

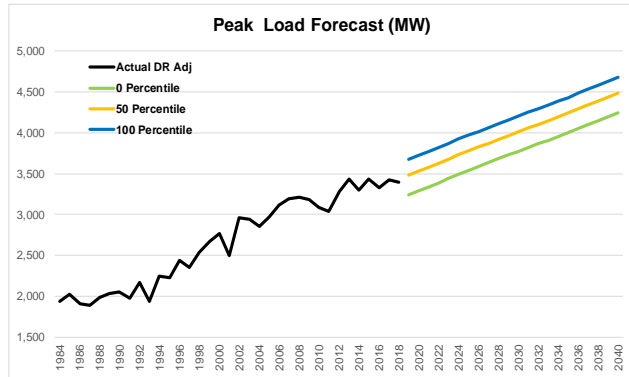


Modeling Regulation Reserve Requirements for 2021 IRP

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Integrated Resource Plan Construction



Optimized
Resource
Expansion



Preferred Portfolio
2021 IRP



Regulation Reserves



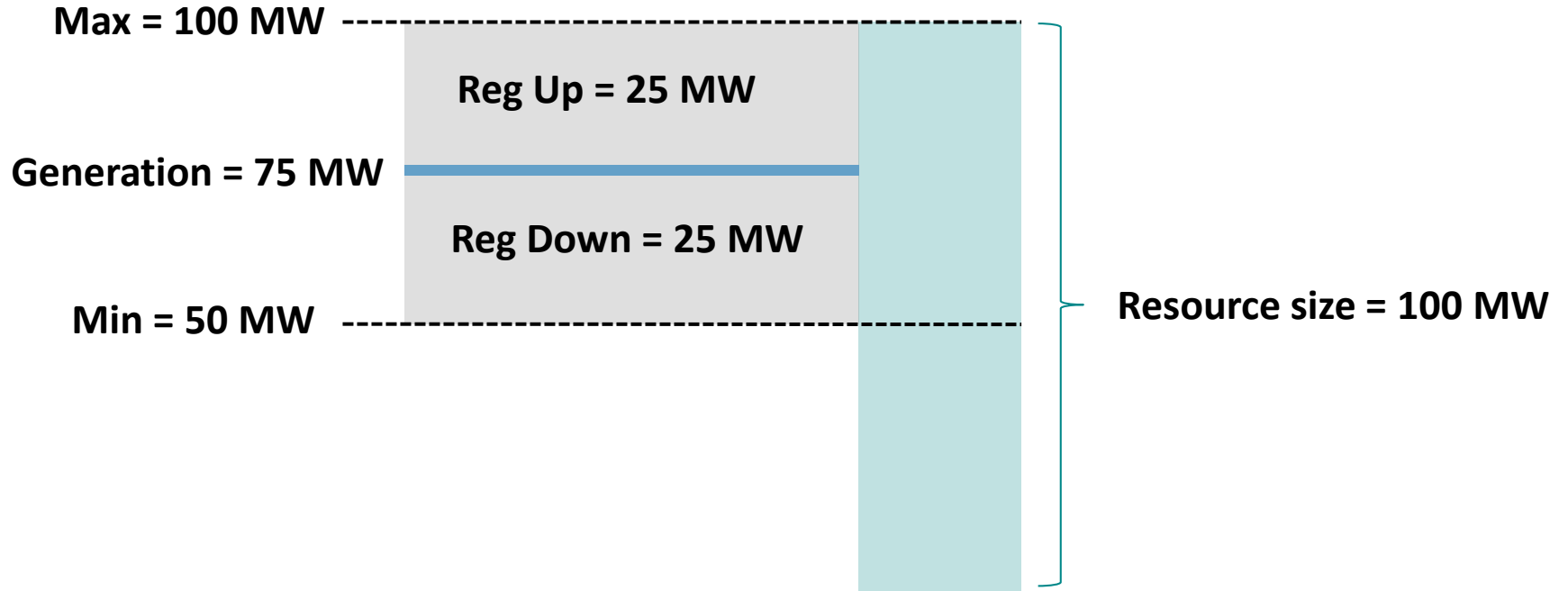
Example: Variable resource generation decreases; flexible resource needs to increase generation.



