

## State-Adjusted Load Forecast: **Arizona**

Reviewed by	Date
Galen Barbose (revised)	08/03/10
Galen Barbose (revised)	08/06/10

This document presents the 2020 State-Adjusted Load Forecast recommended by the SPSC DSM Work Group, and describes the underlying analysis. The State-Adjusted Load Forecast will be used in the SPSC Reference Case, and will be the starting point in developing alternate load forecasts for the other scenarios in the SPSC study request. The State-Adjusted Load Forecast recommended by the DSM Work Group is intended to reflect the expected energy savings and peak demand savings from current energy efficiency policies and utility resource plans, based on the methodology and assumptions described in the Reference Case proposal from the DSM Work Group to the SPSC, and incorporating any subsequent guidance from each state/province’s designated DSM technical contact.<sup>1</sup>

**We seek approval from SPSC members of the State-Adjusted Load Forecasts shown in Column D of Tables 1 and 2. Please respond to Michael Wheeler ([michael.wheeler@cpuc.ca.gov](mailto:michael.wheeler@cpuc.ca.gov)) by August 4<sup>th</sup> indicating whether the proposed forecast is acceptable, and if not, what specific changes are needed.**

Given the limited time available for making revisions to this analysis, we request that revisions to the analysis be made only if they are likely to have a material impact on the load forecasts at the balancing authority level. Any questions about how the State-Adjusted Load Forecasts were developed that are not addressed within this document should be directed to Galen Barbose ([gbarbose@lbl.gov](mailto:gbarbose@lbl.gov), 510-495-2593).

### **A. Recommended State-Adjusted Load Forecast**

There are four balancing authorities that reside within or overlap with Arizona: Arizona Public Service (APS), Salt River Project (SRP), Tucson Electric Power (TEP) and Western Area Power Administration – Lower Colorado Region (WALC). Tables 1 and 2 present the SPSC DSM Work Group’s recommended State-Adjusted Load Forecast for each balancing authority in the state/province (Column D), compared to the forecasts that were submitted by the balancing authorities to WECC. The difference between these two sets of load forecasts reflects the difference between the estimated reference case energy efficiency savings (Column B) and the amount of savings already embedded in the WECC load forecast (Column C). The remainder of this document provides details on the analysis underlying the values shown in Columns B and C.

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<sup>1</sup> See: “Proposed TEPPC Reference Case DSM Assumptions: Request for Review and Input from SPSC Members,” dated April 3, 2010.

Table 1. State-Adjusted Load Forecasts for 2020: Annual Electricity Consumption (GWh)

Balancing Authority (In-State Portion)	A	B	C	D = A - (B - C)	E = (D/A - 1)
	Load Forecast Submitted to WECC	Reference Case Efficiency Savings	Savings Embedded in WECC Load Forecast	State-Adjusted Load Forecast	Percent Change from BA Forecast
	(GWh)	(GWh)	(GWh)	(GWh)	(%)
APS	35,990	<u>7,661</u>	<u>6,189</u>	<u>34,518</u>	<u>-4%</u>
SRP	<u>40,382</u>	<u>2,430</u>	<u>778</u>	<u>38,730</u>	<u>-4%</u>
TEP	16,478	<u>3,387</u>	<u>0</u>	<u>13,091</u>	<u>-21%</u>
WALC	6,202	<u>811</u>	<u>557</u>	<u>5,948</u>	<u>-4%</u>
<b>State Total</b>	<b><u>99,052</u></b>	<b><u>14,289</u></b>	<b><u>7,524</u></b>	<b><u>92,287</u></b>	<b><u>-7%</u></b>

Table 2. State-Adjusted Load Forecasts for 2020: Peak Demand (MW)

Balancing Authority (In-State Portion)	A	B	C	D=A-(B-C)	E = (D/A - 1)
	Load Forecast Submitted to WECC	Reference Case Efficiency Savings	Savings Embedded in WECC Load Forecast	State-Adjusted Load Forecast	Percent Change from BA Forecast
	(MW)	(MW)	(MW)	(MW)	(%)
APS	8,407	<u>1,515</u>	<u>1,160</u>	<u>8,053</u>	<u>-4%</u>
SRP	8,800	<u>543</u>	<u>146</u>	<u>8,403</u>	<u>-5%</u>
TEP	3,660	<u>671</u>	<u>0</u>	<u>2,989</u>	<u>-18%</u>
WALC	1,394	<u>166</u>	<u>104</u>	<u>1,333</u>	<u>-4%</u>
<b>State Total</b>	<b>22,261</b>	<b><u>2,894</u></b>	<b><u>1,411</u></b>	<b><u>20,778</u></b>	<b><u>-7%</u></b>

