

SPSC High DSM Load Forecast: Wyoming

Overview

Tables 1 and 2 present the High DSM load forecasts (Column D) for the balancing authorities in Wyoming, compared to the Common Case load forecasts. Table 3 directly compares the underlying energy efficiency projections for the Common Case and High DSM Case, in terms of their percentage of the hypothetical load forecast with no future energy efficiency savings. The following two sections of this document explain how the High DSM scenario efficiency savings projections were developed for each of the two balancing authority in Wyoming.

Table 1. High DSM Load Forecasts for 2021: Annual Electricity Consumption (GWh)

Balancing Authority (In-State Portion)	A	B	C	D = A - (C - B)	E = (D/A - 1)
	Common Case Load Forecast	Common Case Efficiency Savings	High DSM Efficiency Savings	High DSM Load Forecast	Percent Change from Common Case Load Forecast
	(GWh)	(GWh)	(GWh)	(GWh)	(%)
PACE	13,594	804	1,939	12,459	-8%
WACM	9,827	350	1,539	8,638	-12%
State Total	23,421	1,154	3,478	21,098	-10%

Table 2. High DSM Load Forecasts for 2021: Annual Peak Demand (MW)

Balancing Authority (In-State Portion)	A	B	C	D = A - (C - B)	E = (D/A - 1)
	Common Case Load Forecast	Common Case Efficiency Savings	High DSM Efficiency Savings	High DSM Load Forecast	Percent Change from Common Case Load Forecast
	(MW)	(MW)	(MW)	(MW)	(%)
PACE	2,699	151	282	2,568	-5%
WACM	1,517	68	301	1,284	-15%
State Total	4,216	219	583	3,851	-9%

Table 3. Comparison of Reference Case and High DSM Case (2020 Cumulative Savings)

Balancing Authority (In-State Portion)	Common Case Savings (% of No-EE Load Forecast)		High DSM Case Savings (% of No-EE Load Forecast)	
	GWh	MW	GWh	MW
PACE	6%	5%	13%	10%
WACM	3%	4%	15%	19%
State Total	5%	5%	14%	13%

Note: The percentages in this table were calculated by dividing the savings projection by the sum of the savings

projection and the post-savings load forecast (e.g., High DSM savings divided by High DSM savings plus High DSM load forecast)

PACE Balancing Authority

The High DSM savings projection for the PACE balancing authority is based, in part, on PacifiCorp’s 2011 energy efficiency potential study (Cadmus, 2011). Table 4 presents the *technical potential* estimate from that study, for the Wyoming portion of PacifiCorp’s service territory, in the year 2030.

Table 4. Technical Potential Estimate for 2030 (PacifiCorp Wyoming Service Territory)

Market Sector	aMW	GWh	MW ¹
Residential	47	412	60
Commercial	53	464	68
Industrial	158	1,384	201
Irrigation	0	3	0
Street Lighting	1	5	1
Total	259	2,269	330

Source: Cadmus (2011), Tables 63, 65, 67, 69, and 70

¹ The study provides peak demand savings potential for the Wyoming service territory as a whole, but not for each individual market segment within the service territory. The peak demand savings shown in this table were estimated by applying the peak-to-energy savings ratio implied by the peak and energy savings estimates for the entire service territory (330 MW / 2269 GWh = 0.15 MW/GWh) to each market sector.

In order to use the potential estimates in Table 4 for developing a High DSM savings projection for the entire Wyoming portion of the PACE balancing authority, three additional steps are required:

- 1) Estimate the technical potential for the year 2021
- 2) Estimate economic potential based on the technical potential estimate
- 3) Extrapolate the results to the entire Wyoming portion of the PACE balancing authority

Estimating Technical Potential for the Year 2021

The SPSC DSM Work Group is initially developing High DSM Case savings projections and load forecasts for the year 2021. The technical potential estimate in the Cadmus study, however, is based on the year 2030. Those results must therefore be adjusted to account for the fact that technical potential increases over time. To inform this adjustment, Table 5 segments the technical potential for each market sector into “discretionary” and “lost opportunity” measures.

Table 5. PacifiCorp Technical Potential Estimate: Discretionary vs. Lost Opportunity Measures

Sector	Discretionary	Lost Opportunity
Residential	38%	62%
Commercial	72%	28%
Industrial	100%	0%

Irrigation	100%	0%
Street Lighting	100%	0%
Total	64%	36%

¹ Source: Calculated from Cadmus (2011), Table 54.

To estimate the available technical potential for 2021, we assume that all discretionary measures are available immediately, but that the lost opportunity potential for each market sector increases linearly with time. Based on this assumption, Table 6 presents the estimated technical potential for the PacifiCorp's Wyoming service territory in 2021. Given the relative contribution of discretionary and lost opportunity measures, the estimated technical potential in 2021 (237 aMW) is equal to approximately 91% of the technical potential in 2030 (259 aMW).

Table 6. Technical Potential Estimate for 2021 (PacifiCorp Wyoming Service Territory)

Market Sector	aMW	GWh	MW
Residential	32	283	41
Commercial	46	399	58
Industrial	158	1,384	201
Irrigation	0	3	0
Street Lighting	1	5	1
Total	237	2,074	302

Estimating Economic Potential Based on the Technical Potential Estimate

The SPSC DSM Work Group determined that the savings projections for the High DSM Case are to be based on achieving the full *economic potential* throughout the WECC. The 2011 PacifiCorp potential study provides estimates of technical potential and achievable technical potential; it does not, however, provide an estimate of economic potential. Therefore, we also rely on PacifiCorp's 2007 energy efficiency potential study (Quantec, 2007), which provides estimates of both technical and economic potential. In that study, the economic potential for the Wyoming portion of PacifiCorp's service territory is equal to 89% of the corresponding technical potential. We apply the same percentage to the updated technical potential estimate in Table 6, in order to estimate an updated economic potential for the Wyoming portion of PacifiCorp's service territory, as shown in Table 7.

