Appendix

2013 Case

Key Assumptions

2013 Case

Rocky Mountain Area Transmission Study

2013 Case Assumptions

#	Assumption	Subcommittee Consensus	Assumption Description
1	Operational Costs (Representative)	×	Existing & New Resources (Fuel & Variable O&M) Jacob Williams, Peabody Energy: ✍ Fixed O&M at $25/kW-yr. Smaller plants will have higher fixed O&M since most is related to staff size and maintenance which will occur no matter the size.
2	Transmission topology	✍	33 bubble topology, as provided by the RMATS Transmissions Additions Team.
3	Transmission path ratings & nomograms	✍	As modeled in 2008 Base Case.
4	Transmission additions	×	New transmission includes what is defined in the 2008 Base Case. TAWG to supply transmission for new solutions.
5	Losses	×	TAWG to determine how to factor in losses for "new" high voltage lines
6	RMATS regional loads and average annual load growth	×	As provided by RMATS Load Forecast Work Group (LFWG), based on WECC Load Forecast issued in 2003 with RMATS modifications.
7	DSM, Efficiencies	×	A task force committee is working on quantifying how much DSM should be modeled for in 2013. An agreement was reached to model DSM as a decrement to loads.
8	Existing thermal plants	✍	Existing thermal plants as modeled in the 2008 base case. Any excess capacity is exported
9	Resource additions	×	As determined by the Resource Additions Work Group (RAWG). Use the SSG-WI "Gas" scenario additions for regions outside the Rocky Mountain.
10	Gas prices	✍	As was submitted by the RAWG - task force committee. For year 2013, $4.5 and $6.5 average US Wellhead price, nominal $/MMBtu, in 2004 real.
11	Coal Price	×	Jacob Williams, Peabody Energy: ✍ PRB mining cost of $0.35 - 40/mmbtu in 2004 (cost includes royalties and sales taxes) ✍ SW mining cost of $0.55/mmbtu in 2004 ✍ For coal plants at scale 1,500 MW - EPC of $1,150/kw ($04) before interest during construction and financing fees. If you include those, takes you up to $1,400 - 1,500/kw depending if financed by public power (low cost money) or standard investment. If 500 - 800 MW add 10 - 15% in capital cost and if 200 - 400 MW add 15 - 25% in capital cost. Government subsidies could drive the prices a bit lower. ✍ Variable O&M about $2.00/MWh ✍ Fixed O&M at $25/kW-yr. Smaller plants will have higher fixed O&M since most is related to staff size and maintenance which will occur no matter the size. Jerry Vaninetti, Northern: ✍ Mine-mouth - Life-of-project delivered lignite costs are projected at 55c/mmBtu.
12	Thermal plant lives	×	All plants assumed to remain in operation. Plants on the CEC submittal for plants retirements barely run. Mohave is kept out as advised by the CEC.
13	Hydro plant lives	✍	All plants assumed to remain in operation.
14	Maintenance outages	×	Same assumptions as SSG-WI study; based on the TCA Cost Benefit Study for RTO West. Includes modifications for coordinated maintenance.
15	Generator cost curves	✍	All generators by class and vintage are assumed to have similar cost curves
16	Eastern DC Interfaces	×	Model a price curve to allow for both import and export, rather for just import.
17	Renewable resources	✍	As modeled by SSG-WI, with additions per RMATS Resources Team.
18	Wind modeling	✍	Assumptions consistent with SSG-WI Study. For wind shapes, NREL provided hourly profiles.
19	Base year dollars	✍	Use $2004
20	Emissions: CO2 SO2 NOx	×	Grace Anderson, CEC: California has used $15/ton for CO2. Jacob Williams, Peabody Energy: 0.1 lbs/mmbtu SO2 0.08 lb/mmbtu NOx Heat rate of 9,500 btu/kWh

