

SPSC Scenario Work Group Call

November 29, 2010
Jim Tarpey, Chair

Overview

- ▶ TEPPC developing 2020 cases including 3 SPSC requests
 - Base Case (original BA loads)
 - Reference Case (state-adjusted loads)
 - High Load (10% above Reference Case)
 - High DSM (10.4% below Reference Case)
- ▶ Issues: Moving from Reference Case to the High Load and High DSM cases, should the SPSC --
 - Adjust renewables for RPS?
 - Adjust conventional resources for the targeted planning margin?
 - Impose retirements if excess capacity exists among the existing and under construction fleet?

Schedule to implement 2020 cases

		Data input is completed, and ready for input into the dataset							
		Data input is being developed							
		Study case will be run this week							
Study Case	Tasks	Responsible Party	15-Nov	22-Nov	29-Nov	6-Dec	13-Dec	20-Dec	27-Dec
2020 PC0	OTC Modifications	Pacini							
	IPP DC Modeling Changes	Holland							
	Additional AB Resources	Holland							
2020 PC1	State-Adjusted Loads	Scofield							
	DSM Models	Aguayo							
	SPSC Renewables Resources	Pacini							
	Load/Resource Check - Changes to Conventional Resources	Pacini							
2020 PC2	High Loads	Scofield							
	DSM Models	Aguayo							
	Renewable Resources	Pacini							
	Load/Resource Check - Changes to Conventional Resources	Pacini							
2020 PC3	High DSM Loads	Scofield							
	DSM Models	Aguayo							
	Renewable Resources	Pacini							
	Load/Resource Check - Changes to Conventional Resources	Pacini							
2020 PC4	Identify carbon adders to test	Carr							
	Identify coal plant retirements	Carr							
	Other modifications necessary to reach carbon reduction targets?	Carr							
2020 PC6	Identify resource removals	Pacini							
	Identify location of incremental wind	Pacini							
	Changes to conventional generation?	Pacini							
2020 PC7	Identify resource removals	Pacini							
	Identify location of incremental wind	Pacini							
	Changes to conventional generation?	Pacini							

SUMMARY OF 2020 CASES: Loads and RPS Energy (GWh)

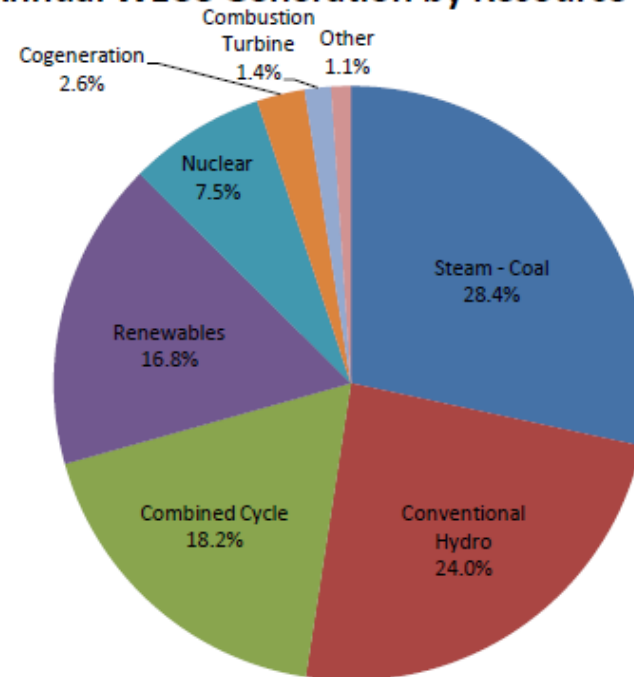
State/ Province	2020 Load Forecast (GWh) by Balancing Areas	Total RPS Energy (GWh) in 2020
Base Case	1,021,649	148,134
Reference Case	981,620	140,288
% Change from Base Case	-3.9%	-5.3%
High Load	1,079,782	154,820
% Change from Reference Case	10.0%	10.4%
High DSM	879,562	129,260
% Change from Reference Case	-10.4%	-7.9%

