

Alternative 3 & 4

Iteration 2

Transmission Solutions

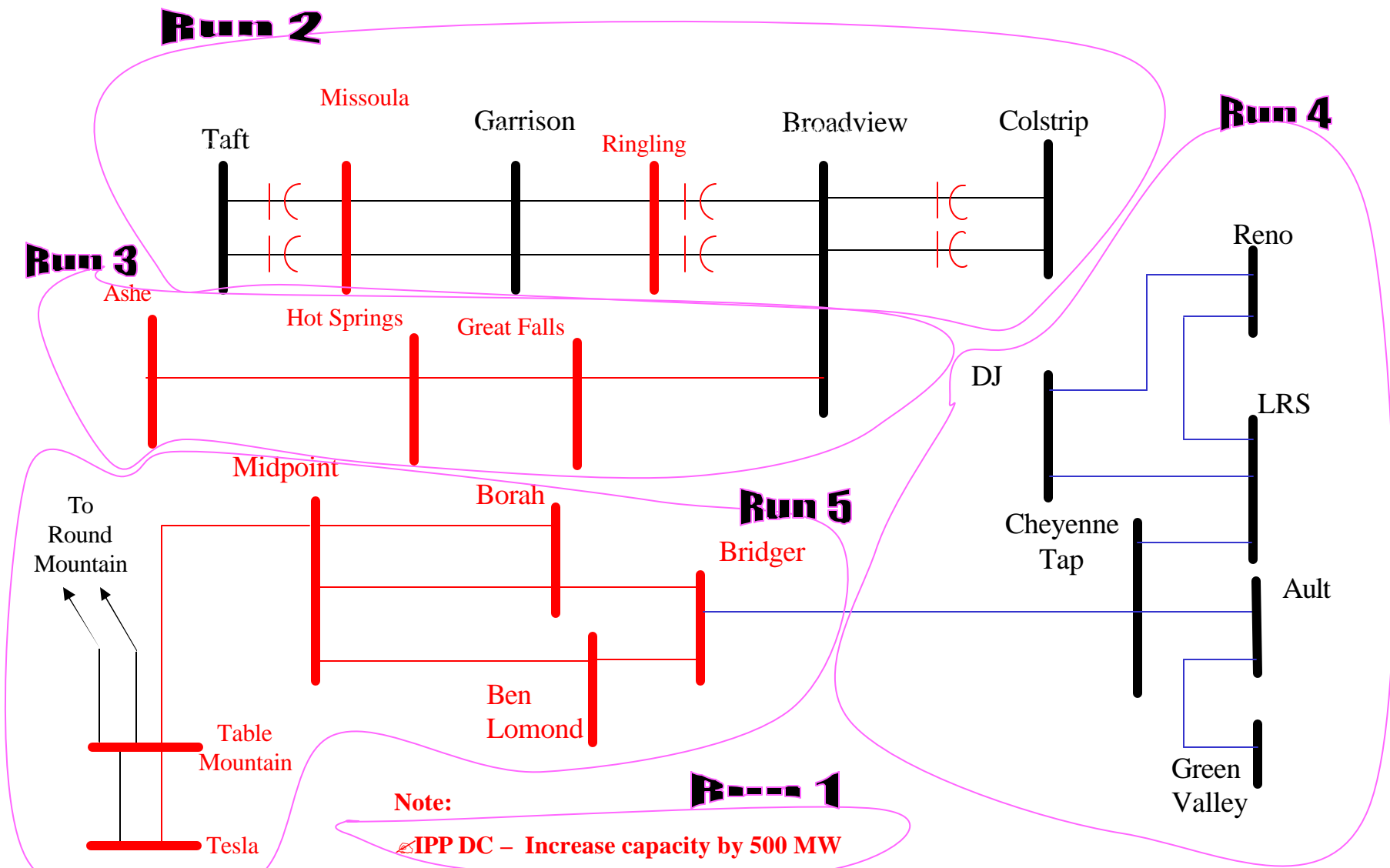
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Rocky Mountain Area Transmission Study

Alternative 3 – Option 1 (Montana to NW)

7800 MW Plan



Note:
 ⚡ IPP DC – Increase capacity by 500 MW
 ⚡ this option requires a 4th line Midway to Vincent

Alternative 3 – Option 1

Transmission Configuration	Definition	Incremental Increase (MW)
Solutions from Alt 1&2	Amps Line – Add a Phase Shifter 230 kV Midpoint to Boise Flaming Gorge Transformers	
	<i>IPP DC</i> Upgrade IPP DC	500
West of Colstrip	Colstrip Transformer 500/230 kV Colstrip to Broadview – Increase Series Compensation	500
	500 kV Broadview to Garrison tap 500 kV Broadview to Ringling – Increase Series Compensation (Replaces Broadview-Townsend lines) Series Comp @ Ringling Series Comp @ Missoula 500	500
Montana to Northwest	500 kV Broadview to Gt Falls Great Falls 500/230 Transformer, duplicate one of the transformers at Broadview 500 kV Gt Falls to Hot Springs 500 kV Hot Springs to Ashe	1000
	500 kV Chief Jo to Monroe	1500

Alternative 3 – Option 1 (Continued)

Transmission Configuration	Definition	Incremental Increase (MW)
Bridger West	500 kV Bridger to Borah; w/ 50% Series Compensation Convert Kinport-Midpoint 345 kV to 500 kV 345 kV Kinport-Borah (new) Add Borah 500/345 kV Transformer 2- 500 kV Borah-Midpoint	1000
	500 kV Bridger to Ben Lomond (add as needed) 500 kV Ben Lomond to Midpoint (add as needed)	1000
Idaho to California	500 kV Midpoint to Table Mountain to Tesla	1000
TOT 3	345 kV Reno to DJ to LRS to Cheyenne Tap to Ault to Green Valley 345 kV Reno to LRS	500
TOT 4A	345 kV Bridger to Miners to Cheyenne	500
Rocky Mountain to California	SWIP to STEP	1200

Alternative 3 – Option 1

Sensitivity Runs

Transmission Sensitivity	Definition	Miles
Run 0 <i>Common to all runs</i>	Existing System Plus: ☞ Flaming Gorge Transformers <i>Serving Idaho Load</i> ☞ 230 kV Midpoint to Boise <i>Idaho to Montana</i> ☞ Amps Line – Add a Phase Shifter	
Transmission Sensitivity	Definition	Miles
Run 1 <i>IPP DC</i>	Run 0 Plus: <i>IPP DC</i> ☞ Upgrade IPP DC	
Transmission Sensitivity	Definition	Miles
Run 2 <i>(1st layer additions, to the NW)</i>	Run 0 Plus: <i>West of Colstrip</i> ☞ Colstrip Transformer 500/230 kV ☞ Colstrip to Broadview – Increase Series Compensation <i>West of Colstrip</i> ☞ 500 kV Broadview to Garrison tap ☞ 500 kV Broadview to Ringling – Increase Series Compensation ☞ (Replaces Broadview-Townsend lines) ☞ Series Comp @ Ringling ☞ Series Comp @ Missoula 500	

Alternative 3 – Option 1

Sensitivity Runs

Transmission Sensitivity	Definition	Miles
Run 3 <i>2nd Layer Additions to the NW</i>	Run 2 Plus: ✍ 500 kV Broadview to Gt Falls ✍ Great Falls 500/230 Transformer, duplicate one of the transformers at Broadview ✍ 500 kV Gt Falls to Hot Springs ✍ 500 kV Hot Springs to Ash	
	✍ 500 kV Chief Jo to Monroe	
Transmission Sensitivity	Definition	Miles
Run 4 <i>Serving the Denver Area</i>	Run 0 Plus: TOT 3 ✍ 345 kV Reno to DJ to LRS to Cheyenne Alt to Tap to Green Valley ✍ 345 kV Reno to LRS	
	TOT 4 A ✍ 345 kV Bridger to Miners to Cheyenne	