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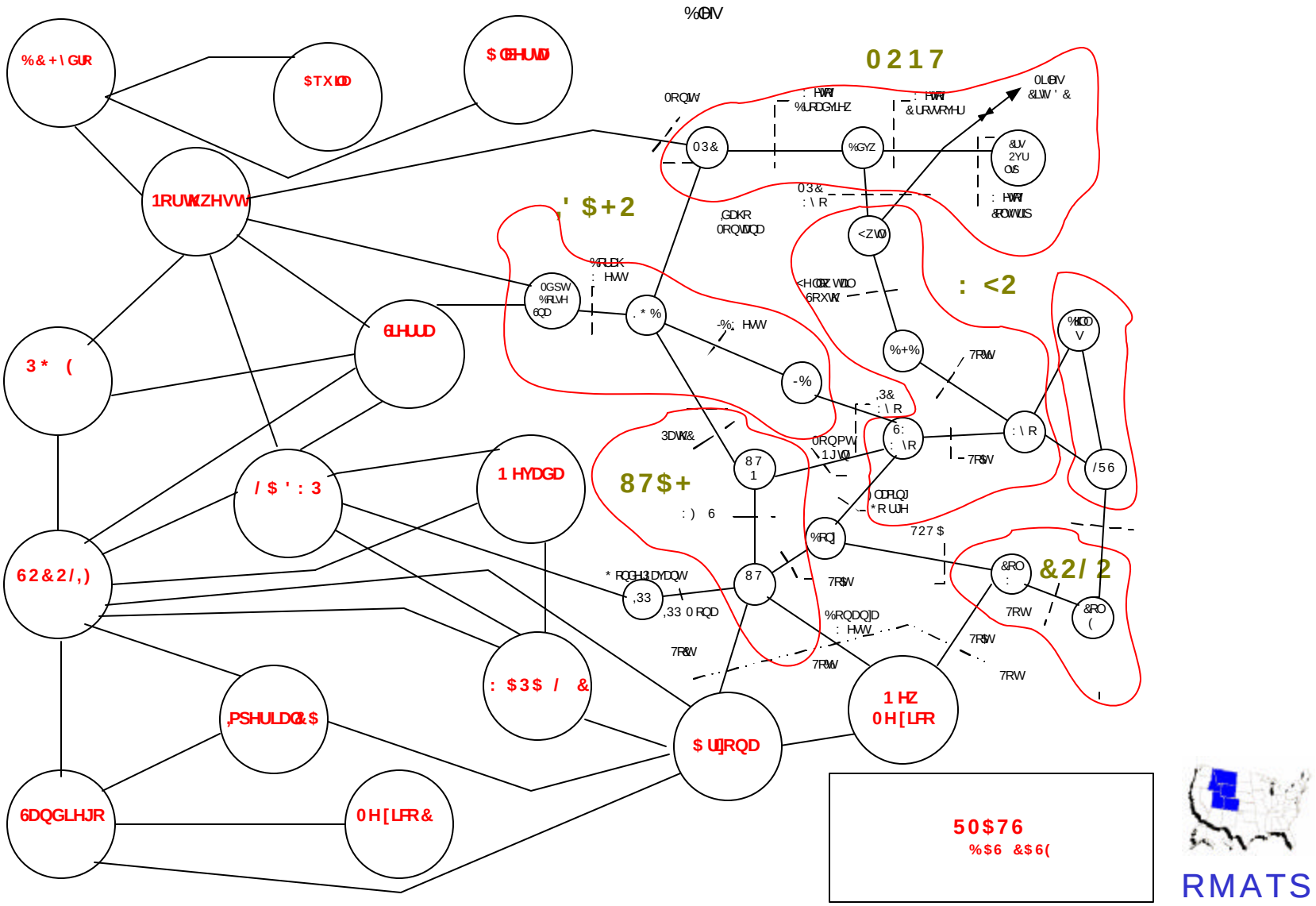
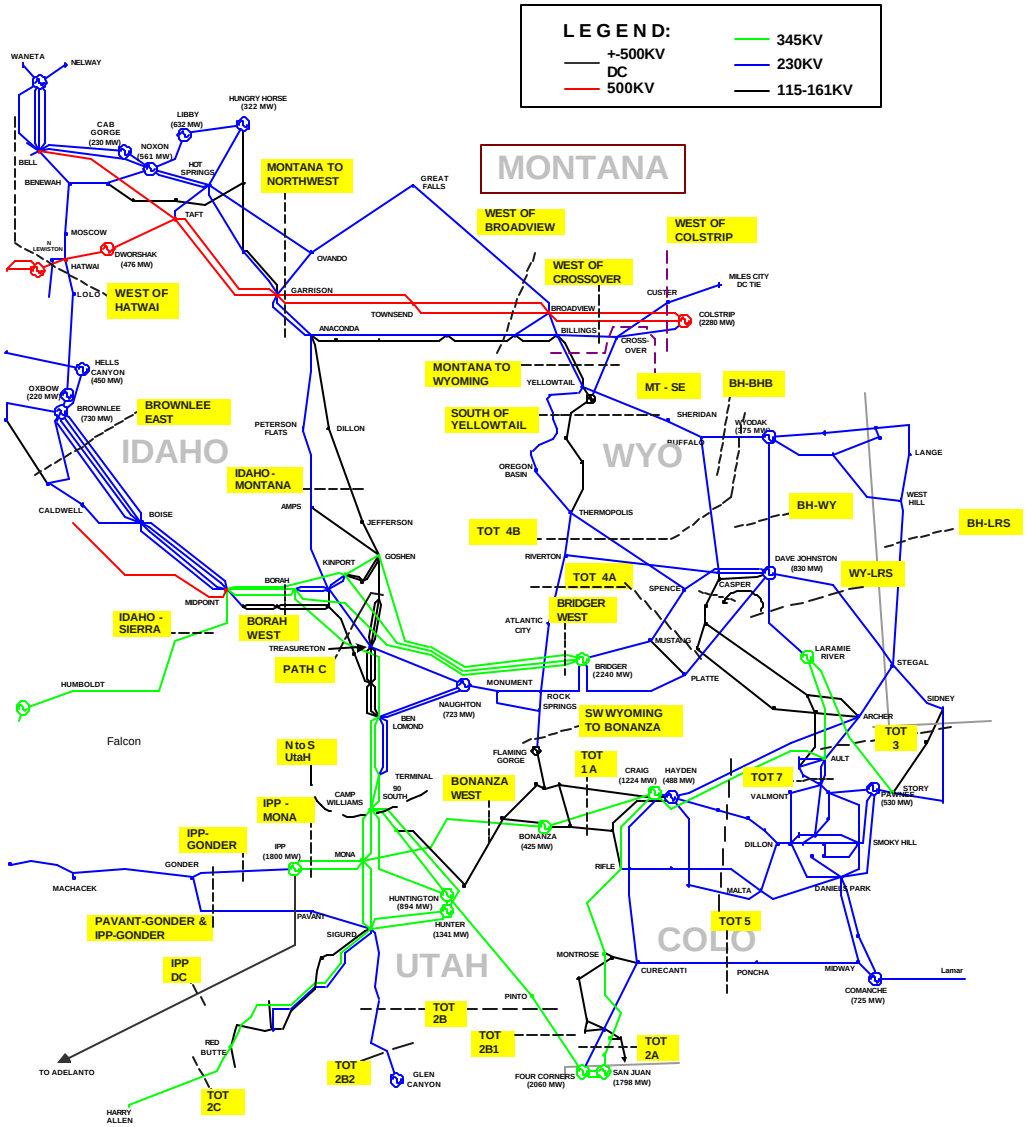
System “Balloon” Diagram



Rocky Mountain Area Path & Ratings Diagram



Name	From	To	Forward Limit (MW)	Reverse Limit (MW)
MONTANA - NORTHWEST	East	West	2,200	(1,350)
WEST OF BROADVIEW	East	West	2,573	N/A
WEST OF COLSTRIP	East	West	2,598	N/A
WEST OF CROSSOVER	East	West	2,598	N/A
IDAHO - NORTHWEST	East	West	2,400	(1,200)
IDAHO - SIERRA	North	South	500	(360)
BORAH WEST	East	West	2,307	N/A
IDAHO - MONTANA	South	North	337	(337)
BRIDGER WEST	East	West	2,200	N/A
PATH C	North	South	1,000	(1,000)
SOUTHWEST OF FOUR CORNERS	NE	SW	2,325	N/A
IPP DC LINE	NE	SW	1,920	(300)
INTERMOUNTAIN - MONA 345 KV	East	West	1,400	(1,200)
INTERMOUNTAIN - GONDER 230 KV	East	West	250	N/A
TOT 1A	East	West	650	N/A
TOT 2A	North	South	690	N/A
PAVANT, INTRMTN - GONDER 230 KV	East	West	440	(235)
BONANZA WEST	East	West	785	N/A
TOT 2B	North	South	780	(850)
TOT 2C	North	South	300	(300)
TOT 3	North	South	1,424	N/A
TOT 4A	NE	SW	810	N/A
TOT 4B	SE	NW	680	N/A
TOT 5	West	East	1,675	N/A
TOT 7	North	South	890	N/A
BILLINGS - YELLOWTAIL	North	South	400	(400)
BROWNLEE EAST	West	East	1,850	N/A
TOT 2B1	North	South	560	(600)
TOT 2B2	North	South	265	(300)
Combined 4a, 4b	N/A	N/A	1,096	N/A
Tot 2a, 2b, 2c Nomogram	North	South	1,570	(1,600)
Montana - Southeast	North	South	600	(450)
Black Hills to Laramie River	North	South	332	(332)
Black Hills to C Wyoming	East	West	332	(332)
Laramie River to C Wyomong	East	West	640	(640)
SW Wyoming to Bonanza	North	South	200	(200)
N to S Utah	North	South	3,000	(3,000)
SW Wyoming to N Utah	East	West	400	(400)
Black Hills to Big Horn	East	West	332	(332)
Yellowtail South (N-S)	North	South	625	N/A
Yellowtail North (S-N)	South	North	600	N/A
West of Naughton (E-S&W)	East	West	920	N/A
Sierra Import Limits	North	South	1,010	N/A

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Loads by Rocky Mountain Area - 2013

Based on WECC L&R Forecast issued in 2003, with RMATS Modifications

Annual GWh with Non-Coincidental Summer & Winter Peaks (MW)

Area	Summer Peak (MW)	Winter Peak (MW)	Energy (MWh)
Black Hills	936	939	6,316,224
Bonanza	202	173	1,092,653
Broadview	303	305	1,931,627
West of Colstrip	92	91	587,511
Wyoming- Central	316	312	2,222,761
Colorado- East	10,205	8,559	59,157,734
Goshen	1,436	1,148	6,621,074
IPP	1	1	7,800
Jim Bridger	1	1	7,800
Laramie River	566	532	3,931,039
Montana- West	1,275	1,275	8,177,245
Wyoming- North (BHB)	451	496	3,624,845
Wyoming- South	514	504	3,867,841
Utah- North	6,870	5,165	36,510,240
Utah- South	1,001	793	5,296,100
Idaho- West	3,388	2,562	16,551,726
Colorado- West	941	969	6,264,562
Yellow Tail	1	1	7,800
Total	**28,358**	**23,721**	**162,176,582**