Base Case Generation

Annual Generation Summary

Category	2020 TEPPC Base Case PC0 (MWh)	% of Total Generation
Steam - Coal	291,195,976	28.4%
Conventional Hydro	246,661,410	24.0%
Combined Cycle	186,544,122	18.2%
Wind	81,336,193	7.9%
Nuclear	76,553,477	7.5%
Geothermal	35,741,201	3.5%
Solar	31,580,224	3.1%
Cogeneration	26,768,269	2.6%
Biomass RPS	15,854,122	1.5%
Combustion Turbine	14,710,410	1.4%
Small Hydro RPS	7,907,105	0.8%
Negative Bus Load	4,640,148	0.5%
Steam - Other	3,523,817	0.3%
Pumped Storage	2,428,298	0.2%
IC	284,870	0.0%
DSM	16,206	0.0%
Total	1,025,745,847	
Renewable Total	172,418,844	16.81%
Renewable Percent	16.8%	
CO2 Emissions (MMetricTons)	383	
Total Var. Prod. Cost (M\$)	19,912	

Annual WECC Generation by Resource Type



Load & Resource Balance across the 4 cases

Base Case

	BASE CASE								
Overall Summary	AZ-NM-NV	Basin	Alberta	British Columbia	CA-North	CA-South	NWPP	RMPA	WECC
Planning Reserve %	13.5%	12.6%	14.1%	14.1%	17.0%	17.0%	17.2%	12.5%	
Peak Load	33,106	16,438	15,049	11,393	29,101	42,110	27,946	13,860	189,003
Gen Requirement (Peak Load + Reserves)	37,575	18,509	17,171	12,999	34,048	49,269	32,753	15,593	217,916
Gen Capacity Available at time of Peak in Dataset	44,357	19,221	16,034	16,125	29,904	40,057	39,090	16,961	221,750
Initial Gap	-6,782	-712	1,137	-3,126	4,144	9,212	-6,338	-1,369	-3,834
Gap Adjustment (Net Exports)	5,661	975	0	0	-4,000	-9,215	6,579	0	0
Adjusted Gap	-1,121	263	1,137	-3,126	144	-3	241	-1,369	-3,834
Resulting PRM	17%	11%	7%	42%	17%	17%	16%	22%	17%

Reference Case

REFERENCE CASE									
Overall Summary	AZ-NM-NV	Basin	Alberta	British Columbia	CA-North	CA-South	NWPP	RMPA	WECC
Planning Reserve %	13.5%	12.6%	14.1%	14.1%	17.0%	17.0%	17.2%	12.5%	
Peak Load	31,316	15,972	15,049	11,393	26,476	39,036	27,083	13,661	179,985
Gen Requirement (Peak Load + Reserves)	35,544	17,984	17,171	12,999	30,976	45,672	31,741	15,369	207,457
Gen Capacity Available at time of Peak in Dataset	44,239	19,219	15,956	16,125	29,904	39,481	39,003	16,963	220,890
Initial Gap	-8,695	-1,235	1,215	-3,126	1,073	6,191	-7,262	-1,594	-13,434
Gap Adjustment (Net Exports)	5,661	975	0	0	-4,000	-9,215	6,579	0	0
Adjusted Gap	-3,034	-260	1,215	-3,126	-2,927	-3,024	-683	-1,594	-13,434
Resulting PRM	23%	14%	6%	42%	28%	25%	20%	24%	23%

High Load Case

HIGH LOAD CASE									
Overall Summary	AZ-NM-NV	Basin	Alberta	British Columbia	CA-North	CA-South	NWPP	RMPA	WECC
Planning Reserve %	13.5%	12.6%	14.1%	14.1%	17.0%	17.0%	17.2%	12.5%	
Peak Load	34,448	17,569	16,554	12,532	28,645	42,326	29,792	15,027	196,893
Gen Requirement (Peak Load + Reserves)	39,098	19,783	18,888	14,299	33,515	49,521	34,916	16,905	226,926
Gen Capacity Available at time of Peak in Dataset	43,925	19,306	16,623	16,125	29,764	41,259	40,840	17,087	224,929
Initial Gap	-4,827	477	2,265	-1,826	3,751	8,263	-5,923	-182	1,997
Gap Adjustment (Net Exports)	5,661	975	0	0	-4,000	-9,215	6,579	0	0
Adjusted Gap	834	1,452	2,265	-1,826	-249	-952	656	-182	1,997
Resulting PRM	11%	4%	0%	29%	18%	19%	15%	14%	14%