## B. Reference Case Energy Efficiency Savings

The reference case energy efficiency savings are associated with: (1) ratepayer-funded energy efficiency programs and (2) new federal appliance and lighting standards. Table 3 summarizes the DSM Work Group’s Reference Case projection of the expected energy and peak savings from each of these policy mechanisms. These projections represent the cumulative impact in 2020 from programs and policies implemented over the 2010-2020 time period; that is, they are incremental to impacts from programs or policies implemented prior to 2010. In the remainder of this section, we describe how the values in Table 3 were derived.

Table 3. Reference Case Energy Efficiency Savings in 2020

Balancing Authority (In-State Portion)	Ratepayer-Funded Energy Efficiency		New Federal Lighting/ Appliance Standards		Total	
	GWh	MW	GWh	MW	GWh	MW
APS	<u>6,381</u>	<u>1,196</u>	<u>1,472</u>	<u>354</u>	<u>7,661</u>	<u>1,515</u>
SRP	<u>778</u>	<u>146</u>	<u>1,652</u>	<u>397</u>	<u>2,430</u>	<u>543</u>
TEP	<u>2,869</u>	<u>538</u>	<u>674</u>	<u>162</u>	<u>3,387</u>	<u>671</u>
WALC	<u>585</u>	<u>110</u>	<u>254</u>	<u>61</u>	<u>811</u>	<u>166</u>
<b>State Total</b>	<b><u>10,613</u></b>	<b><u>1,990</u></b>	<b><u>4,053</u></b>	<b><u>975</u></b>	<b><u>14,289</u></b>	<b><u>2,894</u></b>

## Ratepayer-Funded Energy Efficiency Program Savings

The DSM Working Group developed reference case projections of savings from ratepayer-funded energy efficiency programs for individual electric utilities in Arizona (see Table 4). The savings projections for the state's investor-owned utilities (APS, TEP, UNS, and Morenci) and four Class A cooperatives (Graham, Mohave, Sulphur Springs, and Trico) were developed by assuming full compliance with the state's Energy Efficiency Standard (EES). Navopache is also subject to the EES, but this utility resides within the Public Service of New Mexico balancing authority, and thus for simplicity, was incorporated into the State-Adjusted Load Forecast for the state of New Mexico.

Arizona's EES has several complex provisions, which were treated as follows:

- Demand response (DR) allowance: The EES allows 10% of the overall requirement to be met through demand response, which is credited with energy savings by applying a 50% load factor to the demand reductions. For the DSM Work Group's analysis, utilities were assumed to fully exhaust their DR allowance. However, we do not attribute any energy savings to DR. Thus, the only impact of the DR allowance is to reduce the actual energy savings required to meet the overall target.
- Combined heat and power (CHP) and building codes: The EES allows utilities to meet their targets through a combination of ratepayer-funded energy efficiency programs, CHP, and new building codes. For the purpose of our analysis, we assume that the residual portion of the targets (after deducting the DR contribution) will be met entirely through ratepayer-funded energy efficiency programs. However, alternate assumptions would not fundamentally affect the results of this analysis.
- Pre-Standard energy efficiency programs: The EES allows utilities to receive "retroactive" credit for savings from programs implemented between 2005 and 2010, subject to several limitations. The DSM Work Group compiled data on historical energy efficiency program savings for the IOUs, and applied those savings towards each utility's EES obligations, subject to the restrictions in the EES Rule.<sup>2</sup>

For each utility subject to the EES, annual energy savings were calculated by applying the required savings percentage to estimated retail sales. Retail sales projections for each utility were developed by applying the average annual growth rate for the corresponding balancing authority to historical retail sales data from EIA.

Salt River Project is not subject to the Arizona's EES. The savings projections for SRP shown in Table 4 are based on data obtained through direct communications with SRP staff, and reflect the utility's current energy efficiency program plan. The values shown were confirmed with SRP staff to represent cumulative savings.

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<sup>2</sup> Specifically, we assume that APS and TEP utilize 1,037 GWh and 176 GWh of pre-standard savings, respectively.

Note that Table 4 identifies the balancing authority for each utility (shown in parentheses after the utility name). UNS Electric's service territory appears to be split between the APS and TEP balancing authorities. For the purpose of our analysis, we assign the UNS savings to the TEP balancing authority.