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Loads by Western Interconnect Region- High

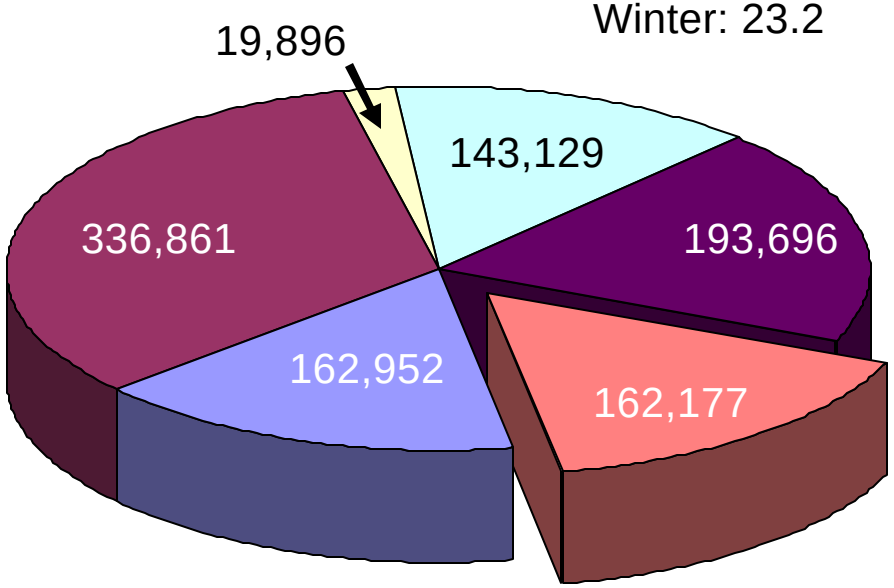
Based on WECC L&R Forecast issued in 2003, with RMATS modifications (2013 load level)

Annual GWh with Coincidental Summer & Winter Peaks (GW)

Mexico - CFE
Summer: 3.7
Winter: 3.4

NWPP-Canada
Summer: 18.4
Winter: 23.2

California
Summer: 62.7
Winter: 48.4



NWPP-US
Summer: 27.7
Winter: 36.0

AZ, NM & S. NV
Summer: 33.6
Winter: 25.4

Rocky Mt. States
Summer: 28.4
Winter: 23.7

Load: 1,017,672 GWh
Summer Peak: 172 GW

* 2013 loads applied to 2008 resources and transmission

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Gas Prices

Sensitivity

						Delivered Price	Wellhead Basis	Delivered Price	Wellhead Basis
Average US Wellhead price						**$ 4.50**		**$ 6.50**	
					Plus 4% FIK	$ 4.68		$ 6.76	
$	0.12	Henry Hub				$ 4.80	$ 0.30	$ 6.88	$ 0.38
	$ (0.45)	AECO				$ 4.35	$ (0.15)	$ 6.43	$ (0.07)
			$	0.40	East-side PNW	$ 4.75	$ 0.25	$ 6.83	$ 0.33
			$	0.63	Northern CA	$ 4.98	$ 0.48	$ 7.06	$ 0.56
		$0.10	Station 2			$ 4.45	$ (0.05)	$ 6.53	$ 0.03
			$	0.22	Sumas - PNW	$ 4.67	$ 0.17	$ 6.75	$ 0.25
			$	0.59	West-side PNW	$ 5.04	$ 0.54	$ 7.12	$ 0.62
	$ (0.26)	San Juan				$ 4.54	$ 0.04	$ 6.62	$ 0.12
			$	0.36	CO	$ 4.90	$ 0.40	$ 6.98	$ 0.48
	$ (0.40)	Rockies				$ 4.40	$ (0.10)	$ 6.78	$ 0.28
			$	0.35	UT	$ 4.75	$ 0.25	$ 7.13	$ 0.63
			$	0.40	WY	$ 4.80	$ 0.30	$ 7.18	$ 0.68
			$	0.33	MT	$ 4.73	$ 0.23	$ 7.11	$ 0.61
			$	0.35	ID	$ 4.75	$ 0.25	$ 7.13	$ 0.63
			$	0.69	N. NV	$ 5.09	$ 0.59	$ 7.47	$ 0.97
	$ (0.17)	Permian				$ 4.63	$ 0.13	$ 6.71	$ 0.21
			$	0.32	AZ	$ 4.95	$ 0.45	$ 7.03	$ 0.53
			$	0.24	NM	$ 4.87	$ 0.37	$ 6.95	$ 0.45
			$	0.33	S. NV	$ 4.96	$ 0.46	$ 7.04	$ 0.54
		$0.33	CA Border			$ 4.96	$ 0.46	$ 7.04	$ 0.54
			$	0.20	Southern CA	$ 5.16	$ 0.66	$ 7.24	$ 0.74

Preliminary screening

Base Case Assumptions	
✍The 2013 US average Wellhead price set at nominal $4.5 & 6.5/MMBtu	✍The dollars in 2013 nominal, de-escalated to 2.5% to 2004