High DSM Case

HIGH DSM CASE									
still need to remove more CA renewables									
Overall Summary	AZ-NM-NV	Basin	Alberta	British Columbia	CA-North	CA-South	NWPP	RMPA	WECC
Planning Reserve %	13.5%	12.6%	14.1%	14.1%	17.0%	17.0%	17.2%	12.5%	
Peak Load	28,270	14,749	12,897	11,219	26,080	37,181	24,168	11,668	166,232
Gen Requirement (Peak Load + Reserves)	32,086	16,607	14,715	12,801	30,514	43,502	28,325	13,127	191,677
Gen Capacity Available at time of Peak in Dataset	43,596	19,163	16,545	16,125	29,764	38,341	38,839	16,818	219,191
Initial Gap	-11,509	-2,556	-1,829	-3,324	750	5,161	-10,514	-3,692	-27,514
Gap Adjustment (Net Exports)	5,661	975	0	0	-4,000	-9,215	6,579	0	0
Adjusted Gap	-5,848	-1,581	-1,829	-3,324	-3,250	-4,054	-3,935	-3,692	-27,514
Resulting PRM	34%	23%	28%	44%	29%	28%	33%	44%	32%

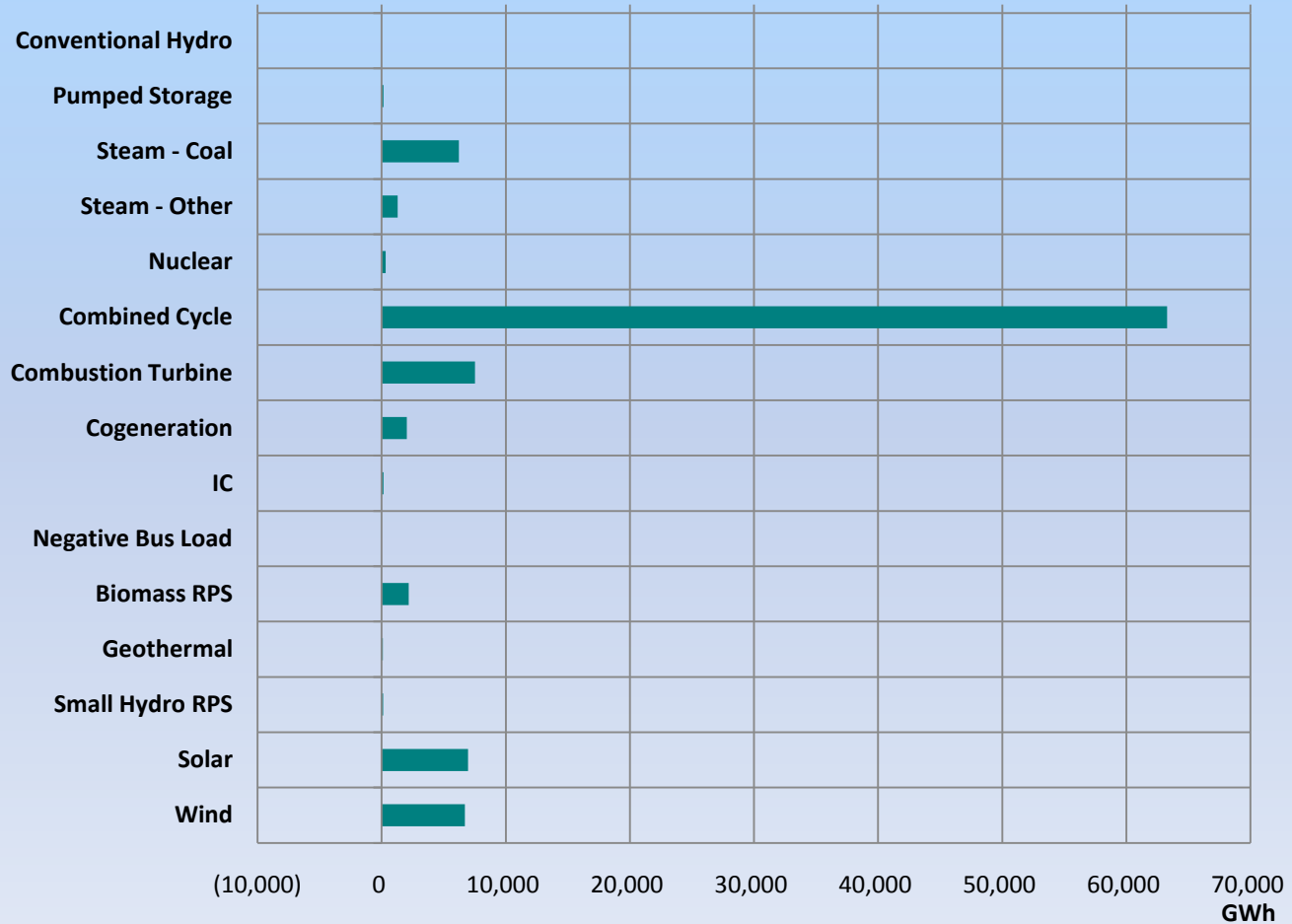
Planning Margin Assumptions

- ▶ WECC's Load and Resource Subcommittee uses the "Building Block Guideline" that has 4 parts:
 - Contingency Reserves
 - Amount of operating reserve to reduce area control area (ACE) to zero in 10 minutes following loss of generating capacity
 - Regulating Reserves
 - Amount of spinning reserves responsive to automatic generation control (AGC), sufficient to provide normal regulating margin
 - Additional Forced Outages
 - Reserves for additional forced outages, beyond what might be covered by operating reserves in order to cover 2nd contingencies
 - Temperature Adders