Alternative 3 – Option 1

Sensitivity Runs

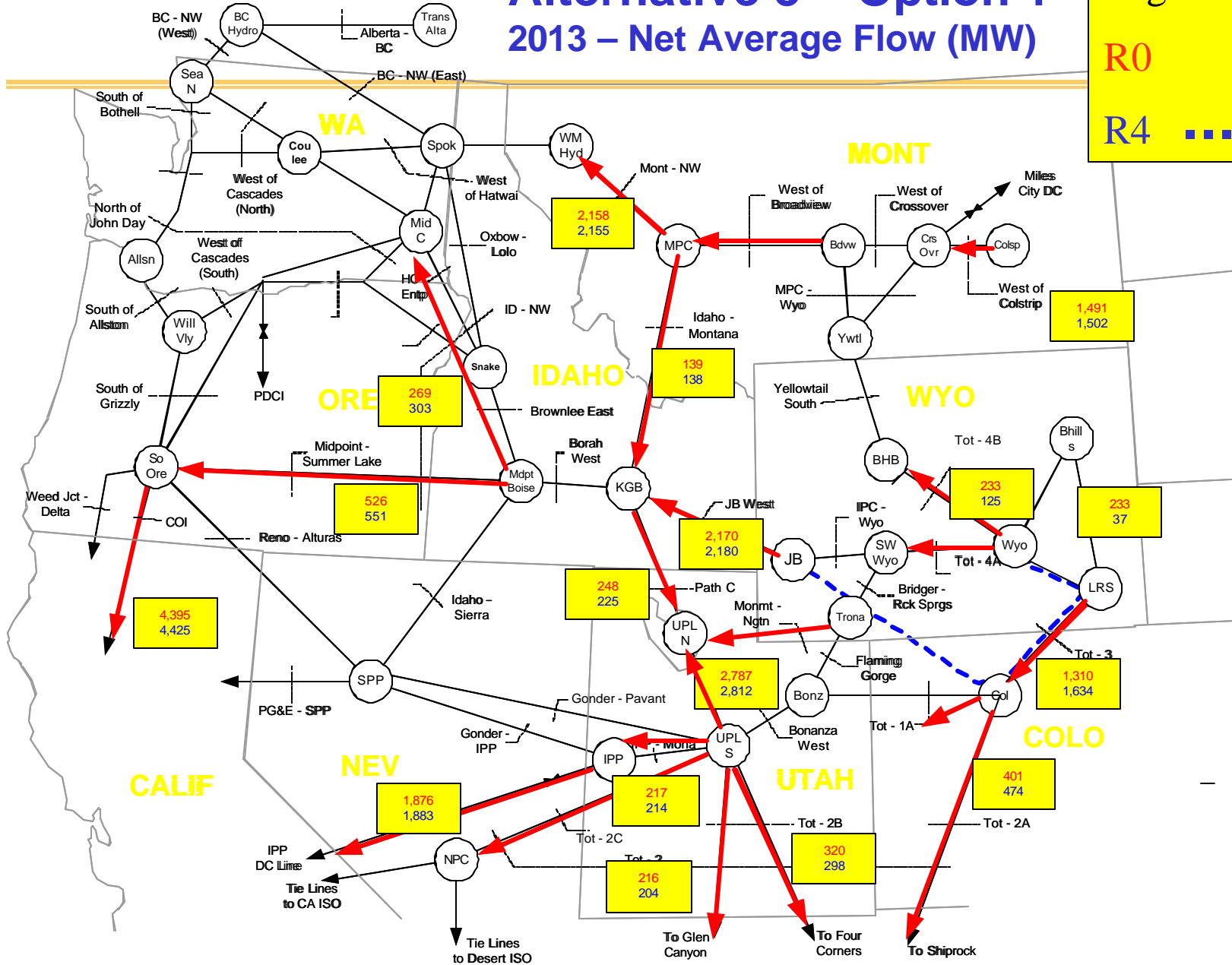
Transmission Sensitivity	Definition	Miles
Run 5 <i>Export to California</i>	Run 0 Plus: <i>Bridger West</i> ✎ 500 kV Bridger to Borah; w/ 50% Series Compensation ✎ Convert Kinport-Midpoint 345 kV to 500 kV ✎ 345 kV Kinport-Borah (new) ✎ Add Borah 500/345 kV Transformer ✎ 2- 500 kV Borah-Midpoint ✎ 500 kV Bridger to Ben Lomond ✎ 500 kV Ben Lomond to Midpoint	
	<i>Idaho to California</i> ✎ 500 kV Midpoint to Table Mountain to Tesla ✎ Midway to Vincent (if needed)	
Transmission Sensitivity	Definition	Miles
Run 6 <i>With all Solutions</i>	Run 1 + 2 + 3 + 4 + 5	

Alternative 3 – Option 1 2013 – Net Average Flow (MW)

Legend:

R0

R4

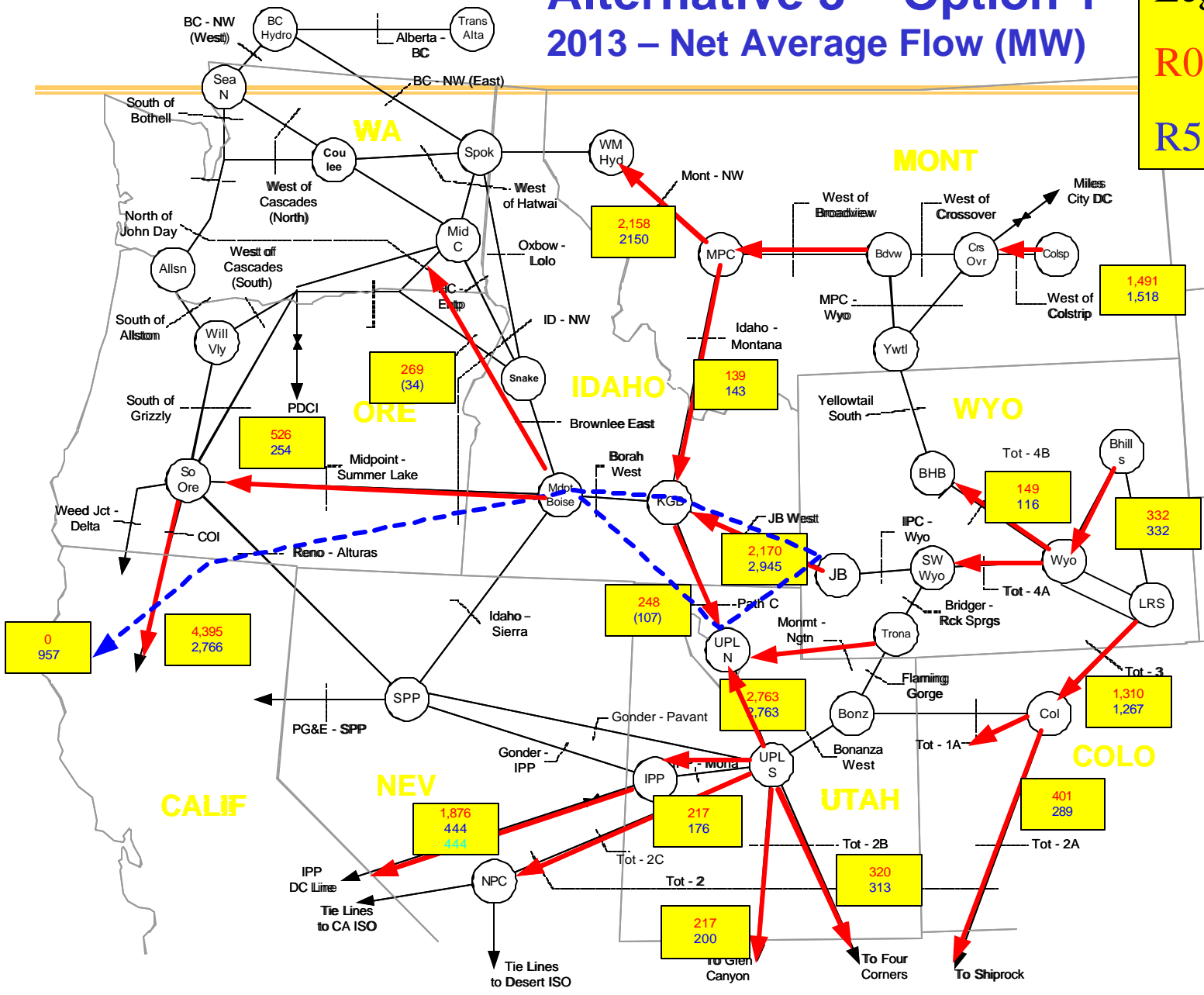


Alternative 3 – Option 1 2013 – Net Average Flow (MW)