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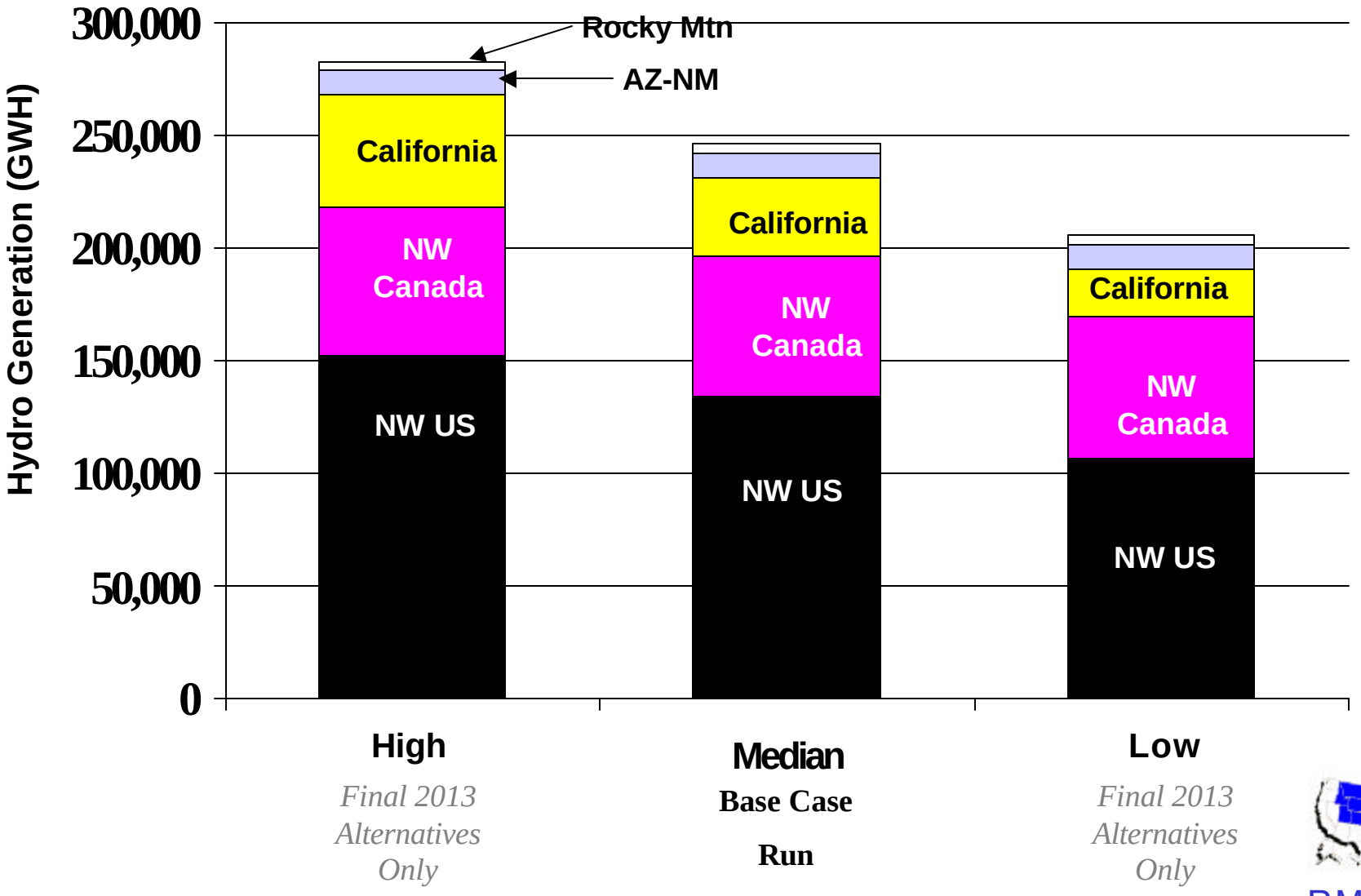
Hydro Generation Is Consistent with SSG-WI



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RAWG Criteria for Building Alternatives

- Applicable to resource alternatives for 2013 studies
- Each new generation project should be modeled in at least one-generation alternative, either as an individual project or as part of a coherent group
  - Generation may be aggregated into coherent groups by fuel type that is within a geographic area.
  - If it becomes necessary to prorate generation capacity, it would be reduced as a group and no individual project would be required to withdraw from the alternative
- Wind generation contributes toward capacity as 20% of the nameplate rating (may modify based on NREL study results)
- Total capacity within an alternative generation group would be generally equal to the multiple of the load increase (from 2008 to 2013) plus 15% planning margin
- A 2013 base or preferred case will not be created, but all the alternatives will reflect a 2013 time frame and will be compared to the 2008 base case

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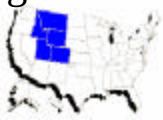
Generation Alternatives for 2013 runs

State	Bubble	Gen Type	Name Plate Generation Values			
2013 ALTERNATIVE CASES			1	2	3	4
Colorado	Colorado East	Coal	1250	500	1540	2500
		Gas	210	210	210	603
		Wind	800	500	800	1500
	Colorado West	Coal				
		Gas				
		Wind			250	250
Idaho	KGB	Coal				
		Gas				
		Wind	125	125	125	125
	Mid Point/Boise/Snake	Coal				
		Gas				
		Wind				440
Montana	Montana West	Coal				
		Gas			260	260
		Wind	225	280	500	1000
	Broadview	Coal		250	500	750
		Gas				
		Wind	0		950	1000
	Colstrip/Crossover	Coal		359	609	1109
		Gas				
		Wind		50	100	200
Utah	Bonanza	Coal				
		Gas				
		Wind				
	IPP	Coal	200		950	950
		Gas				
		Wind				
	Utah North	Coal				
		Gas				
		Wind	250	100	200	320
	Utah South	Coal	575	575	575	575
		Gas	525	140	140	140
		Wind			120	250
Wyoming	Big Horn Basin	Coal				
		Gas				
		Wind	250	250	250	250
	Black Hills	Coal				
		Gas				
		Wind				125
	LRS	Coal				
		Gas				
		Wind		500	500	1500
	SW Wyoming	Coal				
		Gas				
		Wind	925	1150	1000	2450
	Wyoming	Coal		700	1400	2100
		Gas	50		50	50
		Wind				800
WYO(IDA)	Jim Bridger	Coal	575	575	575	575
		Gas				
		Wind			160	230
WYO(MT)	Yellowtail	Coal				
		Gas				
		Wind				
	Total Coal		2600	2959	6149	8559
	Total Gas		785	350	660	1053
	Total Wind Nameplate		2575	2955	4955	10440
	Total Firm Energy		3900	3900	7800	11700

- Designed Alternative 1 based RMATS load growth, IRPs and minimum new transmission; configured incremental resource additions in each state to meet projected load growth plus reserves in that state; major wind in CO-E and SW Wyoming close to load centers.
- Designed Alternative 2 based on RMATS load growth with a focus on Powder River coal and open range wind (cheaper resource cost) and may require more transmission in the region.
- Designed Alternative 3 as an export case (incremental resources equal to 2 times RMATS load growth) with additional Powder River (and Utah) coal and open range wind necessitating more transmission for export.
- Designed Alternative 4 as a larger export case (3 times RMATS load growth) Powder River (and Utah) coal and open range wind necessitating more transmission for export.

20% of wind nameplate applies toward capacity



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Coal Prices

(All 2004 $)	COAL PLANT TYPE						
Plant Size	WY/MT Pwdr Rvr Mine Mouth	WY/MT Pwdr Rvr Transport WY/MT	WY/MT Pwdr Rvr Transport CO	MT/ND Lignite	UT Trucked Coal	UT Rail Transport	SW WYMine Mouth
250 MW to 500 MW Fluidized Bed							
Capital Cost	$2000/kW	$2000/kW	$2000/kW	$2000/kW	$2000/kW	$2000/kW	$2000/kW
Fuel Cost	$0.40/mmbtu	$0.60/mmbtu	$0.70/mmbtu	$0.55/mmbtu	$0.90/mmbtu	$1.25/mmbtu	$1.00/mmbtu
Fuel Cost Escalator (nominal)	1.25%/yr	1.25%/yr	1.25%/yr	1.25%/yr	1.25%/yr	1.25%/yr	1.25%/yr
Heat Rate	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Fixed O&M	$40/kW-yr	$40/kW-yr	$40/kW-yr	$40/kW-yr	$40/kW-yr	$40/kW-yr	$40/kW-yr
Variable O&M	$1.75/MWh	$1.75/MWh	$1.75/MWh	$1.75/MWh	$1.75/MWh	$1.75/MWh	$1.75/MWh
500 MW and Up Conventional Boiler							
Capital Cost ($ year)	$1,500/kw	$1,500/kw	$1,500/kw	$1,500/kw	$1,500/kw	$1,500/kw	$1,500/kw
Fuel Cost	$0.40/mmbtu	$0.60/mmbtu	$0.70/mmbtu	$0.55/mmbtu	$0.90/mmbtu	$1.25/mmbtu	$1.00/mmbtu
Fuel Cost Escalator	1.25%/yr	1.25%/yr	1.25%/yr	1.25%/yr	1.25%/yr	1.25%/yr	1.25%/yr
Heat Rate	9500	9500	9500	9500	9500	9500	9500
Fixed O&M	$25/kW-yr	$25/kW-yr	$25/kW-yr	$25/kW-yr	$25/kW-yr	$25/kW-yr	$25/kW-yr
Variable O&M	$1.50/MWh	$1.50/MWh	$1.50/MWh	$1.50/MWh	$1.50/MWh	$1.50/MWh	$1.50/MWh