Table 4. Cumulative Savings from Ratepayer-Funded EE Programs

Utility (Balancing Auth.)	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Energy Savings (GWh)</b>											
<u>Arizona Public Service</u>	<u>297</u>	<u>666</u>	<u>1,193</u>	<u>1,809</u>	<u>2,517</u>	<u>3,235</u>	<u>3,969</u>	<u>4,637</u>	<u>5,266</u>	<u>5,856</u>	<u>6,381</u>
<u>Salt River Project</u>	<u>184</u>	<u>302</u>	<u>357</u>	<u>460</u>	<u>596</u>	<u>737</u>	<u>780</u>	<u>779</u>	<u>779</u>	<u>778</u>	<u>778</u>
<u>Tucson Electric Power</u>	<u>70</u>	<u>194</u>	<u>372</u>	<u>579</u>	<u>817</u>	<u>1,058</u>	<u>1,317</u>	<u>1,567</u>	<u>1,812</u>	<u>2,053</u>	<u>2,284</u>
<u>UNS Electric (TEP)</u>	<u>12</u>	<u>34</u>	<u>65</u>	<u>101</u>	<u>143</u>	<u>185</u>	<u>220</u>	<u>242</u>	<u>255</u>	<u>261</u>	<u>255</u>
<u>Morenci (TEP)</u>	<u>0</u>	<u>26</u>	<u>64</u>	<u>108</u>	<u>158</u>	<u>209</u>	<u>254</u>	<u>286</u>	<u>310</u>	<u>326</u>	<u>330</u>
<u>Graham County (WALC)</u>	<u>0</u>	<u>2</u>	<u>5</u>	<u>8</u>	<u>11</u>	<u>15</u>	<u>19</u>	<u>23</u>	<u>28</u>	<u>32</u>	<u>36</u>
<u>Mohave (WALC)</u>	<u>0</u>	<u>10</u>	<u>25</u>	<u>41</u>	<u>61</u>	<u>80</u>	<u>102</u>	<u>125</u>	<u>147</u>	<u>170</u>	<u>193</u>
<u>Sulpher Springs (WALC)</u>	<u>0</u>	<u>11</u>	<u>26</u>	<u>43</u>	<u>64</u>	<u>84</u>	<u>107</u>	<u>130</u>	<u>154</u>	<u>177</u>	<u>201</u>
<u>Trico (WALC)</u>	<u>0</u>	<u>8</u>	<u>20</u>	<u>33</u>	<u>49</u>	<u>65</u>	<u>82</u>	<u>100</u>	<u>118</u>	<u>136</u>	<u>155</u>
<b>Peak Demand (MW)<sup>1</sup></b>											
<u>Arizona Public Service</u>	<u>56</u>	<u>125</u>	<u>224</u>	<u>339</u>	<u>472</u>	<u>607</u>	<u>744</u>	<u>869</u>	<u>987</u>	<u>1,098</u>	<u>1,196</u>
<u>Salt River Project</u>	<u>35</u>	<u>57</u>	<u>67</u>	<u>86</u>	<u>112</u>	<u>138</u>	<u>146</u>	<u>146</u>	<u>146</u>	<u>146</u>	<u>146</u>
<u>Tucson Electric Power</u>	<u>13</u>	<u>36</u>	<u>70</u>	<u>109</u>	<u>153</u>	<u>198</u>	<u>247</u>	<u>294</u>	<u>340</u>	<u>385</u>	<u>428</u>
<u>UNS Electric (TEP)</u>	<u>2</u>	<u>6</u>	<u>12</u>	<u>19</u>	<u>27</u>	<u>35</u>	<u>41</u>	<u>45</u>	<u>48</u>	<u>49</u>	<u>48</u>
<u>Morenci (TEP)</u>	<u>0</u>	<u>5</u>	<u>12</u>	<u>20</u>	<u>30</u>	<u>39</u>	<u>48</u>	<u>54</u>	<u>58</u>	<u>61</u>	<u>62</u>
<u>Graham County (WALC)</u>	<u>0</u>	<u>0</u>	<u>1</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>
<u>Mohave (WALC)</u>	<u>0</u>	<u>2</u>	<u>5</u>	<u>8</u>	<u>11</u>	<u>15</u>	<u>19</u>	<u>23</u>	<u>28</u>	<u>32</u>	<u>36</u>
<u>Sulpher Springs (WALC)</u>	<u>0</u>	<u>2</u>	<u>5</u>	<u>8</u>	<u>12</u>	<u>16</u>	<u>20</u>	<u>24</u>	<u>29</u>	<u>33</u>	<u>38</u>
<u>Trico (WALC)</u>	<u>0</u>	<u>2</u>	<u>4</u>	<u>6</u>	<u>9</u>	<u>12</u>	<u>15</u>	<u>19</u>	<u>22</u>	<u>26</u>	<u>29</u>

<sup>1</sup> For all utilities, peak demand savings were calculated from energy savings, based on the peak-to-energy savings ratio implied by annual energy and peak savings targets identified in Table 2 of APS' 2010 Energy Efficiency Implementation Plan. The annual savings targets in that table are 320 GWh and 60 MW, corresponding to a peak-to-energy ratio of 0.19 MW/GWh.