Legend:

R0

R5



Opportunity Cost / Binding Limit

(\$000) / (% of the time)

Opportunity Cost (sorted by Run 0); Yellow highlights indicates that interface was modified

Row	Interface	Opp. Cost (\$) % Binding		IPP DC		Mont West		2nd Mont West		Wyo to Col		JB to ID to CA		1+2+3+4+5	
		Run 0		Run 1		Run 2		Run 3		Run 4		Run 5		Run 6	
1	Black Hills to C Wyoming	285,045	100%	284,256	100%	323,722	100%	440,495	100%	-	0%	379,276	1%	-	0%
2	BRIDGER WEST	242,204	82%	244,061	82%	245,502	82%	275,253	87%	277,932	88%	-	0%	350	1%
3	WEST OF BROADVIEW	191,239	61%	200,354	64%	147,854	49%	3,636	2%	186,995	60%	193,774	60%	3,698	3%
4	TOT 2C	169,697	48%	123,661	42%	159,098	48%	149,272	50%	171,744	46%	57,475	22%	38,129	15%
5	MONTANA - NORTHWEST	156,383	70%	143,455	68%	123,805	61%	53,666	26%	154,674	69%	146,976	65%	52,039	25%
6	TOT 3	143,238	52%	148,195	54%	131,202	49%	106,304	48%	80,261	34%	99,117	42%	16,805	13%
7	IPP DC LINE	73,415	90%	46,045	73%	69,502	88%	57,945	85%	75,322	89%	78,158	91%	49,860	73%
8	WOR - PV to Devers	72,028	39%	68,515	38%	67,003	39%	61,240	40%	68,726	36%	63,365	35%	46,251	31%
9	ALBERTA - BRITISH COLUMBIA	56,387	68%	55,423	26%	53,118	28%	46,699	32%	56,038	27%	48,584	32%	36,365	40%
10	BONANZA WEST	51,911	32%	82,333	42%	48,443	30%	51,762	28%	59,012	29%	63,240	31%	101,456	41%
11	North of Miguel	50,580	56%	49,678	56%	49,036	56%	47,842	56%	50,378	54%	50,464	54%	47,828	57%
12	WOR -n- El Dor to Lugo	48,561	55%	43,590	49%	47,017	55%	45,397	58%	47,225	52%	37,570	27%	27,332	26%
13	TOT 2B2	32,770	24%	14,824	12%	32,391	0%	29,603	22%	35,378	25%	34,510	22%	26,973	18%
14	SOUTHERN NEW MEXICO (NM1)	28,580	43%	28,472	43%	28,729	43%	28,277	41%	30,583	48%	30,553	45%	32,430	45%
15	West of Naughton (E-S&W)	28,326	11%	41,484	16%	27,436	11%	22,863	9%	23,978	9%	-	0%	-	0%
16	TOT 1A	22,764	19%	28,125	21%	21,430	18%	22,677	17%	24,452	21%	40,537	24%	60,275	35%
17	PAVANT, INTRMTN - GONDER 230 K	18,122	9%	1,493	1%	18,596	9%	18,454	9%	17,093	9%	1,819	1%	48,327	25%
18	SOUTHWEST OF FOUR CORNERS	16,525	7%	10,245	5%	17,124	7%	14,415	6%	17,449	7%	8,274	4%	3,024	2%
19	COI	14,398	59%	16,876	68%	14,429	60%	11,767	58%	17,147	62%	1,255	7%	1,046	5%
20	NW to Canada, East BC	13,368	8%	12,024	8%	14,884	9%	9,740	9%	12,784	8%	11,208	10%	11,868	14%
21	SW Wyoming to N Utah	13,141	2%	15,855	3%	12,470	2%	11,972	2%	10,421	2%	-	0%	-	0%
22	Combined PACI & PDCI	12,931	19%	11,456	16%	14,938	20%	16,992	21%	13,122	18%	3,461	4%	6,872	7%
23	TOT 2A	10,150	8%	9,180	7%	10,973	8%	13,807	9%	25,196	15%	2,379	2%	5,745	4%
24	PATH C	9,481	7%	13,508	9%	8,946	6%	7,399	4%	7,863	4%	6,454	9%	1,385	3%
25	IDAHO - MONTANA	6,464	2%	6,971	2%	5,380	2%	2,313	1%	7,297	3%	5,275	2%	1,878	1%
26	N to S Utah	6,337	3%	6,281	3%	6,385	3%	7,564	4%	7,082	3%	2,326	2%	1,532	2%
27	Southern CA Imports	6,167	39%	7,073	41%	6,861	43%	7,733	49%	6,375	39%	8,956	54%	13,448	76%
28	TOT 7	5,302	4%	4,809	4%	4,464	4%	2,882	3%	5,809	4%	5,131	4%	27	0%
29	Montana - Southeast	4,659	9%	2,200	5%	10,102	12%	29,364	13%	2,529	6%	6,619	9%	36,864	17%
30	IDAHO - NORTHWEST	4,483	2%	4,407	2%	4,828	2%	4,602	2%	4,333	2%	10,327	5%	8,318	5%
31	PACIFIC DC INTERTIE (PDCI)	4,266	18%	4,389	17%	3,503	15%	2,116	12%	4,352	20%	8,618	30%	5,933	21%
32	Combined 4a, 4b	4,196	6%	2,161	3%	4,433	6%	7,576	7%	14,245	18%	8,986	7%	51,976	31%
33	NORTHERN - SOUTHERN CALIFORN	4,022	22%	4,073	24%	3,936	21%	3,173	15%	4,712	25%	3,711	21%	3,555	14%
34	Idaho to California	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	281,077	81%	266,432	83%

Alternative 3 – Option 1

2013 - Total Thermal VOM (\$000)

Potential Thermal VOM Savings: \$960 million

Area Name	Run 0	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6
NEW MEXI	418,361	420,164	419,428	421,674	415,158	418,172	422,408
ARIZONA	3,343,013	3,351,849	3,341,354	3,358,594	3,308,763	3,239,295	3,196,083
NEVADA	1,324,414	1,313,718	1,313,224	1,288,960	1,327,070	1,141,584	1,086,282
WAPA L.C	408,675	406,353	408,273	408,205	397,916	389,121	384,218
MEXICO-C	867,287	866,864	866,960	868,184	866,208	862,394	862,751
IMPERIAL	18,564	18,243	18,003	17,192	18,496	17,875	15,637
SANDIEGO	706,677	697,732	702,393	710,804	693,692	696,599	691,358
SOCALIF	1,663,429	1,615,863	1,633,321	1,620,994	1,638,769	1,639,111	1,570,401
LADWP	298,932	295,224	294,248	290,591	296,463	304,670	304,228
IPP	339,073	340,505	338,875	338,860	339,554	335,495	335,588
PG AND E	3,507,169	3,525,221	3,458,751	3,362,065	3,559,741	3,938,930	3,825,351
NORTHWES	2,185,105	2,165,674	2,115,423	1,993,203	2,179,790	2,008,928	1,724,754
B.C.HYDR	552,300	549,103	535,436	516,705	550,602	517,183	472,495
AQUILA	31,307	31,437	30,817	30,005	31,278	28,558	26,688
ALBERTA	1,435,783	1,435,820	1,428,748	1,411,780	1,434,254	1,405,738	1,371,251
IDAHO	1,577	1,595	1,665	1,566	2,019	2,212	1,518
MPC	42,868	45,352	46,697	65,263	41,944	40,879	56,971
SIERRA	199,948	207,864	200,850	210,512	201,781	160,957	181,319
WYO	72,486	73,055	72,512	73,234	102,275	74,124	107,788
BONZ	65,943	64,283	66,029	66,362	64,098	66,569	64,387
UT N	122,667	128,994	123,292	127,715	122,388	113,158	121,793
UT S	354,754	373,066	357,426	370,371	354,368	335,990	360,947
COL E	574,337	577,837	579,115	588,782	499,627	568,826	556,082
COL W	193,368	190,350	193,913	193,832	194,711	191,537	189,641
B HILL	54,891	55,370	60,952	74,388	43,406	62,226	46,227
LRS	79,220	78,502	79,970	80,926	81,965	80,039	82,457
JB	233,717	237,865	236,551	233,421	185,539	300,703	298,953
BDVW	43,887	43,883	45,051	47,815	43,483	44,621	47,938
CRSOVRCO	118,806	121,472	150,004	186,028	119,831	120,965	185,687
Total	19,258,557	19,233,256	19,119,278	18,958,032	19,115,188	19,106,460	18,591,200