 - Adjustment for future peak demand converted from a 1-in-2 forecast to a 1-in-10 forecast

High Load Case: Preliminary Modeling Results

Comparison of Energy Results by Category				
Generation Results (MWh)				
Category	22 Nov run of SPSC Ref Case	23 Nov run of SPSC High Load Case	Difference	Diff %
Conventional Hydro	246,814,053	246,796,643	(17,410)	-0.007%
Pumped Storage	2,604,683	2,758,368	153,685	5.900%
Steam - Coal	287,718,945	293,955,081	6,236,137	2.167%
Steam - Other	3,117,331	4,403,715	1,286,384	41.266%
Nuclear	76,411,714	76,738,722	327,008	0.428%
Combined Cycle	161,160,670	224,453,300	63,292,630	39.273%
Combustion Turbine	12,325,898	19,845,821	7,519,924	61.009%
Cogeneration	26,087,885	28,107,582	2,019,696	7.742%
IC	225,678	377,663	151,985	67.346%
Negative Bus Load	4,640,148	4,640,148	0	0.000%
Biomass RPS	14,901,177	17,074,238	2,173,060	14.583%
Geothermal	35,743,860	35,851,896	108,036	0.302%
Small Hydro RPS	7,755,782	7,871,262	115,480	1.489%
Solar	29,672,103	36,632,692	6,960,589	23.458%
Wind	76,613,125	83,319,442	6,706,317	8.753%
Total	985,793,052	1,082,826,573	97,033,521	9.843%
Renewable Total	164,686,047	180,749,529	16,063,482	9.754%
Renewable Percent	16.7%	16.7%	(0)	-0.081%
Other Results (see TEPPC Glossary for definitions)				
Dump Energy	28,442	14,924	(13,518)	-47.527%
Emergency Energy	390	15,284	14,894	3817.578%
CO ₂ Emissions (MMetricTons)	368	406	38	10.359%
CO ₂ Adder (\$/metric ton)	0.000	0.000		