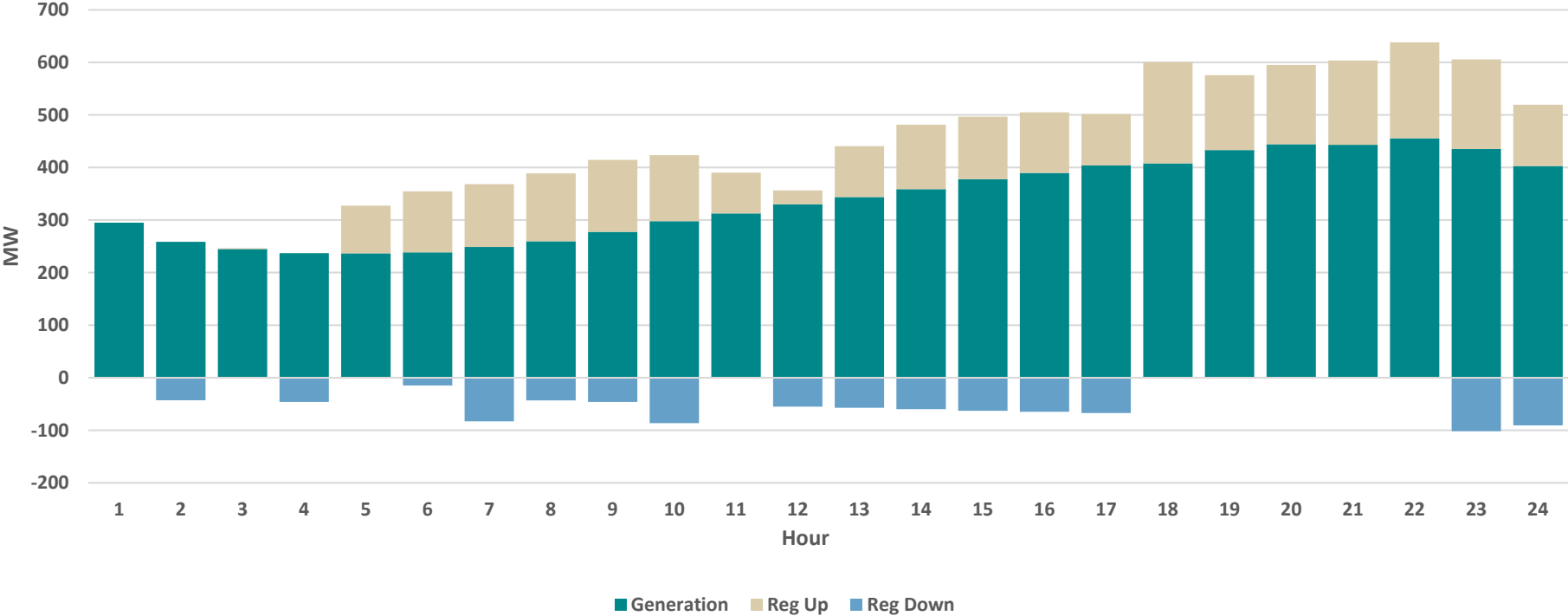
Example: Variable resource generation increases; flexible resource needs to decrease generation.