Delta from R0 - (25,301) (139,279) (300,526) (143,369) (152,097) (667,357)

Alternative 3 – Option 1

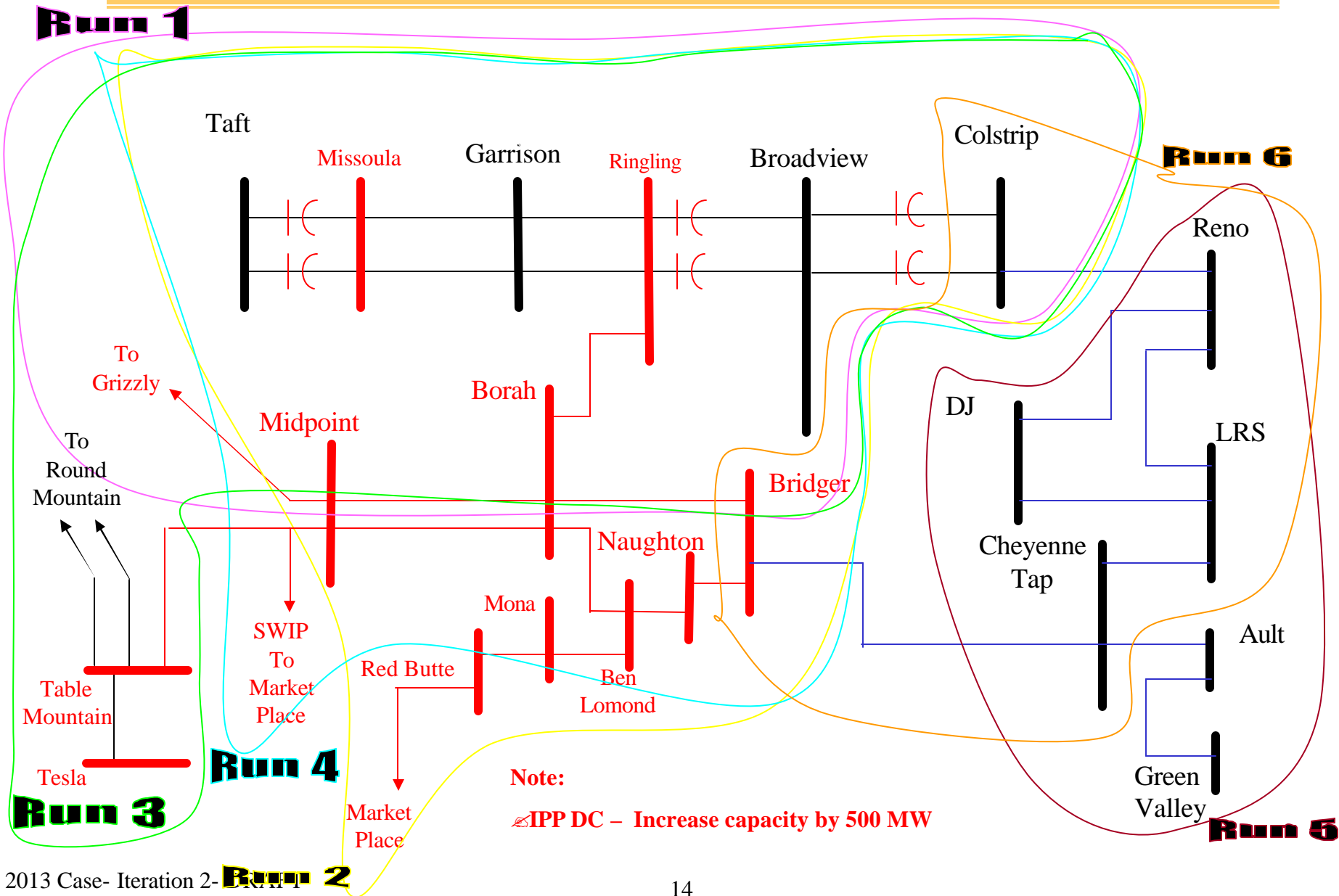
2013 – Total Thermal VOM (\$000) - Delta from Run 0

<i>Area Name</i>	<i>Run 1</i>	<i>Run 2</i>	<i>Run 3</i>	<i>Run 4</i>	<i>Run 5</i>	<i>Run 6</i>
NEW MEXI	1,803	1,067	3,313	(3,203)	(188)	4,048
ARIZONA	8,836	(1,660)	15,581	(34,251)	(103,718)	(146,930)
NEVADA	(10,696)	(11,190)	(35,454)	2,656	(182,830)	(238,132)
WAPA L.C	(2,322)	(401)	(470)	(10,759)	(19,553)	(24,457)
MEXICO-C	(423)	(327)	897	(1,079)	(4,893)	(4,536)
IMPERIAL	(321)	(562)	(1,373)	(68)	(690)	(2,928)
SANDIEGO	(8,944)	(4,284)	4,128	(12,985)	(10,078)	(15,319)
SOCALIF	(47,566)	(30,108)	(42,434)	(24,659)	(24,318)	(93,027)
LADWP	(3,708)	(4,684)	(8,341)	(2,470)	5,738	5,296
IPP	1,432	(198)	(213)	482	(3,577)	(3,485)
PG AND E	18,052	(48,418)	(145,104)	52,572	431,761	318,181
NORTHWES	(19,431)	(69,682)	(191,902)	(5,315)	(176,177)	(460,351)
B.C.HYDR	(3,197)	(16,865)	(35,595)	(1,699)	(35,118)	(79,805)
AQUILA	130	(490)	(1,302)	(29)	(2,748)	(4,619)
ALBERTA	37	(7,034)	(24,003)	(1,529)	(30,044)	(64,532)
IDAHO	18	88	(10)	443	635	(59)
MPC	2,483	3,828	22,395	(924)	(1,989)	14,103
SIERRA	7,916	902	10,565	1,834	(38,991)	(18,629)
WYO	569	26	748	29,789	1,638	35,302
BONZ	(1,660)	86	419	(1,845)	626	(1,555)
UT N	6,326	624	5,048	(279)	(9,510)	(875)
UT S	18,312	2,671	15,616	(387)	(18,764)	6,192
COL E	3,500	4,778	14,444	(74,710)	(5,512)	(18,255)
COL W	(3,017)	545	464	1,343	(1,831)	(3,727)
B HILL	479	6,061	19,497	(11,485)	7,336	(8,664)
LRS	(718)	750	1,706	2,746	819	3,237
JB	4,148	2,834	(296)	(48,177)	66,987	65,236
BDVW	(4)	1,164	3,928	(404)	734	4,051
CRSOVRCO	2,666	31,197	67,222	1,025	2,159	66,881
Total	(25,301)	(139,279)	(300,526)	(143,369)	(152,097)	(667,357)

Alternative 3 – Option 2 (Montana S & W)