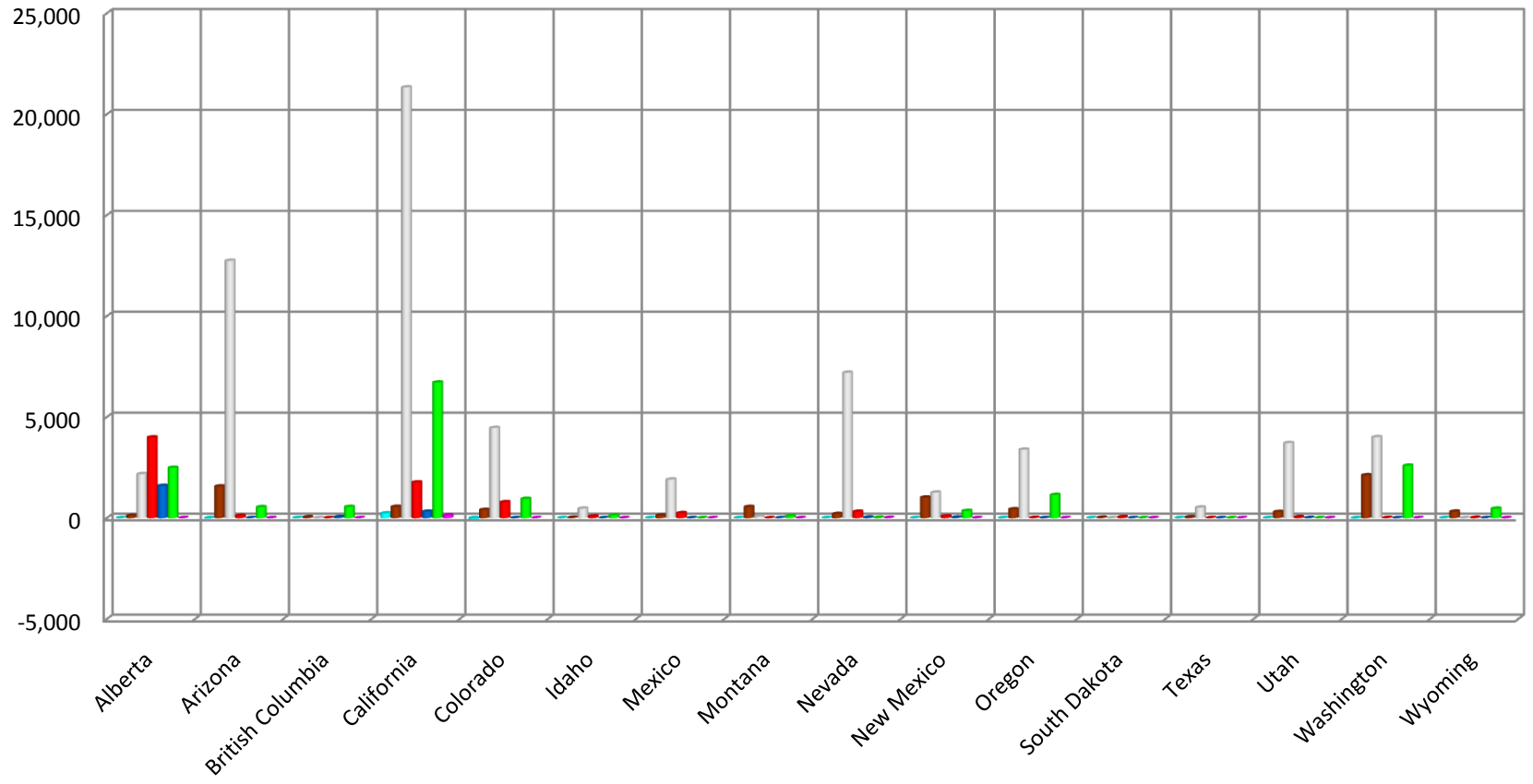
Annual Energy Difference: 22 Nov run of SPSC Ref Case vs. 23 Nov run of SPSC High Load Case



Annual Energy Difference: 22 Nov run of SPSC Ref Case vs. 23 Nov run of SPSC High Load Case

