

The background image shows a close-up of industrial machinery, likely a valve or pipe assembly, with a worker's gloved hand visible in the lower left. The scene is brightly lit, suggesting an outdoor or well-lit industrial environment. A white arrow graphic points from the left edge towards the text box.

Northwestern Energy ETAC Meeting # 6 2025 MT IRP Planning Cycle

March 26, 2025



Stakeholder Working Group

Stakeholder Working Group

- The mission of the working group is to provide a broad range of perspectives and expertise to inform the development of IRPs that are in the best interest of NorthWestern Energy's customers and the State of Montana.
- Charter and Application
 - <https://www.northwesternenergy.com/about-us/gas-electric/montana-electric-supply-planning/electric-technical-advisory-committee>
 - Applications Due back April 11, 2025
- Proposed ETAC Role
 - Help evaluate applicants if more than 20 apply



IRP Work Plan

DRAFT - MT IRP Work Plan

- ETAC Suggestions?



Resource Adequacy

Resource Adequacy

- WECC Western Assessment of Resource Adequacy
 - Link: <https://feature.wecc.org/soti/index.html>



New Resource Cost Modeling

2023 MT IRP Candidate Resource Chart

No.		Nameplate Capacity				Summer WRAP ELCC			Winter WRAP ELCC		
		Generation (MW _{ac})	Storage (MW _{ac})	Installed Overnight ^{1,2} (\$/kW)	Installed Overnight w/ IRA Tax Credits ⁷ (\$/kW)	Qualifying Capacity Credit (MW _{QCC})	RR + Fixed O&M (\$/kW _{QCC} -yr)	RR w/ IRA Tax Credits + Fixed O&M ⁷ (\$/kW _{QCC} -yr)	Qualifying Capacity Credit (MW _{QCC})	RR + Fixed O&M (\$/kW _{QCC} -yr)	RR w/ IRA Tax Credits + Fixed O&M ⁷ (\$/kW _{QCC} -yr)
1	Wind	100	-	\$ 1,970	\$ 1,379	14.2	\$ 1,652.85	\$ 1,243.39	30.0	\$ 782.35	\$ 588.54
2	Wind	300	-	\$ 1,764	\$ 1,235	42.6	\$ 1,457.77	\$ 1,091.02	90.0	\$ 690.01	\$ 516.41
3	Solar PV - SAT	100	-	\$ 1,864	\$ 1,305	30.4	\$ 732.45	\$ 535.58	2.7	\$ 8,246.83	\$ 6,030.27
4	Solar PV - SAT	300	-	\$ 1,662	\$ 1,163	91.2	\$ 653.15	\$ 477.70	8.1	\$ 7,354.04	\$ 5,378.52
5	BESS - Li-Ion ³ - 2hr duration	-	25	\$ 1,242	\$ 869	10.0	\$ 382.43	\$ 278.30	10.0	\$ 382.43	\$ 278.30
6	BESS - Li-Ion - 5hr duration	-	25	\$ 2,570	\$ 1,799	25.0	\$ 322.09	\$ 235.87	25.0	\$ 322.09	\$ 235.87
7	BESS - Li-Ion - 4hr duration	-	50	\$ 1,984	\$ 1,389	40.0	\$ 311.64	\$ 228.46	40.0	\$ 311.64	\$ 228.46
8	BESS - Li-Ion - 5hr duration	-	50	\$ 2,398	\$ 1,679	50.0	\$ 302.36	\$ 221.92	50.0	\$ 302.36	\$ 221.92
9	BESS - Li-Ion - 8hr duration	-	50	\$ 3,576	\$ 2,503	50.0	\$ 454.07	\$ 334.12	50.0	\$ 454.07	\$ 334.12
10	BESS - Li-Ion - 5hr duration	-	100	\$ 2,237	\$ 1,566	100.0	\$ 283.94	\$ 208.88	100.0	\$ 283.94	\$ 208.88
11	Wind + BESS - 5hr duration	100	50	\$ 3,147	\$ 2,203	42.8	\$ 895.39	\$ 666.41	53.3	\$ 718.55	\$ 534.79
12	Solar + BESS ⁴ - 5hr duration	100	50	\$ 2,993	\$ 2,095	53.6	\$ 679.95	\$ 497.69	35.1	\$ 1,037.34	\$ 759.29
13	Solar + BESS - 5hr duration	100	100	\$ 4,009	\$ 2,806	65.2	\$ 756.55	\$ 554.48	51.4	\$ 960.60	\$ 704.03
14	Solar + BESS - 5hr duration	300	150	\$ 2,673	\$ 1,871	160.8	\$ 610.03	\$ 447.25	105.4	\$ 930.68	\$ 682.33
15	PHES (Slice of Larger Project)	-	100	\$ 3,561	\$ 2,493	100.0	\$ 348.82	\$ 249.42	100.0	\$ 348.82	\$ 249.42
16	Geothermal	20	-	\$ 4,038	\$ 2,827	19.0	\$ 621.58	\$ 482.10	19.0	\$ 621.58	\$ 482.10
17	SC CT - Aero ⁵	50	-	\$ 1,867	\$ 1,867	49.3	\$ 226.68	\$ 226.68	49.3	\$ 226.91	\$ 226.91
18	SC RICE ⁵	50	-	\$ 2,141	\$ 2,141	49.3	\$ 265.20	\$ 265.20	49.6	\$ 263.59	\$ 263.59
19	SC RICE ⁵	150	-	\$ 1,719	\$ 1,719	147.8	\$ 208.14	\$ 208.14	148.7	\$ 206.88	\$ 206.88
20	CCCT ⁶	250	-	\$ 1,640	\$ 1,640	246.5	\$ 200.73	\$ 200.73	246.3	\$ 200.93	\$ 200.93