7800 MW Plan

Existing —
 "New" 500 kV —
 "New" 345 kV —



Alternative 3 – Option 2

Transmission Configuration	Definition	Incremental Increase (MW)
Solutions from Alt 1&2	Amps Line – Add a Phase Shifter 230 kV Midpoint to Boise	
IPP DC	Upgrade IPP DC	500
Montana to Wyoming	Colstrip Transformer 345/230 kV Colstrip to Broadview – Increase Series Compensation	500
West of Colstrip	500 kV Broadview to Garrison tap 500 kV Broadview to Ringling – Increase Series Compensation	500
	500 kV Ringling to Borah	1000
Bridger West	500 kV Bridger to Borah; w/ 50% Series Compensation Convert Kinport-Midpoint 345 kV to 500 kV 345 kV Kinport-Borah (new) Add Borah 500/345 kV Transformer 2- 500 kV Borah-Midpoint 500 kV Bridger to Naughton to Ben Lomond (add as needed) 500 kV Ben Lomond to Borah (add as needed)	1000
Idaho to Northwest	500 kV Midpoint to Grizzly	1000
Utah to Market Place	500 kV Ben Lomond to Mona to Red Butte to Market Place	1000
Idaho to California	500 kV Midpoint to Table Mountain to Tesla	1000
TOT 3	345 kV Reno to DJ to LRS to Cheyenne Tap to Ault to Green Valley 345 kV Reno to LRS	500
TOT 4A	345 kV Bridger to Miners to Cheyenne	500
Rocky Mountain to California	SWIP to STEP	1200

Alternative 3 – Option 2

Transmission Sensitivity	Definition	Miles
Run 1 <i>To the NW</i>	(Option 1: Run 2) Plus: <i>Bridger West</i> ✍ 500 kV Ringling to Borah <i>Bridger West</i> ✍ 500 kV Bridger to Borah; w/ 50% Series Compensation ✍ Convert Kinport-Midpoint 345 kV to 500 kV ✍ 345 kV Kinport-Borah (new) ✍ Add Borah 500/345 kV Transformer ✍ 2- 500 kV Borah-Midpoint ✍ 500 kV Bridger to Naughton to Ben Lomond (add as needed) ✍ 500 kV Ben Lomond to Borah (add as needed) ✍ 500 kV Midpoint to Grizzly	
Transmission Sensitivity	Definition	Miles
Run 2 <i>Market Place</i>	Run 1 Plus: <i>Utah to Market Place</i> ✍ Take out 500 kV Midpoint to Grizzly ✍ 500 kV Ben Lomond to Mona to Red Butte to Market Place ✍ 345 kV Emery to Grand Junction	

Alternative 3 – Option 2 (Continued)

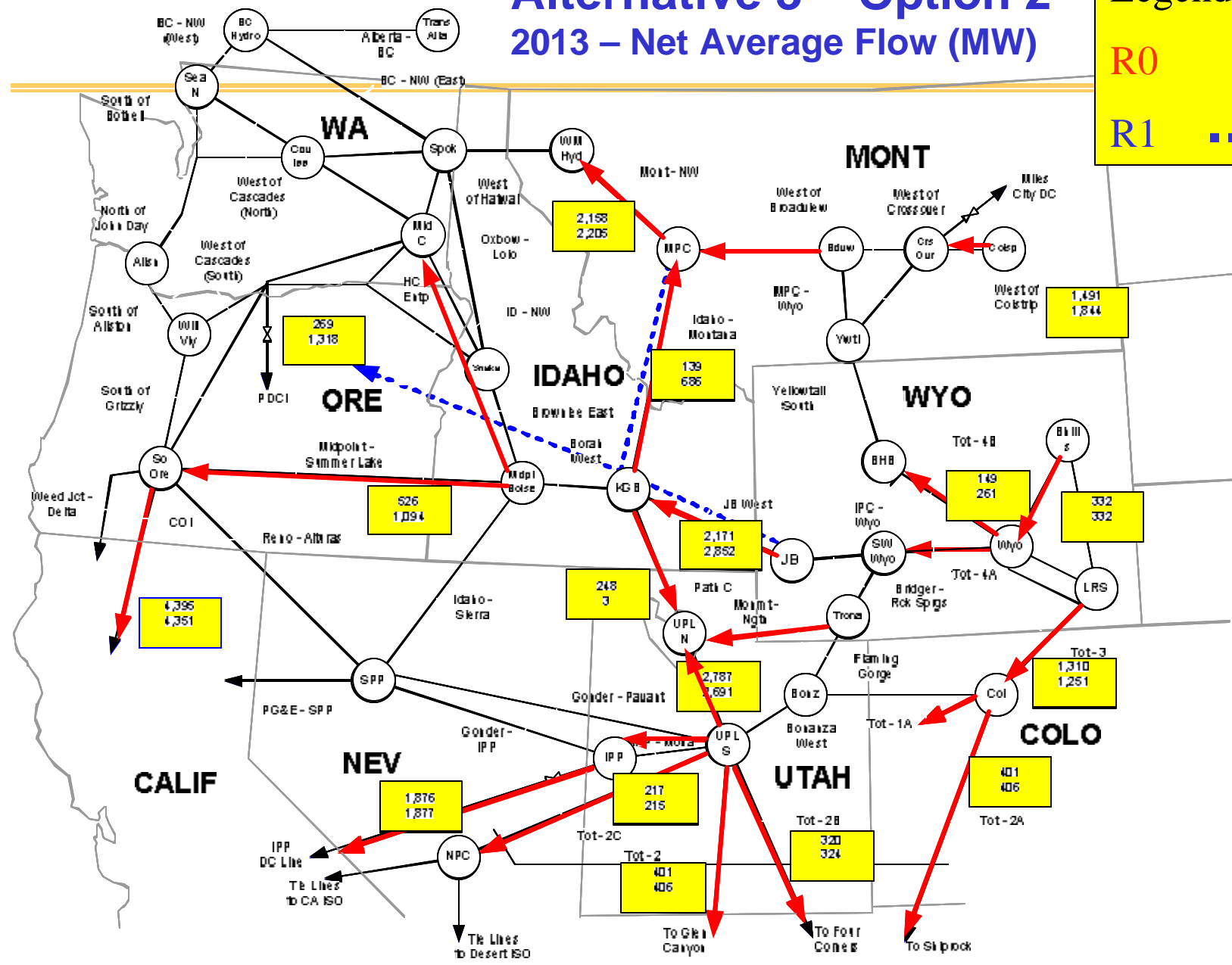
Transmission Sensitivity	Definition	Miles
Run 3 <i>Table Mountain to Tesla</i>	Run 1 Plus: <i>Idaho to California</i> ☞ Take out 500 kV Midpoint to Grizzly ☞ 500 kV Midpoint to Table Mountain to Tesla ☞ Midway to Vincent (if needed)	
Transmission Sensitivity	Definition	Miles
Run 4 <i>To California</i>	Run 1 Plus: ☞ Take out 500 kV Midpoint to Grizzly <i>Idaho to Market Place</i> ☞ 500 kV Midpoint to SWIP	
Transmission Sensitivity	Definition	Miles
Run 5 <i>Wyoming to Colorado</i>	Run 1 Plus: ☞ Take out 500 kV Midpoint to Grizzly <i>TOT 3</i> ☞ 345 kV Reno to DJ to LRS to Cheyenne Alt to Tap to Green Valley ☞ 345 kV Reno to LRS <i>TOT 4 A</i> ☞ 345 kV Bridger to Miners to Cheyenne	

Alternative 3 – Option 2 (Continued)

Transmission Sensitivity	Definition	Miles
Run 6 <i>Wind Integration</i>	(Option 1: Run 0) Plus: <i>West of Colstrip</i> ✍ 345 kV Colstrip to Reno ✍ 345 kV Reno to DJ ✍ 345 kV Reno to LRS to DJ <i>TOT 4 A</i> ✍ 2 nd 345 kV Bridger to Miners to Cheyenne	
Transmission Sensitivity	Definition	Miles
Run 7 <i>Full Run</i>	Take the best two performers: Run 1 + Run 2 + Run 5 + Run 6	

