$2,306	\$54.20	\$4.52	8,103
Wind Energy							
Wind Energy	N/A	105.0	25	\$1,410	\$37.00	N/A	N/A
Solar Photovoltaic (PV)							
Solar PV - Single Axis Tracking	N/A	105.0	20	\$1,330	\$21.60	N/A	N/A
Geothermal							
Geothermal - Flash Steam	N/A	21.0	30	\$2,800	\$123.98	\$9.88	1,000
Pumped Hydro Energy Storage (PHES)							
PHES - Closed Loop (9 Hour)	Elec. Grid / NG	525.0	30	\$1,700-\$3,000	\$14.55	\$0.90	N/A
Compressed Air Energy Storage (CAES)							
CAES - Diabatic (8 Hour)	Elec. Grid / NG	105.0	30	\$1,500-\$2,300	\$15.27	\$8.53	4,500
Battery Energy Storage System (BESS)							
BESS - Lithium Ion (4 Hour)	N/A	26.3	20	\$1,660	\$39.61	\$7.00	N/A
BESS - Vanadium Flow (4 Hour)	N/A	26.3	20	\$1,700	\$34.01	N/A	N/A

¹ Thermal heat rates are presented on a higher heating value (HHV) basis.

² \$/kW capital cost metrics divide estimated project costs by the net winter output for a given technology.

³ Capacity factors for dispatchable technologies assumed in order to develop O&M costs.

⁴ Dual fuel performance and costs are presented as a blend of NG and alternative fuel (NG or FO) operations (1,034 hours NG and 263 hours alternate).

Western Montana	Fuel	Nameplate Capacity (Nominal)	Design Life	Capital Cost ²	Fixed O&M (Yr 1)	Variable O&M (Yr 1) ³	Net Heat Rate Winter (HHV) ¹
Technology	(Type)	(MW)	(Years)	(\$/kW)	(\$/kW-yr)	(\$/MWH)	(Btu/kWH)
Combustion Turbine - Dry Cooling							
Simple Cycle 1x0 CT - 50 MW Frame	NG	48.1	30	\$1,433	\$13.18	\$8.73	9,986
Simple Cycle 1x0 CT - 25 MW Aeroderivative	NG	28.1	30	\$1,659	\$20.42	\$5.58	9,902
Simple Cycle 1x0 CT - 50 MW Aeroderivative	NG	47.4	30	\$1,336	\$13.38	\$4.38	9,388
Simple Cycle 1x0 CT - 50 MW Aeroderivative (NG / Fuel Oil) ⁴	NG / Fuel Oil	47.2	30	\$1,491	\$13.81	\$5.21	9,426
Simple Cycle 1x0 CT - 50 MW Aeroderivative (NG/LNG) ⁴	NG / LNG	47.4	30	\$1,780	\$13.88	\$4.72	9,418
Combined Cycle 2x1 CT - Frame/Industrial CT	NG	133.3	30	\$1,323	\$25.75	\$6.30	7,210
Combined Cycle 2x1 CT - Frame/Industrial CT w/ DB - Unfired	NG	133.3	30	\$1,385	\$25.85	\$6.31	7,221
Combined Cycle 2x1 CT - Frame/Industrial CT w/ DB - Fired	NG	151.9	30	\$1,215	\$22.69	\$5.55	7,533
Reciprocating Internal Combustion Engine							
Simple Cycle 1x0 RICE - 18 MW Class NG Only	NG	19.4	30	\$1,833	\$23.26	\$4.68	8,329
Simple Cycle 1x0 RICE - 18 MW Class NG Only (NG / LNG) ⁴	NG / LNG	19.4	30	\$2,149	\$23.62	\$5.02	8,357
Simple Cycle 1x0 RICE - 18 MW Class Dual Fuel	NG	17.9	30	\$2,080	\$25.31	\$5.77	8,463
Simple Cycle 1x0 RICE - 18 MW Dual Fuel (NG / Fuel Oil) ⁴	NG / Fuel Oil	17.4	30	\$2,075	\$29.70	\$7.41	8,503
Simple Cycle 1x0 RICE - 9 MW Class NG Only	NG	9.6	30	\$2,324	\$54.62	\$4.55	8,103
Wind Energy							
Wind Energy	N/A	105.0	25	\$1,410	\$37.00	N/A	N/A
Solar Photovoltaic (PV)							
Solar PV - Single Axis Tracking	N/A	105.0	20	\$1,330	\$21.60	N/A	N/A
Geothermal							
Geothermal - Flash Steam	N/A	21.0	30	\$2,800	\$123.98	\$9.88	1,000
Pumped Hydro Energy Storage (PHES)							
PHES - Closed Loop (9 Hour)	Elec. Grid / NG	525.0	30	\$1,700-\$3,000	\$14.55	\$0.90	N/A
Compressed Air Energy Storage (CAES)							
CAES - Diabatic (8 Hour)	Elec. Grid / NG	105.0	30	\$1,500-\$2,300	\$15.27	\$8.53	4,500
Battery Energy Storage System (BESS)							
BESS - Lithium Ion (4 Hour)	N/A	26.3	20	\$1,660	\$39.61	\$7.00	N/A
BESS - Vanadium Flow (4 Hour)	N/A	26.3	20	\$1,700	\$34.01	N/A	N/A