Definitions: RR = Revenue Requirement, QCC = Qualified Capacity Credit

Notes

- Overnight installed costs include direct and indirect EPC project costs and owner's cost but exclude AFUDC, electric transmission network upgrades, and bulk gas system upgrades, as applicable.
- Overnight installed (\$/kW) and fixed O&M (\$/kW-yr) costs expressed based on dividing total costs by the renewable component output.
- BESS resources based on lithium ion technology, 365 equivalent cycles per year, and capacity augmentation throughout the study period.
- Solar + BESS hybrid resources based on dc-connected, SAT solar PV.
- O&M costs for simple cycle configurations assume a dispatch profile of 100 starts per year and 1,000 hours of operation per year.
- O&M costs for combined cycle configurations assume a dispatch profile of 150 starts per year and 4,000 hours of operation per year.
- This table presents IRA credits as a 30% reduction to the cost estimates

DRAFT 2026 IRP Candidate Resource Chart

		Generation	Storage			2025\$	2022\$		2025\$	2022\$	
No.	Montana	Scale (MW _{ac})	Scale (MW _{ac})	Duration (hours)	Capability (MWh)	Installed Overnight ¹ (\$/kW)	Installed Overnight ¹ (\$/kW)	% Increase	Variable O&M (\$/MWh)	Variable O&M (\$/MWh)	% Increase
1	Wind	50	-	-	-	\$ 2,238			\$ -		
2	Wind	100	-	-	-	\$ 2,088	\$ 1,970	6%	\$ -		
3	Wind	300	-	-	-	\$ 1,871	\$ 1,764	6%	\$ -		
4	Solar PV - SAT	50	-	-	-	\$ 2,096			\$ -		
5	Solar PV - SAT	100	-	-	-	\$ 1,937	\$ 1,864	4%	\$ -		
6	Solar PV - SAT	300	-	-	-	\$ 1,732	\$ 1,662	4%	\$ -		
7	BESS - Li-Ion ²	-	50	4	200	\$ 2,144	\$ 1,984	8%	\$ -		
8	BESS - Li-Ion ²	-	100	4	400	\$ 2,071			\$ -		
9	BESS - Li-Ion ²	-	50	8	400	\$ 3,778	\$ 3,576	6%	\$ -		
10	BESS - Li-Ion ²	-	100	8	800	\$ 3,649			\$ -		
11	BESS - Vanadium Flow	-	50	10	500	\$ 6,312			\$ -		
12	LDSE - Iron-Air	-	50	100	5,000	\$ 3,090			\$ 0.11		
13	PHES - Closed Loop	-	100	8	800	\$ 4,800	\$ 3,561	35%	\$ 0.65	\$ 1.08	-40%
14	Hybrid - Solar PV + BESS ⁵	100	50	4	200	\$ 2,960			\$ -		
15	Hybrid - Solar PV + BESS ⁵	100	100	4	400	\$ 3,960			\$ -		
16	Hybrid - Wind + BESS ⁵	100	50	4	200	\$ 3,145			\$ -		
17	Hybrid - Wind + BESS ⁵	100	100	4	400	\$ 4,118			\$ -		
18	Geothermal	25	-	-	-	\$ 5,929			\$ -		
19	Nuclear - SMR	320	-	-	-	\$ 11,015			\$ 5.15		
20	SC RICE ³	50	-	-	-	\$ 2,171	\$ 2,141	1%	\$ 15.79	\$ 2.31	583%
21	SC RICE ³	100	-	-	-	\$ 2,026			\$ 15.40		
22	SC Duel Fuel RICE ³	50	-	-	-	\$ 2,491			\$ 18.02		
23	SC CT - Aero ³	50	-	-	-	\$ 2,236	\$ 1,867	20%	\$ 6.59	\$ 0.48	1263%
24	SC CT - Aero ³	100	-	-	-	\$ 2,085			\$ 6.44		
25	SC CT - Dual Fuel Aero ³	50	-	-	-	\$ 2,379			\$ 8.08		
26	SC CT - F Class ³	200	-	-	-	\$ 1,817			\$ 3.67		
27	CCCT ⁴ - Industrial 2x1	150	-	-	-	\$ 2,359			\$ 1.66		
28	CCCT ⁴ - F Class 1x1	320	-	-	-	\$ 1,888			\$ 1.33		