Regulation Reserves Continued

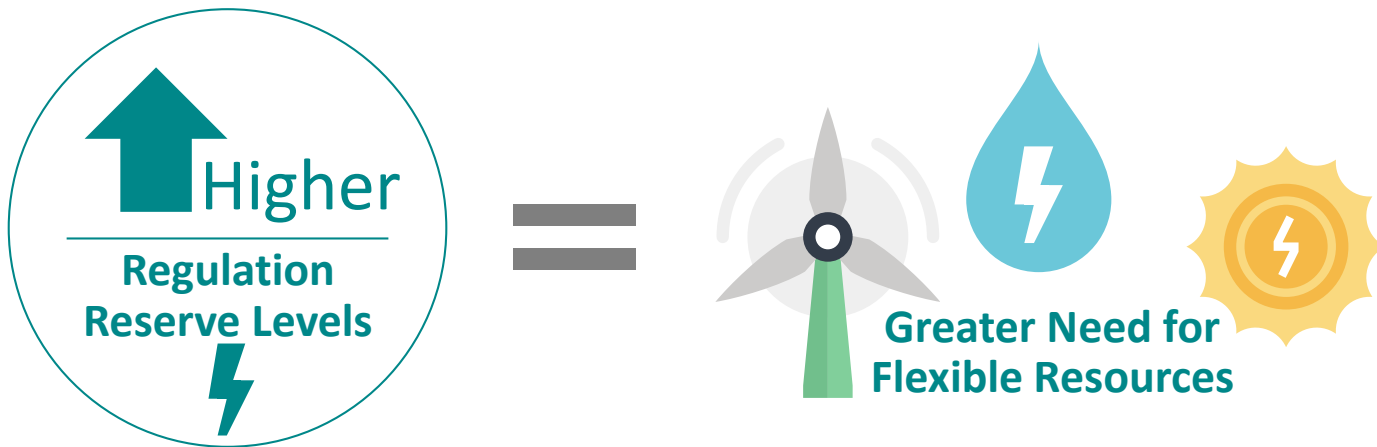


Regulation Reserves: Hydro Example



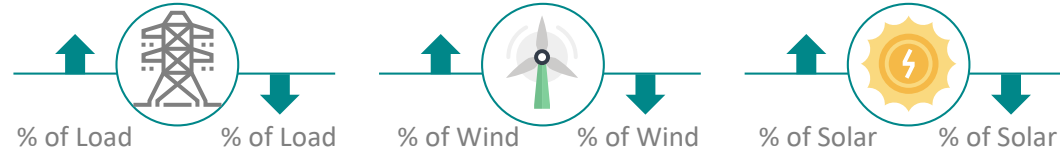


Regulation Reserves: Portfolio Impacts





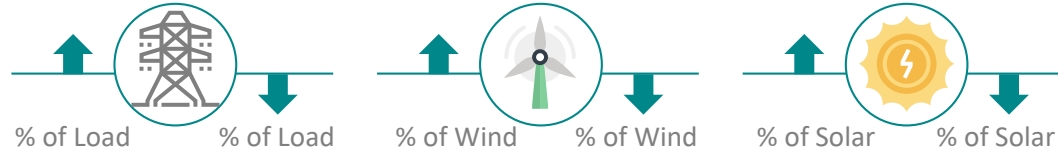
Regulation Reserve Requirements: 2019 IRP



Month	LoadUp	LoadDn	WindUp	WindDn	SolarUp	SolarDn
1	8.0%	12.7%	38.0%	0.0%	69.0%	17.0%
2	8.0%	12.7%	38.0%	0.0%	69.0%	17.0%
3	11.0%	29.1%	44.0%	0.0%	47.0%	0.0%
4	11.0%	29.1%	44.0%	0.0%	47.0%	0.0%
5	11.0%	29.1%	44.0%	0.0%	47.0%	0.0%
6	7.0%	14.2%	48.0%	0.0%	53.0%	0.0%
7	7.0%	14.2%	48.0%	0.0%	53.0%	0.0%
8	7.0%	14.2%	48.0%	0.0%	53.0%	0.0%
9	9.0%	29.1%	49.0%	0.0%	66.0%	0.0%
10	9.0%	29.1%	49.0%	0.0%	66.0%	0.0%
11	9.0%	29.1%	49.0%	0.0%	66.0%	0.0%
12	8.0%	12.7%	38.0%	0.0%	69.0%	17.0%

Table 8.1 and 8.2 from 2019 IRP

Regulation Reserve Requirements: 2021 IRP



Month	LoadUp	LoadDn	WindUp	WindDn	SolarUp	SolarDn
1	8.2%	1.7%	19.6%	19.6%	51.9%	57.6%
2	8.3%	1.6%	15.9%	21.2%	32.1%	39.3%
3	8.3%	1.7%	21.4%	22.1%	59.3%	59.3%
4	8.2%	1.7%	20.3%	26.0%	45.9%	50.6%
5	8.2%	1.6%	25.4%	34.5%	45.6%	53.7%
6	8.1%	1.6%	27.4%	21.7%	43.1%	29.3%
7	8.2%	1.4%	19.4%	22.0%	36.0%	24.6%
8	8.2%	1.5%	18.8%	23.8%	42.5%	31.9%
9	8.5%	1.8%	29.9%	29.9%	42.5%	40.5%
10	8.3%	1.6%	21.0%	31.8%	49.2%	51.4%
11	8.4%	1.8%	18.3%	29.2%	87.8%	71.8%
12	8.1%	1.6%	20.5%	39.3%	65.9%	73.3%

Table 7: Base 2023 Cases (Case 1 and Case 2) from 2020 VER Study

Comparison 2019 IRP to 2021 IRP



Average Hourly Regulation Reserves Required (MW)

	2019 IRP	2021 IRP	Difference (2021 vs. 2019)
Total Reg Up MW	291	228	-22%
Total Reg Down MW	373	120	-68%



Questions/Comments

Thank you!