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Typical Thermal Resource Values Are Used

Per Generation Technology / Age ($2004)

Fuel Type	Technology	Size	Vintage	Heatrate	VOM $/MWh
Gas/Oil	Steam	<100 MW	Pre 1960	12,500	$5.52
Gas/Oil	Steam	>100 MW	Pre 1960	11,500	$5.52
Gas/Oil	Steam	<100 MW	Post 1960	10,500	$5.52
Gas/Oil	Steam	>100 MW	Post 1960	9,500	$3.31
Gas	SCCT		Pre 1985	13,500	$8.83
Gas	CCCT		Pre 1985	9,300	$5.52
Gas	SCCT	<70 MW	Post 1985	9,500	$5.52
Gas	SCCT	>70 MW	Post 1985	10,500	$5.52
Gas	CCCT		Post 1985	7,250	$2.21
Coal	Steam	<100 MW	Pre 1960	12,000	$4.42
Coal	Steam	>100 MW	Pre 1960	11,000	$2.21
Coal	Steam	<100 MW	Post 1960	11,000	$3.31
Coal	Steam	>100 MW	Post 1960	10,000	$1.75
Coal	Fluid Bed			10,500	$1.75
Coal	PC- Supercritical	>750	Post 2008	9,500	$1.50
Coal	IGCC	>250	Post 2008	8,000	$1.50
Diesel				11,000	$13.25
Gas/Oil	CCCT- Frame F		Post 2001	7,000	$2.21
Gas/Oil	CCCT- Frame G	>450 MW	Post 2008	6,300	$2.21

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Planned Maintenance Outages

- **Values consistent with SSG-WI study**
- **Updated outages to reflect a coordinated schedule**
- **Model reduces dispatch for scheduled outages based upon user input for amount and time (e.g., six weeks)**

	(% year, very approximate)
Combined Cycle	7%
CT	7%
Coal Plant	10%
Steam Oil/Gas	10%
Nuclear	12%
Geothermal	10%

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Alternative 1 & 2

Iteration 1

Rocky Mountain Area Transmission Study

Observation/Qualifications – Alt 1 & 2

- Results from Alternative 2 (regionally "optimized"- pseudo IRP for the region) shows greater value to the Rocky Mountain region over Alternative 1 (existing & uncoordinated company IRPs)
- Results:
  - Quantify the value of Alternate 2 over Alternate 1
  - Validate the need to build new transmission to integrate "new" resources in the Rocky Mountain area
  - Highlight the need to reinforce the Bridger and Central Wyoming transmission (LMP values ~$10 to $20 lower than other locations, even within the region).
  - Pave the way to consider reinforcing export paths ($57 LMP at LADWP vs $22 at Laramie River)
- Reminder, results account for just VOM costs; no consideration has been given thus far to transmission & resources capital costs

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Alternative 1

Iteration 2

Rocky Mountain Area Transmission Study

Transmission Additions – Alternative 1

RUN 1:

- **Bridger to Naughton to Ben Lomond 345 line (Bridger West and Naughton West)**
- **Miners to Bridger 345 and Miners 345/230 transformer.**
- **230 Midpoint to Boise**

Note: **TOT 2C was the path with the highest congestion and opportunity cost, but was not included in Alternative 1 because the TAWG felt that it should be dealt with in an export case. Transmission additions to Path 2C will be analyzed in Alternatives 3 & 4.**

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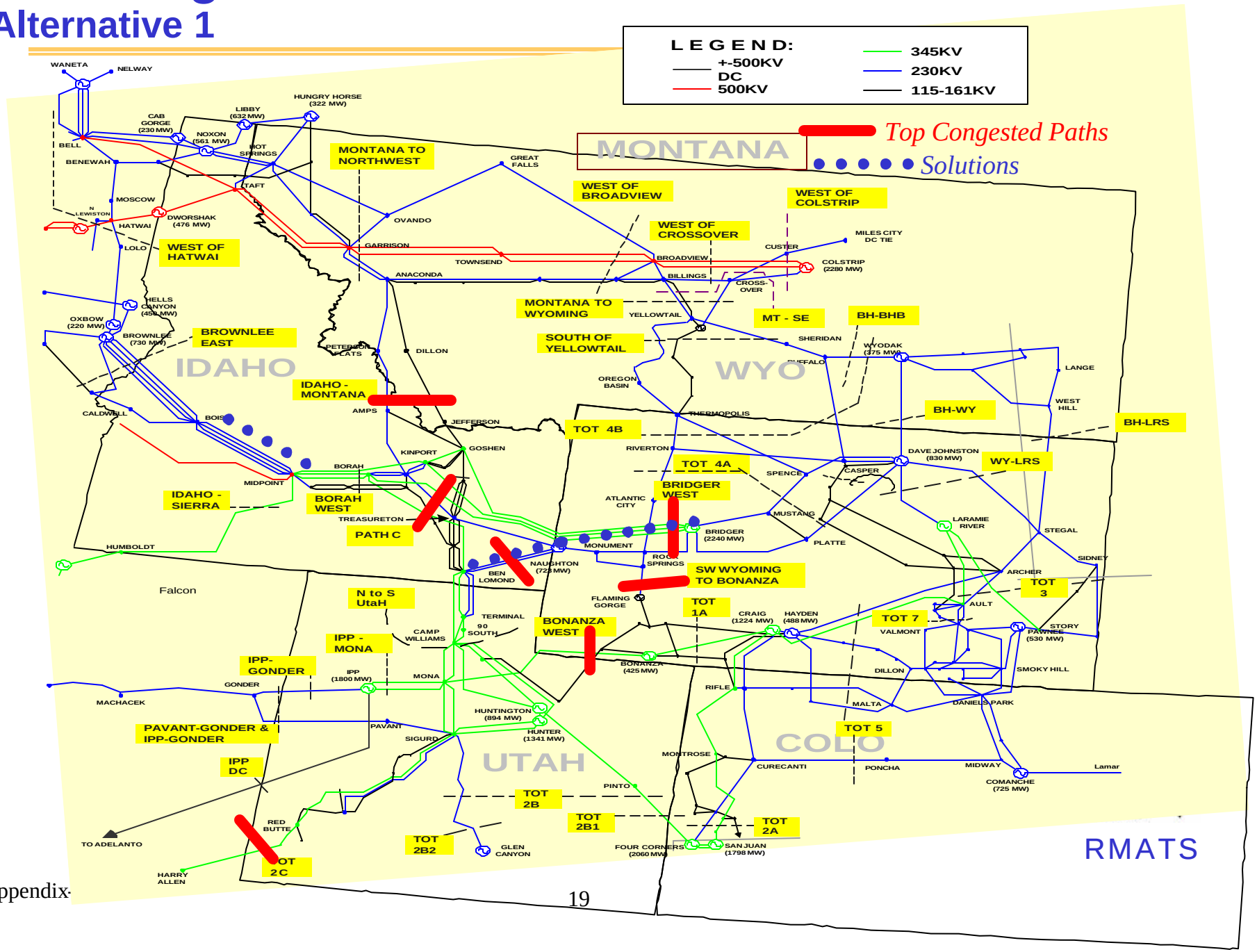
Relieving Transmission Constraints-
Alternative 1