Alternative 3 – Option 2 2013 – Net Average Flow (MW)

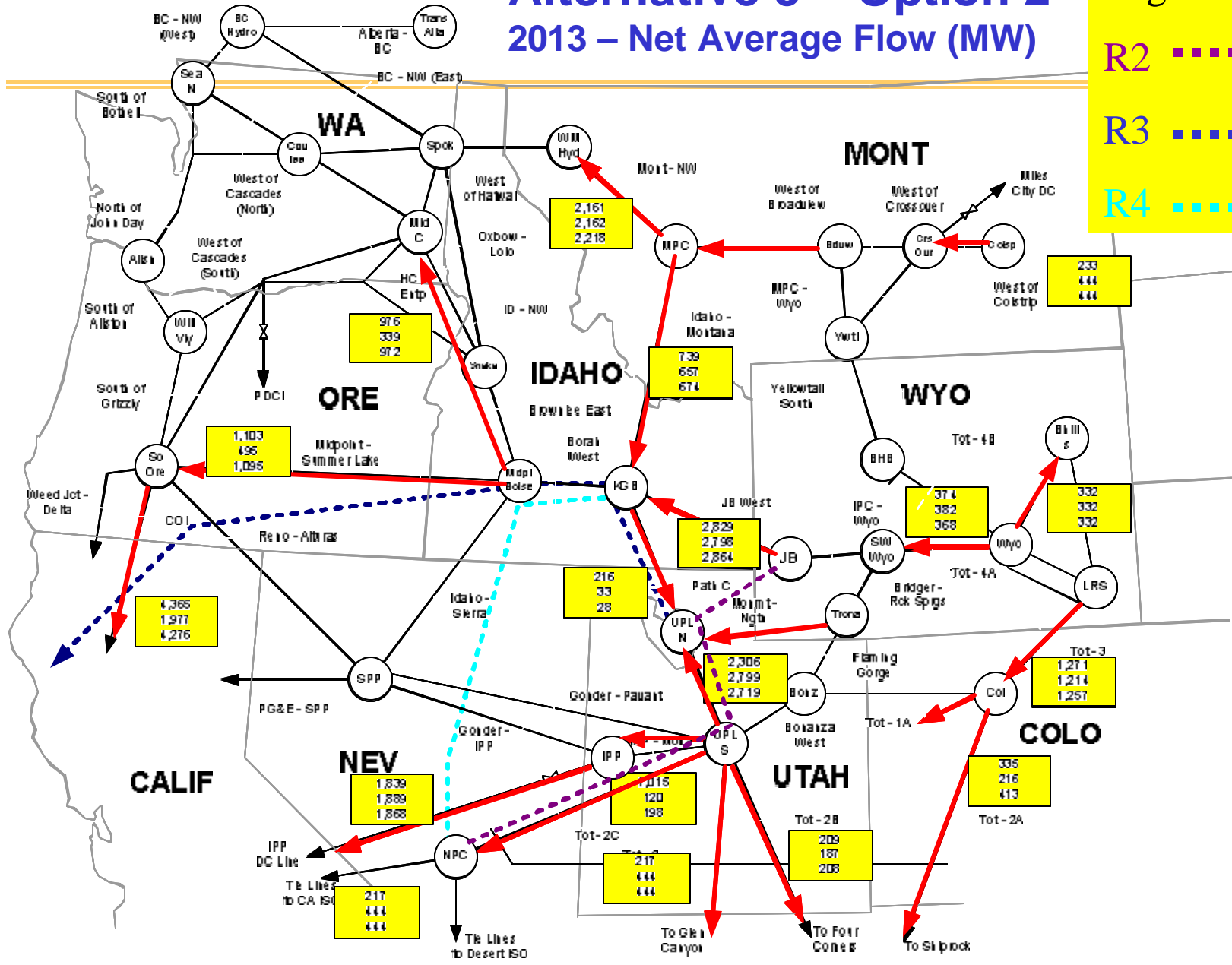
Legend:
R0
R1



Alternative 3 – Option 2 2013 – Net Average Flow (MW)

Legend:

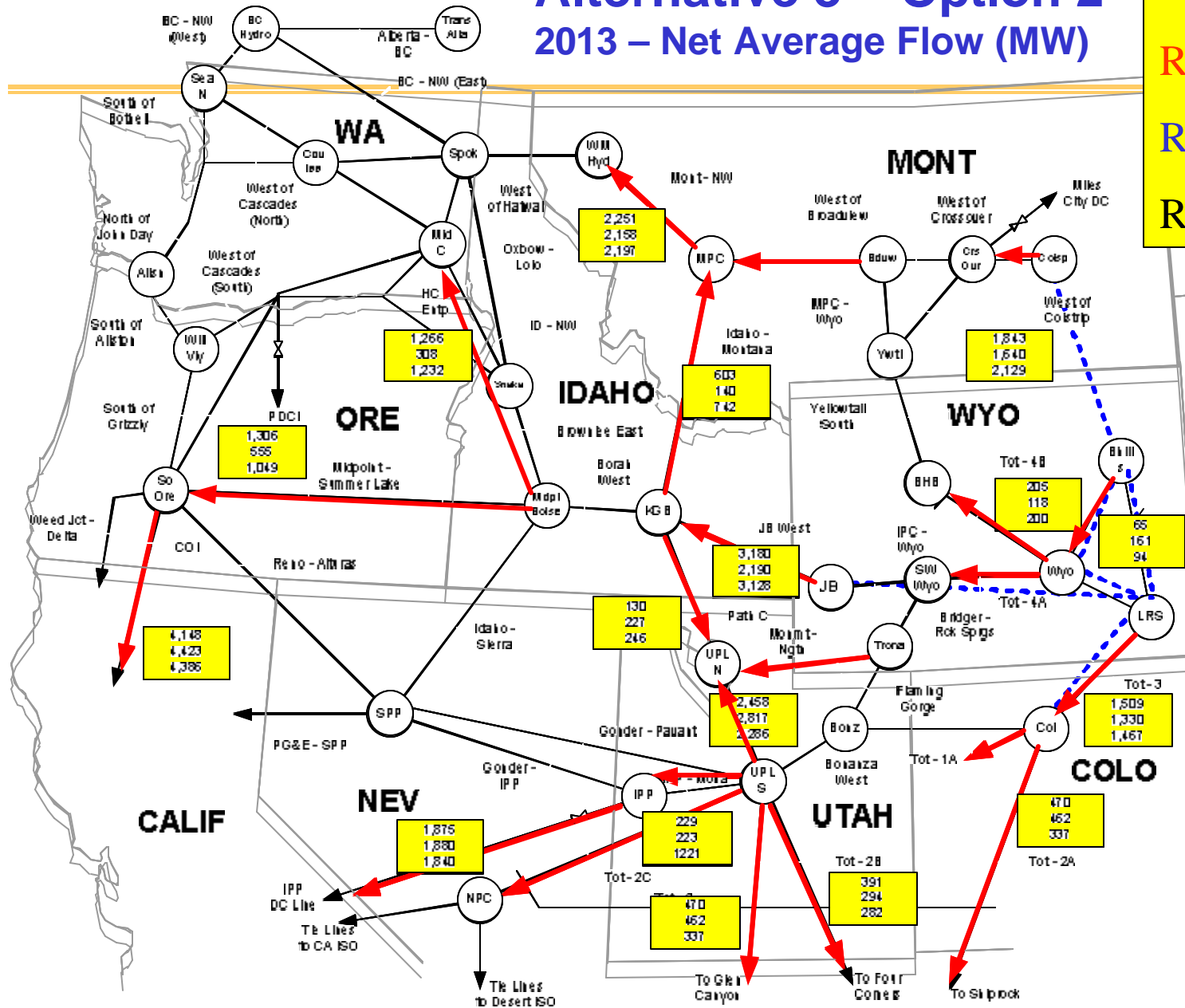
- R2
- R3
- R4



Alternative 3 – Option 2 2013 – Net Average Flow (MW)

Legend:

- R5
- R6
- R7



Opportunity Cost / Binding Limit

(\$000) / (% of the time)

Opportunity Cost (sorted by Run 0); Yellow highlights indicates that interface was modified

Row	Interface	Opp. Cost (\$) % Binding		ID to NW		Ut to LV		ID to CA		ID to LV		Wyo to Col		Mont to Wyo		1+2+5+6	
		Run 0	%	Run 1	%	Run 2	%	Run 3	%	Run 4	%	Run 5	%	Run 6	%	Run 7	%
1	Black Hills to C Wyoming	285,045	100%	484,177	100%	505,415	100%	420,651	100%	488,592	100%	-	0%	-	0%	-	0%
2	BRIDGER WEST	242,204	82%	-	0%	-	0%	-	0%	-	0%	-	0%	273,990	93%	-	0%
3	WEST OF BROADVIEW	191,239	61%	250,093	76%	256,609	77%	219,874	71%	253,822	77%	223,598	74%	193,417	63%	294,565	84%
4	TOT 2C	169,697	48%	141,452	50%	51,839	42%	39,584	14%	147,545	43%	187,142	55%	194,748	48%	56,068	45%
5	MONTANA - NORTHWEST	156,383	70%	14,879	10%	8,184	7%	24,516	17%	13,977	13%	18,574	12%	167,341	71%	8,342	7%
6	TOT 3	143,238	52%	69,202	39%	72,610	42%	72,941	32%	71,124	39%	25,918	19%	200,542	63%	28,439	21%
7	IPP DC LINE	73,415	90%	60,534	90%	50,812	85%	79,261	93%	60,228	89%	91,901	89%	81,977	89%	51,590	86%
8	WOR - PV to Devers	72,028	39%	61,483	43%	57,071	44%	53,487	34%	61,362	43%	56,555	38%	71,758	40%	51,297	39%
9	ALBERTA - BRITISH COLUMBIA	56,387	68%	47,125	68%	47,698	67%	42,686	66%	48,047	69%	42,169	63%	57,483	73%	49,900	69%
10	BONANZA WEST	51,911	32%	24,177	13%	35,689	16%	39,689	21%	17,388	11%	30,198	20%	58,260	32%	23,059	11%
11	North of Miguel	50,580	56%	48,309	57%	48,252	57%	51,585	54%	48,460	58%	47,822	55%	50,611	56%	47,186	55%
12	WOR -n- El Dor to Lugo	48,561	55%	45,721	54%	53,959	60%	37,376	29%	48,689	56%	45,303	49%	48,857	55%	49,999	53%
13	TOT 2B2	32,770	24%	35,327	26%	24,964	19%	38,949	24%	37,435	26%	61,610	40%	45,916	32%	23,100	17%
14	SOUTHERN NEW MEXICO (NM1)	28,580	43%	27,774	39%	27,560	37%	31,267	46%	27,721	39%	30,414	43%	28,869	44%	29,322	41%
15	West of Naughton (E-S&W)	28,326	11%	-	0%	-	0%	-	0%	-	0%	-	0%	23,422	9%	-	0%
16	TOT 1A	22,764	19%	23,228	17%	-	0%	44,176	23%	16,852	15%	24,388	22%	16,443	19%	2,243	3%
17	PAVANT, INTRMTN - GONDER 230 KV	18,122	9%	5,032	3%	202	0%	4,493	3%	6,432	4%	2,992	2%	13,988	7%	274	0%
18	SOUTHWEST OF FOUR CORNERS	16,525	7%	16,731	8%	10,381	4%	6,859	4%	22,168	9%	26,330	11%	10,216	5%	6,911	3%
19	COI	14,398	59%	11,319	56%	12,449	62%	45	0%	13,399	61%	10,603	47%	14,466	60%	18,882	69%
20	NW to Canada, East BC	13,368	8%	12,240	5%	12,004	8%	11,488	12%	10,674	8%	10,961	4%	13,365	8%	12,589	8%
21	SW Wyoming to N Utah	13,141	2%	-	0%	-	0%	-	0%	-	0%	-	0%	11,949	4%	-	0%
22	Combined PACI & PDCI	12,931	19%	15,022	18%	11,860	15%	181	0%	11,734	16%	13,173	14%	13,068	19%	13,191	18%
23	TOT 2A	10,150	8%	16,265	12%	5,957	3%	2,015	2%	26,715	18%	21,213	15%	19,106	13%	3,421	2%
24	PATH C	9,481	7%	5,017	3%	14,536	8%	10,675	4%	2,991	2%	4,193	3%	5,269	4%	16,910	8%
25	IDAHO - MONTANA	6,464	2%	3,337	2%	2,761	2%	17,224	6%	6,453	3%	1,232	1%	4,418	1%	1,938	1%
26	N to S Utah	6,337	3%	204	1%	-	0%	176	0%	461	1%	6	0%	7,411	4%	-	0%
27	Southern CA Imports	6,167	39%	8,002	48%	7,578	44%	11,935	63%	7,717	46%	7,987	46%	6,283	39%	8,405	51%
28	TOT 7	5,302	4%	2,693	3%	1,456	3%	5,467	5%	2,880	4%	185	0%	5,183	3%	142	0%
29	Montana - Southeast	4,659	9%	21,682	18%	17,921	14%	24,861	20%	20,627	17%	22,005	20%	67	17%	1,758	2%
30	IDAHO - NORTHWEST	4,483	2%	-	0%	-	0%	406	0%	-	0%	-	0%	4,037	3%	-	0%
31	PACIFIC DC INTERTIE (PDCI)	4,266	18%	1,738	10%	1,469	11%	13,966	33%	985	6%	1,770	8%	4,565	16%	1,974	9%
32	Combined 4a, 4b	4,196	6%	12,025	8%	10,862	7%	13,688	10%	10,934	8%	25,849	23%	9,974	16%	3,462	3%
33	NORTHERN - SOUTHERN CALIFORN	4,022	22%	2,434	12%	1,770	13%	2,622	12%	2,529	14%	2,471	13%	3,606	21%	2,451	15%
34	Idaho to California	N/A	N/A	N/A	N/A	N/A	N/A	348,291	89%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
35	Idaho to LV	N/A	N/A	N/A	N/A	N/A	N/A	-	0%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
36	Colstrip South	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	24,840	15%	35,934	15%

Alternative 3 – Option 2

2013 - Total Thermal VOM (\$000)

Area Name	ID to NW		Ut to LV		ID to Cal		ID to LV		Wyo to Col		Mon to Wyo		1+2+5+6	
	Run 0	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7						
NEW MEXI	418,361	424,414	427,027	420,048	423,272	419,055	418,555	424,450						
ARIZONA	3,343,013	3,353,886	3,376,297	3,270,250	3,363,092	3,260,878	3,321,115	3,332,287						
NEVADA	1,324,414	1,263,526	1,077,778	1,110,959	1,161,650	1,305,887	1,337,946	1,087,313						
WAPA L.C	408,675	415,441	396,347	391,030	407,830	402,105	408,215	381,784						
MEXICO-C	867,287	868,256	866,774	863,369	866,676	863,590	866,511	865,138						
IMPERIAL	18,564	17,238	17,340	17,486	17,344	17,009	18,521	16,968						
SANDIEGO	706,677	708,199	712,161	721,662	705,542	678,871	695,014	697,380						
SOCALIF	1,663,429	1,612,041	1,581,548	1,675,855	1,595,097	1,558,605	1,645,758	1,545,476						
LADWP	298,932	293,970	280,327	304,325	270,793	291,186	300,946	281,472						
IPP	339,073	332,984	334,589	335,867	331,606	309,692	339,252	336,518						
PG AND E	3,507,169	3,364,035	3,440,926	4,021,318	3,427,282	3,634,067	3,508,012	3,417,587						
NORTHWES	2,185,105	2,010,990	2,035,200	1,850,318	2,050,651	1,869,251	2,184,055	2,036,651						
B.C.HYDR	552,300	513,623	523,815	487,387	523,229	507,937	550,442	517,595						
AQUILA	31,307	28,614	29,221	26,551	29,443	26,246	31,100	29,948						
ALBERTA	1,435,783	1,405,351	1,414,190	1,369,244	1,414,810	1,390,982	1,431,513	1,416,003						
IDAHO	1,577	-	-	19	-	-	1,621	-						
MPC	42,868	76,104	78,962	57,633	76,367	63,017	39,565	83,051						
SIERRA	199,948	194,253	199,839	153,123	197,863	175,931	196,247	200,405						
WYO	72,486	73,667	74,235	72,709	73,737	105,084	101,128	105,149						
BONZ	65,943	65,646	61,026	67,430	65,716	60,195	63,606	62,019						
UT N	122,667	126,885	134,278	107,288	127,662	120,523	121,036	130,451						
UT S	354,754	372,770	390,925	322,958	380,123	348,564	355,626	380,010						
COL E	574,337	589,022	614,500	548,281	585,840	551,456	609,820	550,307						
COL W	193,368	194,315	199,962	192,969	195,170	190,617	198,417	200,150						
B HILL	54,891	74,728	78,508	68,042	75,047	46,322	33,647	47,984						
LRS	79,220	81,676	81,686	81,044	81,566	82,502	74,894	82,509						
JB	233,717	306,088	306,848	294,249	307,028	304,009	195,586	306,600						
BDVW	43,887	47,224	47,403	46,108	47,250	46,244	33,305	32,036						
CRSOVRCO	118,806	147,695	149,074	147,825	148,105	147,538	118,622	156,083						
Total	19,258,557	18,962,642	18,930,785	19,025,347	18,949,790	18,777,363	19,200,076	18,723,322						