### New Federal Lighting and Appliance Standards

In developing its projection of savings from federal lighting and appliance standards, the DSM Work Group focused exclusively on the impact of *new* (or relatively recent) standards<sup>3</sup>, including:

- Standards established directly by Congress through the Energy Independence and Security Act of 2007 (EISA), the most significant of which being the lighting standard;
- Standards established by DOE since 2009 through its normal rulemaking process, or scheduled to be established by January 2013.

<sup>3</sup> The DSM Work Group's decision to focus exclusively on the impact of *new* standards was predicated on the assumption that, in general, the load forecasts submitted by balancing authorities to WECC will already adequately account for the future impact of *existing* standards, by virtue of the econometric load forecasting methods commonly used.

The projected state-level energy and peak demand savings from those new standards are summarized in Table 5. These projections derive largely from secondary data sources, as described in the notes section of the table. For some standards, the data sources directly provided state-level savings estimates, based on state-specific demographic and end-use data. For other standards, the data sources provided only national estimates, and the DSM Work Group estimated the state-level impacts, based on the projected savings from standards for similar standards for which both state and national savings estimates were available. Within each state, savings were allocated to individual balancing authorities in proportion to their projected 2020 load.

Table 5. Projected Savings from New Federal Appliance and Lighting Standards in 2020

Balancing Authority (In-State Portion)	EISA <sup>1</sup>		DOE <sup>2</sup>		Total	
	GWh	MW	GWh	MW	GWh	MW
APS	649	97	823	257	1,472	354
SRP	729	109	924	288	1,652	397
TEP	297	44	377	118	674	162
WALC	112	17	142	44	254	61
<b>Statewide</b>	<b>1,787</b>	<b>267</b>	<b>2,266</b>	<b>707</b>	<b>4,053</b>	<b>975</b>

<sup>1</sup> Data Source: Andrew deLaski, executive director of the Appliance Standards Awareness Project (ASAP), provided a spreadsheet with his analysis of the expected savings from each EISA standard. This is an updated version of an analysis previously published jointly by ASAP and ACEEE, and includes only the savings from those standards directly established by EISA. This data source provided only national impacts.

<sup>2</sup> Data Sources: For new standards that DOE has *scheduled* but not yet established, we rely on the savings projections estimated in Neubauer et al. (2009).<sup>4</sup> That report provides estimates of the expected national savings from each individual standard for which DOE expects to complete its rulemaking by January 2013. State-level estimates are not contained within the report, but are published on ASAP's website, at the following URL: [http://www.standardsasap.org/state/2009%20federal%20analysis/ka-BOOM\\_overview.html](http://www.standardsasap.org/state/2009%20federal%20analysis/ka-BOOM_overview.html). For new standards that DOE has *already* established, since July 2009, we rely on the DOE technical support documentation associated with the final rule, rather than on the projections in Neubauer et al. (2009).

### C. Energy Efficiency Savings Embedded in the WECC Load Forecasts

The State-Adjusted Load Forecasts were developed by deducting from the load forecast that each balancing authority submitted to WECC the *incremental* reference case savings not already embedded within that forecast. The incremental reference case savings is equal to the difference between the total reference case savings (as described in the previous section) and the energy savings from the same programs/policies that are already embedded within the load forecast. Table 6 presents the DSM Working Group's estimates of the energy efficiency program/policy savings already embedded in the balancing authority load forecasts. Further details on the underlying analysis are presented in the remainder of this section.

<sup>4</sup> Max Neubauer, Andrew deLaski, Marianne DiMascio & Steven Nadel . 2009. *Ka-BOOM! The Power of Appliance Standards Opportunities for New Federal Appliance and Equipment Standards*. Washington, DC: American Council for an Energy-Efficient Economy (ACEEE) and the Appliance Standards Awareness Project (ASAP). Report Number ASAP-7/ACEEE-A091.