GWh

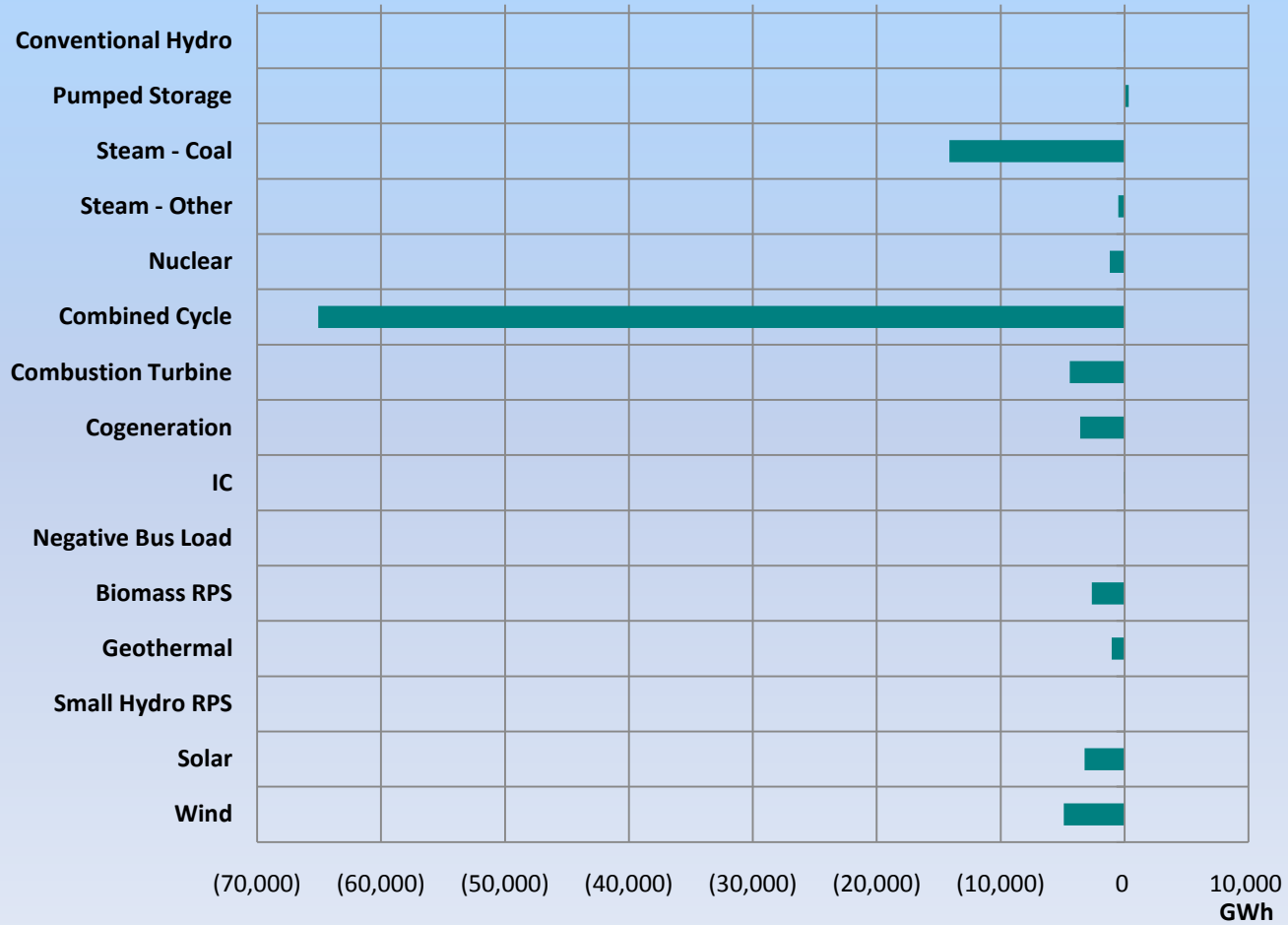
Hydro+PS Steam - Boiler Combined Cycle Combustion Turbine Cogeneration Renewable Other