Table 7. Updated Economic Potential Estimates for PacifiCorp Wyoming Service Territory in 2021

Market Sector	aMW	GWh	MW
Residential	29	253	37
Commercial	41	356	52
Industrial	141	1,235	180
Irrigation	0	2	0
Street Lighting	1	5	1
Total	211	1,851	269

Extrapolating the Results to the Entire Wyoming Portion of the PACE Balancing Authority

The Wyoming portion of the PACE balancing authority consists primarily of PacifiCorp’s load, but also includes several small utilities and cooperatives. We extrapolate the PacifiCorp potential study results for each sector (residential, commercial, and industrial) to the entire Wyoming portion of PACE by simply scaling up the energy and peak demand savings potential based on the ratio of the total balancing authority retail sales to PacifiCorp’s retail sales, for that sector. While we recognize that this is a simplistic approach, and ignores potential differences in demographics, climate, and end-use characteristics, we also believe that it is a reasonable approximation given the data and resources available. This extrapolation, presented below in Table 8, yields an estimated economic potential for the entire Wyoming portion of PACE equal to 1,939 GWh and 282 MW.

Table 8. Extrapolation of Economic Potential to Wyoming Portion of PACE

	Res.	Com.	Ind.	Total
<u>Retail Sales¹</u>				
PacifiCorp (Wyoming)	1,083	1,519	6,734	9,335
PACE (Wyoming)	1,254	1,691	6,775	9,720
<u>Net Economic Potential in 2021 (GWh)</u>				
PacifiCorp (Wyoming)	253	356	1,242	1,851
PACE (Wyoming)	293	397	1,250	1,939
<u>Net Economic Potential in 2021 (MW)</u>				
PacifiCorp (Wyoming)	37	52	181	269
PACE (Wyoming)	43	58	182	282

¹ Data Source: EIA-861 retail sales data for 2008.

WACM Balancing Authority

The High DSM scenario savings estimate for the WACM balancing authority is based on the 2010 energy efficiency potential study for Tri-State Generation and Transmission Cooperative (Nexant, 2010). The potential estimates from that study, for the Wyoming portion of Tri-State’s service territory in the year 2020, are presented below in Table 9.

Table 9. Tri-State Energy Efficiency Potential (Wyoming Service Territory, 2020)

	Technical	Economic	Max. Achievable ¹
GWh	402	308	179
MW	83	62	36
% of baseline retail sales	20%	15%	9%

Source: Calculated from detailed savings tables in Nexant (2010), Appendix A

Notes: The potential study indicates that the baseline projection accounts for naturally occurring savings, thus the potential estimates are net of naturally occurring savings.

¹ Max. Achievable scenario assumes incentives cover 100% of incremental measure cost. The study also estimated achievable potential under three other incentive levels.

For the purpose of the High DSM scenario we assume that the full economic potential is achieved in the Wyoming portion of the WACM balancing authority region. Developing a High DSM load forecast for the balancing authority involves three additional steps:

- 1) Adding avoided T&D losses to the economic potential estimate
- 2) Extrapolating the potential study results to the entire Wyoming portion of the WACM balancing authority

Adding Avoided T&D Losses to the Potential Estimates

The potential estimates presented in the Tri-State study represent savings at the customer meter. The economic potential estimate must therefore be scaled up to the bus-bar to account for avoided T&D losses, based on an estimated marginal T&D loss factor (7.7%).¹ The results of this adjustment are shown below in Table 10.

Table 10. Tri-State Economic Potential (Wyoming, 2020) Including Avoided T&D Losses

	Res.	Com.	Ind.	Irrig.	Total
GWh	83	14	224	12	334
MW	14	3	45	5	67

Extrapolating the Study Results to the Entire Wyoming Portion of WACM

The Wyoming portion of the WACM balancing authority consists of numerous utilities (the largest being Powder River, Cheyenne, High Plains, and Lower Valley). Tri-State G&T serves about one quarter of the total load within the Wyoming portion of WACM.

To extrapolate the Tri-State potential study, we follow a similar procedure as with the PACE balancing authority. Namely, we scale up the potential study results for each sector, in proportion to 2008 retail sales for that sector. This extrapolation is presented below in Table 11, which indicates that the total economic potential in the Wyoming portion of WACM is estimated to be 1,539 GWh and 301 MW in 2020. These values represent savings at the bus bar and are net of naturally occurring savings.

¹ Tri-State's potential study cites an average T&D loss factor of 5.5%. We assume that marginal T&D loss factors are equal to 1.4 times the average T&D loss factor, based on preliminary analysis conducted by Jim Lazar and shared with members of the DSM working group. Marginal loss factors are the relevant metric for estimating avoided T&D losses from DSM and are higher than average loss factors, because resistive losses increase exponentially with load.

Table 11. Estimated Economic Potential for Wyoming Portion of WACM

	Res.	Com.	Ind. & Irr.	Total
<u>2008 Retail Sales</u>				
Tri-State (WY)	387	56	1,210	1,653
WACM (WY)	1,465	2,721	2,785	6,970
<u>Net Economic Potential in 2020 (GWh)</u>				
Tri-State (WY)	83	14	237	334
WACM (WY)	314	681	545	1,539
<u>Net Economic Potential in 2020 (MW)</u>				
Tri-State (WY)	14	3	50	67
WACM (WY)	53	132	116	301

¹ Data Source: EIA-861 retail sales data for 2008.