Table 6. Energy Efficiency Savings Embedded in the WECC Load Forecasts (2020)

Balancing Authority (In-State Portion)	Ratepayer-Funded Energy Efficiency		New Federal Lighting/ Appliance Standards		Total	
	GWh	MW	GWh	MW	GWh	MW
APS	<u>6,381</u>	<u>1,196</u>	0	0	<u>6,381</u>	<u>1,196</u>
SRP	<u>778</u>	<u>146</u>	0	0	<u>778</u>	<u>146</u>
TEP	<u>0</u>	<u>0</u>	0	0	<u>0</u>	<u>0</u>
WALC	<u>585</u>	<u>110</u>	0	0	<u>585</u>	<u>110</u>
<b>State Total</b>	<b><u>7,744</u></b>	<b><u>1,452</u></b>	<b>0</b>	<b>0</b>	<b><u>7,744</u></b>	<b><u>1,452</u></b>

### WECC LSE DSM Survey

Members of the SPSC DSM Work Group and the TEPPC DSM Task Force developed a survey instrument to collect information from load serving entities (LSEs) regarding the energy efficiency and DSM assumptions incorporated into the load forecasts provided to WECC. WECC distributed this survey to LSEs on June 8<sup>th</sup>, requesting that they complete the survey by June 30<sup>th</sup>. To date, the DSM Work Group has not received any survey responses from Arizona LSEs.

### Supplemental Data and Analysis

In lieu of survey responses, the LBNL technical lead for the DSM Working Group (Galen Barbose) reached out to the key individuals within each balancing authority in order to obtain information about the energy efficiency savings embedded within the load forecast.

- APS: Galen Barbose contacted Peter Ewen at APS (Chief Economist and Director of APS Revenue and Fuel Analysis and Forecasts). Mr. Ewen confirmed that the forecast that APS submitted to WECC assumes full compliance with Arizona’s EES; however, the forecast does not explicitly account for the EISA lighting/appliance standards or future standards for DOE has already scheduled a rulemaking. The DSM Work Group decided that, as a default rule, if a load forecast does not explicitly account the impact of new federal standards, then the savings from new standards would be assumed to not be embedded within the load forecast.<sup>5</sup>
- SRP: Galen Barbose communicated with a group of individuals at SRP (Rob Taylor, Jan Miller, Karen Smith, and Arlyn Herrera) to obtain information about SRP’s energy efficiency program plans and load forecasting methods. These individuals confirmed that the load forecast submitted to WECC does fully account for the savings from the energy efficiency programs implemented over the entire 2010-2020 period, but the load forecast does not explicitly account for the savings from new federal

<sup>5</sup> Load forecasts that are developed through econometric methods and calibrated to historical data may implicitly assume that future savings from federal lighting appliance standards will accrue at the same rate as in the past. The analysis in Neubauer et al. (2009) suggests that existing federal standards generated savings at a rate of 0.5% of U.S. retail sales per year over the 2000-2010 period, and will continue to generate additional savings at the same rate over the 2010-2020 period. Thus, the savings from new federal standards represent an increase in the rate at which federal standards will accrue energy savings, and this effect is unlikely to be captured by load forecasts that do not explicitly model the savings from these new standards.

lighting and appliance standards. Thus, following the default rule described above, the savings from new standards were assumed to not be embedded within the SRP load forecast.

- TEP: Galen Barbose communicated with Mike Sheehan (Director of Supply Side Planning at TEP), who confirmed that the forecast that TEP submitted to WECC does not account for savings from energy efficiency programs implemented over the 2010-2020 period. This characterization is consistent with the load forecast presented by John Bowman of TEP at the utility's September 29, 2009 IRP workshop. As indicated in the workshop presentation, the IRP reference case load forecast has an average growth rate of 1.5% per year over the 2010-2020 period, *prior to the effects of energy efficiency and distributed generation*. When DSM programs are accounted for, the load forecast shows effectively no growth over the 2010-2020 period. In comparison, the load forecast submitted by TEP to WECC shows a 1.5% growth rate over the 2013-2020 period, which further confirms that this load forecast does not account for the effects of DSM programs.
- WALC: Given the small size of WALC, and the fact that it is composed of many small utilities, the DSM Work Group did not undertake any additional efforts to assess the degree to which the reference case energy efficiency savings are embedded within the load forecast submitted to WECC. As the default, the load forecast was (conservatively) assumed to fully account for savings from ratepayer-funded programs, and was assumed to not account for any of the savings from new federal lighting/appliance standards.