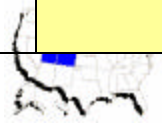


Change in Congestion/Congestion Costs with Tx Solutions

Alternative 1

Interface	Location [Direction]	Current Forward limit (MW)	Current Reverse limit (MW)	Opportunity cost of next $/MW		% hours congested	
				W/O Tx	W/ Tx	W/O Tx	W/ Tx
TOT 2C	S.W Utah to S.E. Nevada [N – S]	300	300	77,804	**67,791**	40%	**37%**
Bridger West	S.W. Wyoming to S.E. Idaho & to Northwest [E – W]	2,200	N/A	60,978	**0**	28%	**0%**
West of Naughton	S.W. Wyoming to N Utah [E – W]	920	N/A	39,533	**1,371**	13%	**0%**
Path C*	N Utah/ S Idaho [S – N]	1,000	1,000	19,909	**3,649**	6%	**2%**
Bonanza West	N.E. Utah to Central Utah [N – S]	785	N/A	17,659	**18,177**	8%	**10%**
SW Wyoming to Bonanza	S.W. Wyoming to N.E. Utah [N – S]	200	200	17,602	**34,018**	9%	**13%**
Idaho to Montana	E. Idaho to W. Montana [S – N]	337	337	4,741	**23,429**	1%	**3%**

Opportunity Cost: the cost of delivering the next 1 MW of power to a particular location, or the savings from reducing load by 1 MW at that location (sometimes called shadow price)



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* Reaches seasonal capacity of 750 MW

Western Interconnect Impact for 2013
Alternative 1

Interface limitation	Annual VOM ($000)	Delta from Base Annual VOM ($000)
Midpoint w/o Trans. Adds	20,027,681	
All interfaces unconstrained*	19,851,430	(176,251)
Only internal RM interfaces are unconstrained*	20,005,040	(22,640)
With Transmission Additions	20,017,760	(9,921)
Adjusted 2008 Base Case* **Note* Adj. Value**	24,641,043	4,571,644

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Western Interconnect Impact for 2013

Alternative 1 – Bridger Location

Interface limitation	Annual VOM ($000)	Delta from Base Annual VOM ($000)
w/o Transmission Additions	20,069,399	
All interfaces unconstrained	19,825,590	(243,809)
Only internal RM interfaces are unconstrained	19,986,953	(82,446)
W/Transmission Additions **(compared to MP w/o transmission)**	19,992,295	(76,705) (35,386)
Adjusted 2008 Base Case	24,641,043	4,571,644

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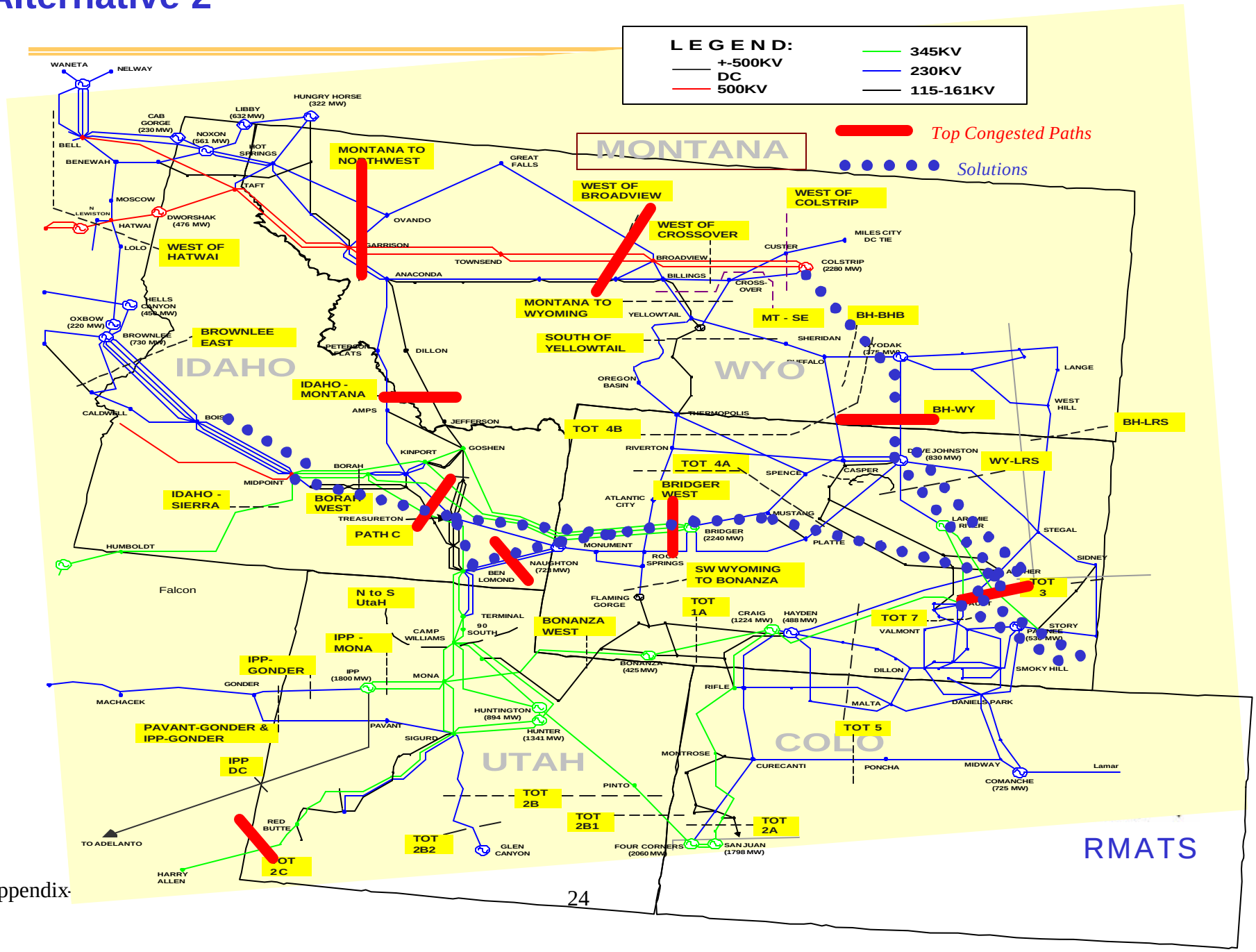
Alternative 2