Modeling Scenarios

2023 MT IRP Scenarios

No.	Scenario	Description
1	Base Case	NorthWestern's current portfolio including the Colstrip 222 MW acquisition beginning Jan 1, 2026.
2	Colstrip Retirement in 2030	Colstrip 222 MW acquisition occurs in 2026 and then Colstrip retires in 2030. The model indicates replacement resources.
3	Colstrip Retirement in 2035	Colstrip 222 MW acquisition occurs in 2026 and then Colstrip retires in 2035. The model indicates replacement resources.
4	Colstrip Retirement in 2025 with renewable replacements	Colstrip retires in 2025. The model can only select wind, solar, and energy storage for future procurements. The scenario was provided by the Joint Environmental Group ³⁶ in comments for ETAC.
5	Colstrip Retirement in 2035 with SMR replacement	Colstrip 222 MW acquisition occurs in 2026 and then Colstrip retires in 2035. A 320 MW SMR replaces Colstrip.

Base Portfolio

- NorthWestern's current generation portfolio
 - Includes 222 MW Avista acquisition and 370 MW Puget acquisition in Colstrip Units 3 and 4 starting January 2026
 - Colstrip operates through 2042
 - Does not include QF's without signed PPA as NorthWestern cannot accurately project which QFs will ultimately sign and be constructed

Proposed Scenarios for 2026 MT IRP

- A. Base Case – Colstrip retires December 31, 2042.
- B. Colstrip retires June 30, 2027, according to MATS.
- C. Colstrip complies with MATS using baghouse on July 1, 2028 (assuming 1 year extension for work in progress). Colstrip retires December 31, 2031, according to GHG.
- D. Colstrip complies with MATS using baghouse on July 1, 2028 (assuming 1 year extension for work in progress). Colstrip retires December 31, 2042.
- E. Colstrip retires December 31, 2031, according to GHG.

Proposed Base Case Sensitivities for 2026 MT IRP

- F. ARS allows carbon emitting resources to be selected after 2035. (per MPSC comments from 2023 IRP)
- G. 50% power costs.
- H. 150% power costs.
- I. 50% natural gas costs.
- J. 150% natural gas costs.
- K. Proposed data center load.



PowerSimm

PowerSimm

- Any questions after Whitepaper review?
- Output of Results
 - Is there a preferred format ETAC members would like to see?
 - Walk through SD cube report

Required Information for PowerSimm Access

- Full Name
 - Email Address
 - Cell Phone Number
 - Access to authenticator app
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- If you haven't replied to my email with information, please send an email with this required information.



Questions/Comments?