High DSM Case: Preliminary Modeling Results

Comparison of Energy Results by Category				
Generation Results (MWh)				
Category	22 Nov run of SPSC Ref Case	22 Nov run of SPSC High DSM Case	Difference	Diff %
Conventional Hydro	246,814,053	246,775,444	(38,610)	-0.016%
Pumped Storage	2,604,683	2,928,545	323,862	12.434%
Steam - Coal	287,718,945	273,592,508	(14,126,437)	-4.910%
Steam - Other	3,117,331	2,608,744	(508,587)	-16.315%
Nuclear	76,411,714	75,217,247	(1,194,467)	-1.563%
Combined Cycle	161,160,670	96,094,010	(65,066,660)	-40.374%
Combustion Turbine	12,325,898	7,897,217	(4,428,680)	-35.930%
Cogeneration	26,087,885	22,510,373	(3,577,513)	-13.713%
IC	225,678	157,184	(68,494)	-30.350%
Negative Bus Load	4,640,148	4,640,148	0	0.000%
Biomass RPS	14,901,177	12,269,487	(2,631,690)	-17.661%
Geothermal	35,743,860	34,698,507	(1,045,352)	-2.925%
Small Hydro RPS	7,755,782	7,755,792	10	0.000%
Solar	29,672,103	26,436,282	(3,235,822)	-10.905%
Wind	76,613,125	71,701,608	(4,911,517)	-6.411%
Total	985,793,052	885,283,095	(100,509,957)	-10.196%
Renewable Total	164,686,047	152,861,676	(11,824,372)	-7.180%
Renewable Percent	16.7%	17.3%	0	3.358%

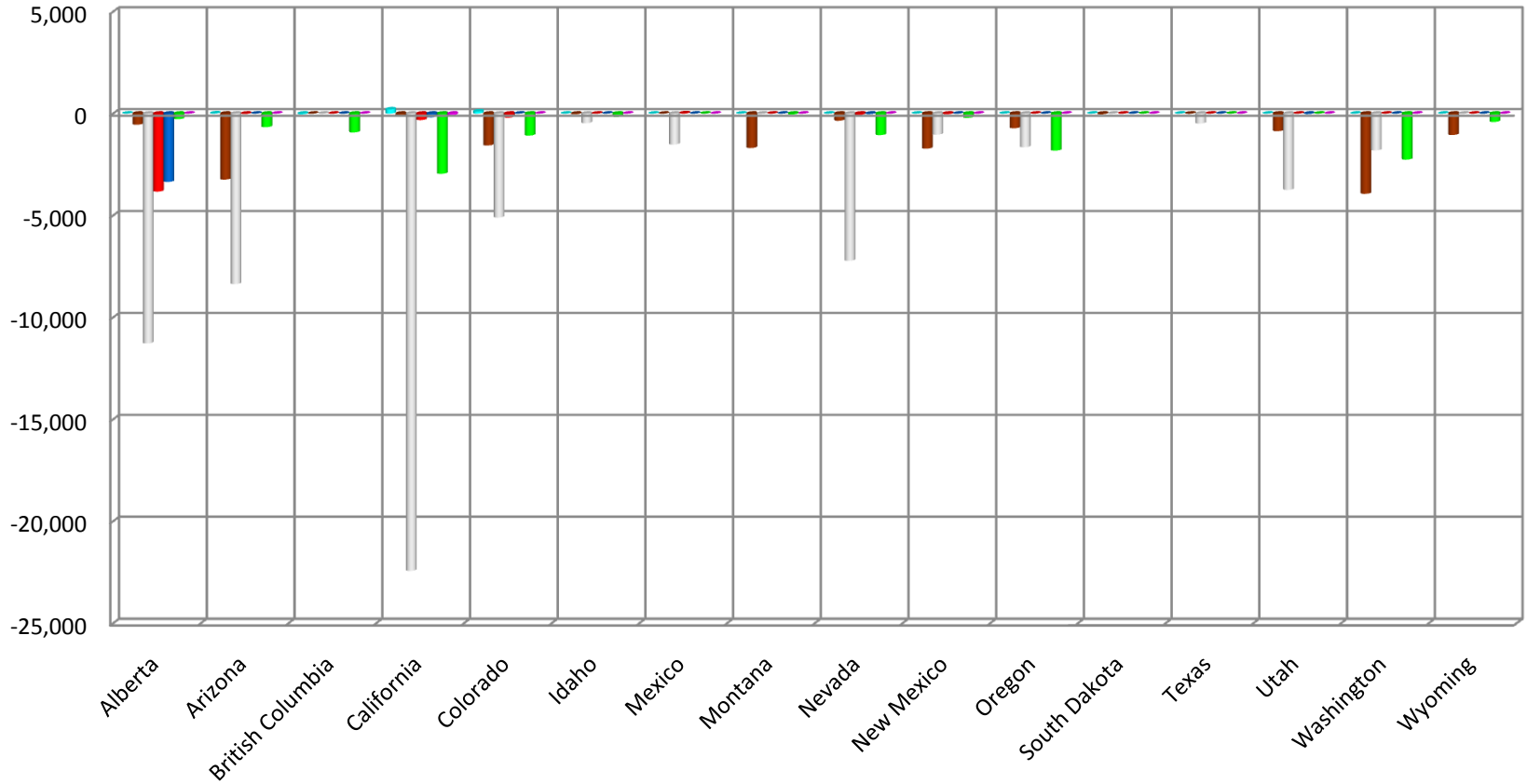
Annual Energy Difference: 22 Nov run of SPSC Ref Case vs. 22 Nov run of SPSC High DSM Case