Iteration 2

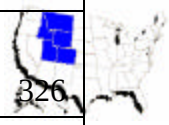
Rocky Mountain Area Transmission Study

Relieving Transmission Constraints
Alternative 2



Alternative 2- Tx Sensitivity Runs

Transmission Configuration	Definition	Miles
Existing system	Existing transmission system	
All interfaces unconstrained	Existing transmission system with unlimited capacity	
Only internal RM interfaces are unconstrained	Existing transmission system with unlimited capacity on interfaces internal to the Rocky Mountain region	
Run 1 *First Layer Additions*	*Existing system plus* 1. Reno to DJ to LRS to Cheyenne to Ault to Green Valley 345 line (TOT 3) 2. Bridger to Midpoint 345 line via Treasureton) (Bridger West) 3. Miners to Cheyenne 345 line and Miners (TOT 4A) 4. Miners to Bridger 345 and Miners 5. 230 Midpoint to Boise	**1,019** 326 345 112 130 106
Run 2 *Second Layer Additions*	*Run 1 plus* 1. Reno to LRS to Ault to Green Valley 345 line 2. Bridger to Naughton to Ben Lomond 345 line	**516** 326 190
Run 3 *All Additions*	*Run 2 plus* 1. Colstrip to Reno 345kV 2. Treasureton to Ben Lomond 345kV 3. Loop Bridger to Midpoint at Treasureton- Loop Borah Ben Lomond at Treasureton	**227** 162 65
Run 4	*Run 1 plus* 1. Reno to LRS to Ault to Green Valley 345 line	326
Run 5	*Run 2 plus* 1. Colstrip to Reno 345kV	162



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Western Interconnect Impact for 2013

Alternative 2

Transmission Configuration	Annual VOM ($000)	Delta from Existing System *Annual VOM ($000)*	Incremental Values
Existing system	20,075,091		
All interfaces unconstrained	19,653,573	(421,513)	
Only internal RM interfaces are unconstrained	19,846,737	(228,354)	
Run 1 1st - Reno to Denver & JB west	19,893,613	(181,479)	
Run 2 2nd - Reno to Denver & JB west	19,861,991	(213,101)	
Run 3 All Transmission Additions	19,851,235	(223,857)	
Run 4 Run 1 + 2nd Reno to Denver line	19,861,582	(213,509)	(32,031)
Run 5 Run 2 + Colstrip to Reno line	19,850,473	(224,619)	
R4- R2 Values 2nd JB west line			(409)
R5- R2 Values Colstrip to Reno line			(11,518)

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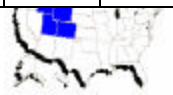
Change in Congestion/Congestion Costs with Tx Solutions

Alternative 2

Interface	Opportunity cost of next $/MW						% hours congested					
	No Add. Tx	Run 1	Run 2	Run 3	Run 4	Run 5	No Add. Tx	Run 1	Run 2	Run 3	Run 4	Run 5
C. Wyoming to Black Hills	265,617	33,950	15,873	21,237	21,875	21,220	84%	12%	8%	9%	9%	9%
TOT 3	238,969	65,764	4,096	7,838	15,585	9,213	76%	38%	5%	8%	12%	10%
Bridger West	228,819	66,603	690	50	30,592	35	73%	28%	-	-	14%	-
West of Broadview	172,681	152,797	134,310	97,578	101,790	98,499	51%	44%	41%	36%	36%	36%
West of Naughton	97,736	7,685	8,975	3,611	-	16,138	32%	3%	4%	2%	-	6%
TOT 2C	57,830	64,824	73,194	85,126	78,518	82,759	31%	31%	33%	32%	31%	31%
Montana to Northwest	24,361	30,044	29,717	29,647	27,614	28,493	8%	11%	11%	12%	12%	11%
Idaho to Montana	45,982	17,382	87,438	9,220	4,384	26,974	4%	2%	7%	1%	1%	2%
Path C*	25,891	47,500	5,793	24,071	47,148	7,038	9%	10%	2%	7%	10%	2%



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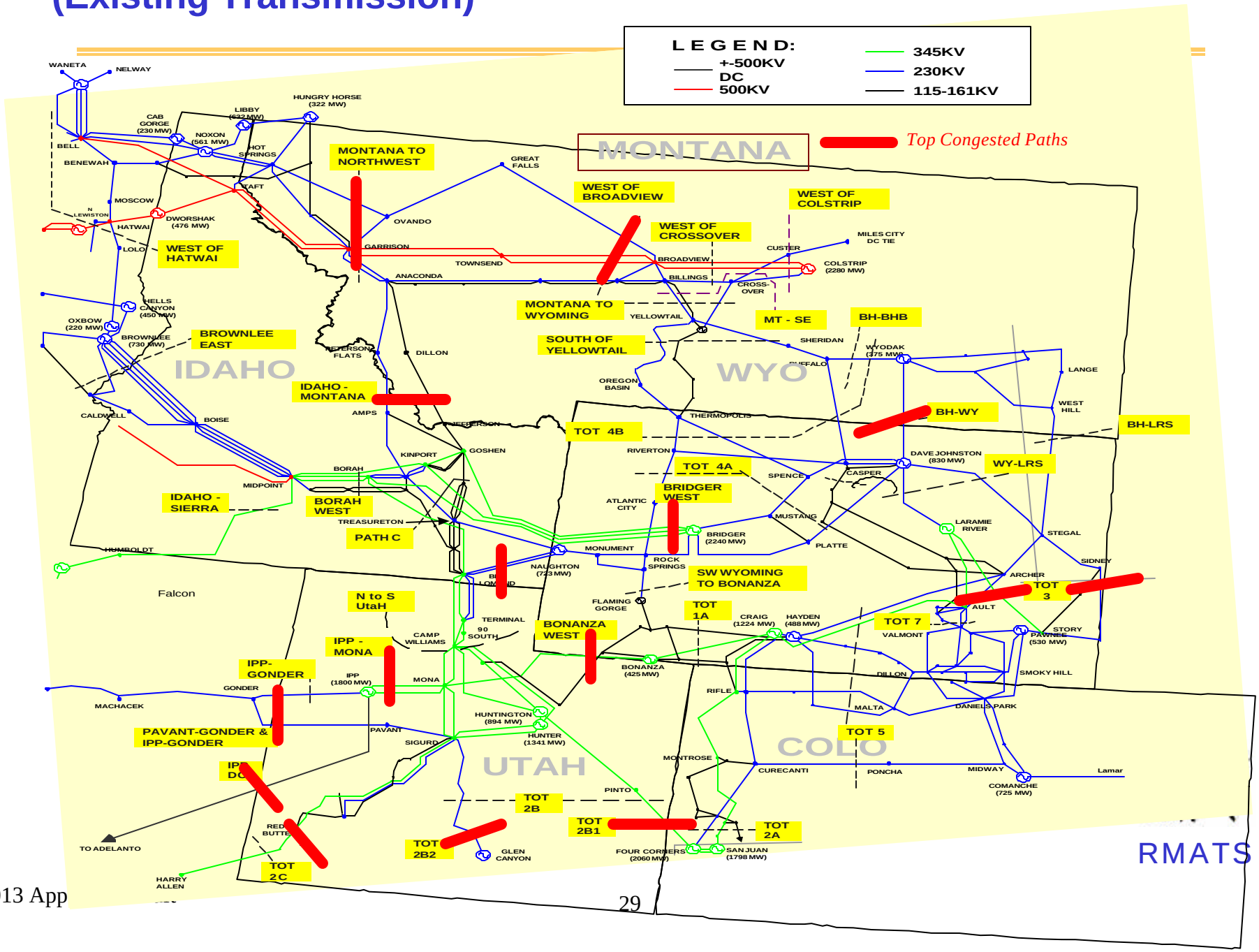
* Reaches seasonal capacity of 750 MW

2013 Alternatives 3
Iteration 1

Transmission Constraints - Alternative 3
(Existing Transmission)