Delta from Run 0 - (295,915) (327,772) (233,210) (308,767) (481,194) (58,481) (535,235)

Alternative 3 – Option 2

2013 - Total Thermal VOM (\$000) – Delta to Run 0

Potential Thermal VOM Savings: \$960 million

	ID to NW	Ut to LV	ID to Cal	ID to LV	Wyo to Col	Mon to Wyo	1+2+5+6
Area Name	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7
NEW MEXI	6,054	8,667	1,687	4,911	694	194	6,090
ARIZONA	10,873	33,284	(72,763)	20,079	(82,135)	(21,898)	(10,727)
NEVADA	(60,888)	(246,636)	(213,455)	(162,764)	(18,527)	13,532	(237,101)
WAPA L.C	6,766	(12,328)	(17,645)	(845)	(6,570)	(460)	(26,891)
MEXICO-C	969	(513)	(3,918)	(611)	(3,697)	(776)	(2,149)
IMPERIAL	(1,326)	(1,225)	(1,078)	(1,220)	(1,556)	(44)	(1,597)
SANDIEGO	1,522	5,484	14,985	(1,135)	(27,805)	(11,663)	(9,297)
SOCALIF	(51,387)	(81,881)	12,427	(68,331)	(104,823)	(17,671)	(117,952)
LADWP	(4,962)	(18,605)	5,393	(28,139)	(7,746)	2,014	(17,460)
IPP	(6,088)	(4,484)	(3,205)	(7,466)	(29,381)	180	(2,555)
PG AND E	(143,134)	(66,243)	514,148	(79,887)	126,898	843	(89,583)
NORTHWES	(174,115)	(149,906)	(334,787)	(134,454)	(315,854)	(1,050)	(148,454)
B.C.HYDR	(38,677)	(28,485)	(64,913)	(29,071)	(44,363)	(1,858)	(34,706)
AQUILA	(2,693)	(2,085)	(4,755)	(1,864)	(5,061)	(207)	(1,358)
ALBERTA	(30,431)	(21,592)	(66,539)	(20,972)	(44,801)	(4,269)	(19,780)
IDAHO	(1,577)	(1,577)	(1,558)	(1,577)	(1,577)	44	(1,577)
MPC	33,236	36,093	14,765	33,498	20,148	(3,303)	40,183
SIERRA	(5,695)	(109)	(46,825)	(2,085)	(24,017)	(3,700)	457
WYO	1,181	1,749	223	1,251	32,598	28,642	32,663
BONZ	(297)	(4,917)	1,487	(227)	(5,748)	(2,336)	(3,924)
UT N	4,218	11,611	(15,379)	4,994	(2,145)	(1,631)	7,784
UT S	18,015	36,170	(31,796)	25,369	(6,190)	872	25,256
COL E	14,685	40,162	(26,056)	11,503	(22,881)	35,483	(24,030)
COL W	947	6,595	(399)	1,802	(2,750)	5,049	6,782
B HILL	19,837	23,618	13,151	20,156	(8,568)	(21,244)	(6,907)
LRS	2,456	2,467	1,824	2,346	3,283	(4,326)	3,289
JB	72,372	73,131	60,532	73,312	70,293	(38,130)	72,883
BDVW	3,337	3,516	2,221	3,363	2,357	(10,582)	(11,851)
CRSOVRCO	28,889	30,267	29,019	29,299	28,732	(184)	37,277
Total	(295,915)	(327,772)	(233,210)	(308,767)	(481,194)	(58,481)	(535,235)

Alternative 3 – Summary

2013 - Total Thermal VOM (\$000)

Area Name	Run 0 (existing Tx system)	Run 0 (existing Tx system- NC)	Option 1 (Run 6)	Option 2 (Run 7)
NEW MEXI	418,361	449,740	422,408	424,450
ARIZONA	3,343,013	4,099,897	3,196,083	3,332,287
NEVADA	1,324,414	1,071,774	1,086,282	1,087,313
WAPA L.C	408,675	472,637	384,218	381,784
MEXICO-C	867,287	877,234	862,751	865,138
IMPERIAL	18,564	12,015	15,637	16,968
SANDIEGO	706,677	555,051	691,358	697,380
SOCALIF	1,663,429	844,070	1,570,401	1,545,476
LADWP	298,932	152,714	304,228	281,472
IPP	339,073	341,407	335,588	336,518
PG AND E	3,507,169	2,290,859	3,825,351	3,417,587
NORTHWES	2,185,105	1,969,638	1,724,754	2,036,651
B.C.HYDR	552,300	516,578	472,495	517,595
AQUILA	31,307	33,758	26,688	29,948
ALBERTA	1,435,783	1,706,559	1,371,251	1,416,003
IDAHO	1,577	43	1,518	-
MPC	42,868	95,824	56,971	83,051
SIERRA	199,948	234,523	181,319	200,405
WYO	72,486	120,471	107,788	105,149
BONZ	65,943	68,644	64,387	62,019
UT N	122,667	159,945	121,793	130,451
UT S	354,754	460,559	360,947	380,010
COL E	574,337	876,624	556,082	550,307
COL W	193,368	200,404	189,641	200,150
B HILL	54,891	59,683	46,227	47,984
LRS	79,220	82,520	82,457	82,509
JB	233,717	307,200	298,953	306,600
BDVW	43,887	48,515	47,938	32,036
CRSOVRCO	118,806	189,264	185,687	156,083
Total	19,258,557	18,298,151	18,591,200	18,723,322
Delta From Run 0		(960,406)	(667,357)	(535,235)

Alternative 4

Transmission Sensitivity	Definition	Miles
Run 1 <i>Montana to Wyoming to CO</i>	<i>West of Colstrip</i> ✎ 500 kV Colstrip to Wyodak (2 lines) ✎ 500 kV Wyodak to Jim Bridger ✎ 500 kV Wyodak to LRS to Green Valley ✎ 500 kV Green Valley to Grand Junction to Emery to Mona to Crystal to Mira Loma <i>TOT 4 A</i> ✎ 2 - 345 kV Bridger to Miners to Cheyenne	
Run 2 <i>Wyoming to LA</i>	✎ 500 kV DC Wyodak to LA (3000 MW)	
Run 3 <i>Full Run</i>	Take the best two performers from Alt 3 – Option 2: (Grizzly, SWIP, Market Place & Table Mt.) + TOT 3 + TOT 4 A + IPP DC + Run 1 + Run 2	

Preliminary