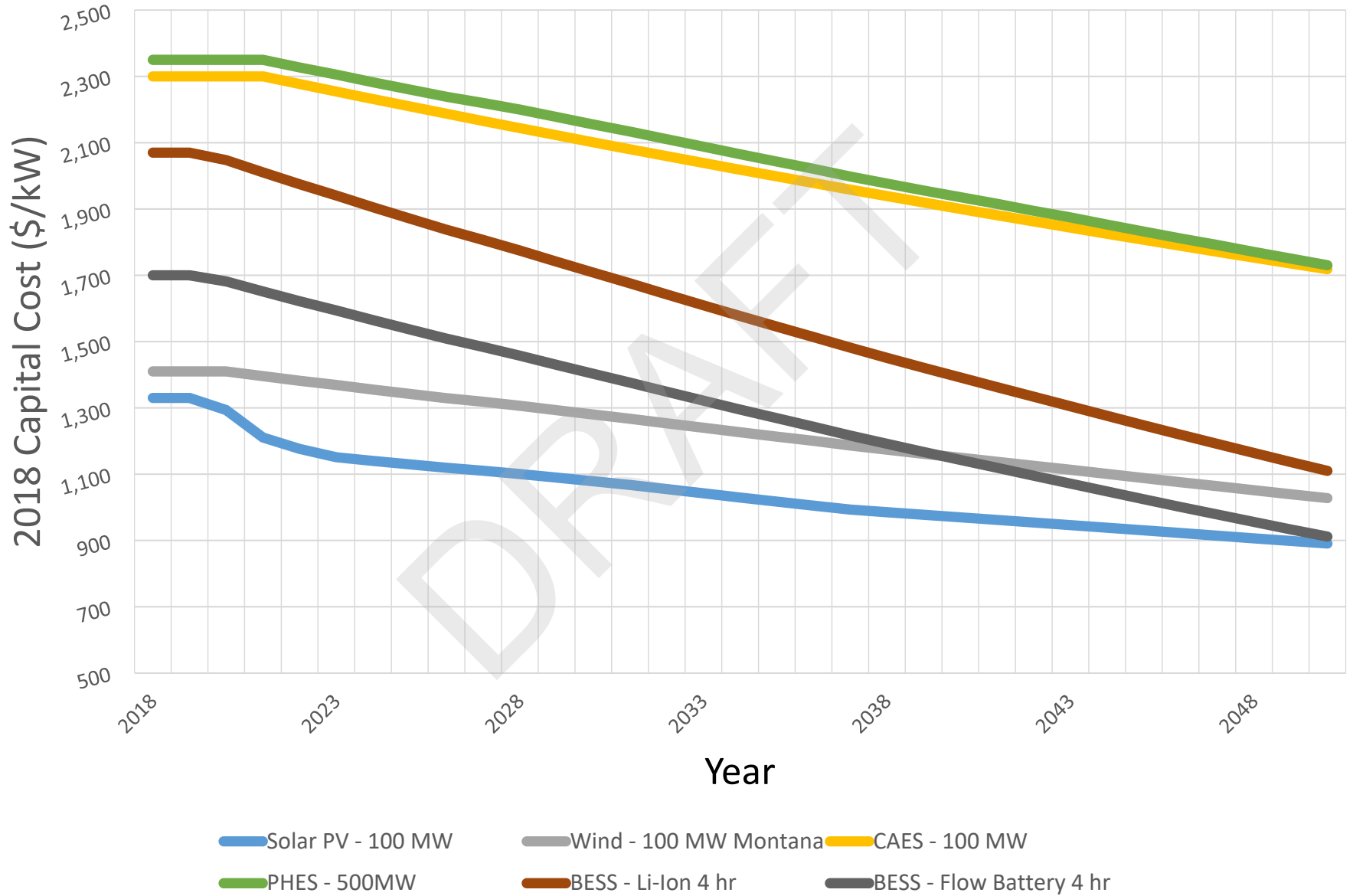
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Potential Cost Trends - Renewables and Storage



Potential Cost Trends - Thermal