Transmission Congestion/Congestion Costs

Alternative 3

Interface	Location [Direction]	Forward limit (MW)	Reverse limit (MW)	Opportunity cost of next MW	% hours congested
Black Hills to C Wyoming	E. Wyoming to C. Wyoming [E – W]	332	332	**284,623**	99%
Bridger West	S.W. Wyoming to S.E. Idaho & to Northwest [E – W]	2,200	N/A	**250,790**	82%
West of Broadview	Central Montana [E – W]	2,573	N/A	**205.282**	67%
TOT 2C	S. Utah to S.E. Nevada [N – S]	300	300	**168,704**	48%
TOT 3	S.E. Wyoming to N.E. Colorado [N – S]	1,424	N/A	**148,224**	54%
Montana to Northwest	W. Montana to E. Washington	2,200	1,350	**132,002**	64%
Idaho to Montana	E. Idaho to W. Montana [S – N]	337	337	**94,537**	9%
IPP DC Line	C. Utah to S. California [NE – SW]	1,920	300	**72,356**	89%
Bonanza West	E. Utah to C. Utah [E – W]	785	N/A	**48,463**	30%
TOT 2B2	S. Utah to N. Arizona [N – S]	265	300	**31,752**	24%
West of Naughton	S.E. Wyoming to N. Utah [E – W]	920	N/A	**28,394**	11%
TOT 1A	W. Colorado to E. Utah [E – W]	650	N/A	**21,629**	18%

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Western Interconnect Impact for 2008

Alternative 3

Interface limitation	Annual VOM ($000)	Delta from Base Annual VOM ($000)
Alternative 3- no transmission additions	19,258,515	
All interfaces unconstrained	18,297,721	(960,794)

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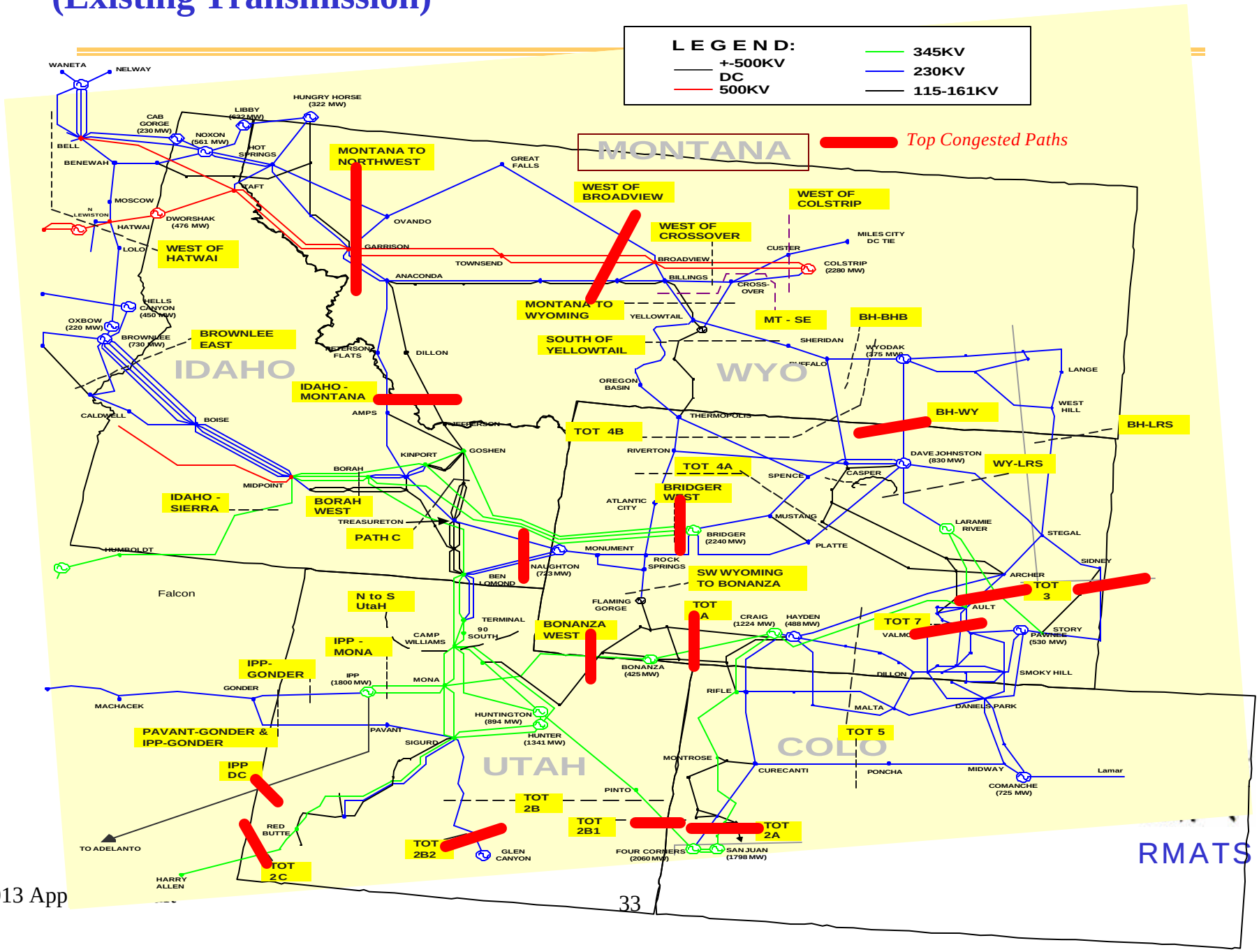
Alternative 4

Iteration 1

Rocky Mountain Area Transmission Study

Transmission Constraints - Alternative 4
(Existing Transmission)



Transmission Congestion/Congestion Costs

Alternative 4

Interface	Location [Direction]	Forward limit (MW)	Reverse limit (MW)	Opportunity cost of next MW	% hours congested
Bridger West	S.W. Wyoming to S.E. Idaho & to Northwest [E – W]	2,200	N/A	273,329	96%
Montana to Northwest	W. Montana to E. Washington	2,200	1,350	253,687	79%
Black Hills to C Wyoming	E. Wyoming to C. Wyoming [E – W]	332	332	176,302	79%+
TOT 2C	S. Utah to S.E. Nevada [N – S]	300	300	154,151	43%
West of Broadview	Central Montana [E – W]	2,573	N/A	130,392	42%
Bonanza West	E. Utah to C. Utah [E – W]	785	N/A	120,829	59%
TOT 3	S.E. Wyoming to N.E. Colorado [N – S]	1,424	N/A	102,056	56%
Idaho to Montana	E. Idaho to W. Montana [S – N]	337	337	99,677	8%
TOT 2A	S.W. Colorado [N – S]	690	N/A	97,253	50%
IPP DC	C. Utah to S. California [NE – SW]	1,920	300	76,879	85%
TOT 1A	W. Colorado to E. Utah [E – W]	650	N/A	64,263	59%
West of Naughton	S.E. Wyoming to N. Utah [E – W]	920	N/A	47,928	20%
SW of 4 Corners	S.E. Utah to N.W. New Mexico [SE – NW]	2,325	N/A	36,863	15%
TOT 2B2	S. Utah to N. Arizona [N – S]	265	300	32,405	23%

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Western Interconnect Impact for 2008

Alternative 4

Interface limitation	Annual VOM ($000)	Delta from Base Annual VOM ($000)
Alternative 4- no transmission additions	18,694,873	
All interfaces unconstrained	16,609,281	(2,085,592)

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