Annual Energy Difference: 22 Nov run of SPSC Ref Case vs. 22 Nov run of SPSC High DSM Case

GWh

Hydro+PS Steam - Boiler Combined Cycle Combustion Turbine Cogeneration Renewable Other



EXTRA SLIDES

2020 Load and RPS Requirements by Cases						
	Base Case		Reference Case			
State/ Province	2020 Load Forecast (GWh) by Balancing Areas	Total RPS Energy (GWh) in 2020	2020 Load Forecast (GWh) by Balancing Areas	% Change from Base Case	Total RPS Energy (GWh) in 2020	% Change from Base Case
AB	108,555		108,555	0.0%		
AZ	99,052	5,622	92,283	-6.8%	5,238	-6.8%
BC	63,241		63,241	0.0%		
CA	326,508	94,986	307,183	-5.9%	89,055	-6.2%
CO	69,315	11,746	68,639	-1.0%	11,632	-1.0%
ID	28,527		27,250	-4.5%		
MEX	17,259		17,484	1.3%		
MT	14,729	1,084	13,527	-8.2%	995	-8.2%
NV	41,067	5,582	39,426	-4.0%	5,359	-4.0%
NM	19,749	2,907	18,871	-4.4%	2,777	-4.4%
OR	58,836	8,681	56,717	-3.6%	8,368	-3.6%
TX	8,483	424	8,104	-4.5%	405	-4.5%
UT	38,045	4,747	37,415	-1.7%	4,668	-1.7%
WA	104,316	12,355	99,539	-4.6%	11,789	-4.6%
WY	23,968		23,387	-2.4%		
Total	1,021,649	148,134	981,620	-3.9%	140,288	-5.3%

2020 Load and RPS Requirements by Cases								
	High Load Case				High DSM Case			
State/ Province	2020 Load Forecast (GWh) by Balancing Areas	% Change from Reference Case	Total RPS Energy (GWh) in 2020	% Change from Reference Case	2020 Load Forecast (GWh) by Balancing Areas	% Change from Reference Case	Total RPS Energy (GWh) in 2020	% Change from Reference Case
AB	119,411	10.0%			88,417	-18.6%		
AZ	101,511	10.0%	5,761	10.0%	80,663	-12.6%	4,578	-12.6%
BC	69,565	10.0%			52,188	-17.5%		
CA	337,902	10.0%	98,483	10.6%	289,642	-5.7%	83,672	-6.0%
CO	75,503	10.0%	12,795	10.0%	60,873	-11.3%	10,316	-11.3%
ID	30,028	10.2%			24,990	-8.3%		
MEX	19,232	10.0%			17,484	0.0%		
MT	14,859	9.8%	1,093	9.8%	13,023	-3.7%	958	-3.7%
NV	43,369	10.0%	5,895	10.0%	32,974	-16.4%	4,482	-16.4%
NM	20,758	10.0%	3,055	10.0%	17,725	-6.1%	2,609	-6.1%
OR	61,966	9.3%	9,143	9.3%	50,912	-10.2%	7,512	-10.2%
TX	8,914	10.0%	446	10.0%	7,516	-7.3%	376	-7.3%
UT	41,157	10.0%	5,135	10.0%	34,150	-8.7%	4,261	-8.7%
WA	109,883	10.4%	13,014	10.4%	88,624	-11.0%	10,497	-11.0%
WY	25,726	10.0%			20,380	-12.9%		
Total	1,079,782	10.0%	154,820	10.4%	879,562	-10.4%	129,260	-7.9%