Technical Support Document (TSD) for
Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units
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Translation of the Clean Power Plan Emission Rate-Based CO_2 Goals to Mass-Based Equivalents

U.S. Environmental Protection Agency

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I. Overview

This technical support document (TSD) describes two illustrative calculation-based approaches for translating the Clean Power Plan (CPP) emission rate-based goals to a mass-based equivalent.[1] These approaches should be viewed as two potential ways in which implementing authorities may wish to translate the form of the goal to a mass-based equivalent.[2] The first approach produces mass-based equivalents that apply to existing affected fossil fuel-fired sources only. In light of the fact that the CPP takes comment on the inclusion of new, fossil fuel-fired sources as a component of state plans,[3] the second approach produces mass equivalents that are inclusive of emissions from existing affected and new fossil fuel-fired sources.

This TSD describes each approach to converting emission rate-based goals to mass-based equivalents conceptually and then applies the calculation to an example state. The data, historical emissions, calculations, and results for every affected jurisdiction are available in the appendix to this TSD or the 'Rate to Mass Translation' data file posted on the CPP website.[4]

In its simplest form, a mass-based outcome is the product of an emissions rate and generation level:

$$Mass = CO2\ Emissions\ Rate * Generation$$

In calculating a mass-based equivalent, the illustrative methodologies presented in this TSD use each affected jurisdiction's proposed rate-based goal as the emissions rate. The basic concepts and considerations that both methodologies adopt for specifying a mass equivalent generation level are detailed in the next section.

[1] The Clean Power Plan (CPP) is a reference to the proposed rule, "Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units," published on June 18, 2014 and the proposed supplemental rule "Carbon Pollution Emission Guidelines for Existing Stationary Sources: EGUs in Indian Country and U.S. Territories; Multi-jurisdictional Partnerships," issued on October 28, 2014. The methodologies for translating rate-based CO2 goals to mass-based equivalents described in this TSD apply to both the June 2014 proposal and October 2014 supplemental proposal.

[2] Note that the metric for compliance is independent from the approaches states (as well as areas of Indian country and U.S. territories with affected EGUs) may adopt to achieve them. For example, a state could potentially adopt a mass-based program that achieves a rate-based goal, or adopt rate-based standards and/or other measures and demonstrate that they have met the goal using a mass-based metric.

[3] The term 'state plans' is intended to encompass all implementing authorities.

[4] Historical emissions for affected EGUs are provided for 2012 in the 'Rate to Mass Translation' data file, which is available at http://www2.epa.gov/carbon-pollution-standards/clean-power-plan-proposed-rule-technical-documents

II. Establishing a Level of Generation for Use in the Translation from an Emission Rate-Based Goal to a Mass-Based Equivalent

This TSD defines several concepts and considerations that we use here to quantify a generation level that – combined with the rate-based goal – is capable of translating the emission rate-based goal to a mass-based equivalent.[5] The first concept is to recognize that the deployment of BSER measures will reduce generation from affected fossil fuel-fired sources. BSER measures are grouped into four building blocks, which describe the emission reductions achievable through:

1. Heat rate improvements to affected coal steam electric generating units (EGUs);
2. Dispatch changes among affected fossil fuel-fired EGUs; [6]
3. Deployment of less carbon-intensive generating capacity; and
4. Deployment of demand-side energy efficiency

The four BSER building blocks interact with the total generation level from affected fossil fuel-fired sources in different ways. For example, the application of BSER building blocks one and two is not assumed to alter the overall generation level from affected units.[7] In contrast, incremental renewable energy (RE), under construction nuclear facilities[8], and energy efficiency (EE) under building blocks three and four are part of BSER due to their assumed replacement of generation from affected sources.[9]

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[5] The concepts and considerations presented in this section should not be viewed as prescriptive; rather, these concepts represent one particular way of constructing an approach that is capable of translating the form of the rate-based goal to a mass-based equivalent.

[6] EPA recognizes that the word "dispatch" can be used to describe how balancing authorities conduct real-time selection of specific generation (supply) to meet load (demand), on an hourly or even 15-minute basis. In the context of the proposed CPP and in this TSD, the word "dispatch" is intended to refer to broader patterns of generation across different generating technologies over longer periods of time, in keeping with the compliance flexibilities afforded under this rule (e.g., where emission performance can be averaged over multiple years).

[7] Building block one assumes no change in generation due to heat rate improvements. Likewise, the re-dispatch assumed under building block two maintains the overall level of utilization. Although BSER building blocks one and two do not affect the mass equivalent generation level, the emissions impact of applying heat rate improvements and dispatch changes among affected fossil fuel-fired EGUs is captured in the rate-based goal that is multiplied by generation to produce the mass equivalent.

[8] EPA has received significant comment on the inclusion of under construction nuclear facilities in BSER, including how generation from these facilities interact with affected sources and future demand. Consistent with the methodology for both approaches, the application of under construction nuclear facilities as part of BSER building block three is simply intended to reflect the June 18, 2014 proposal.

[9] The methodology for calculating rate-based goals in the June 2014 proposal and October 2014 supplemental proposal did not assume any reduction of historical generation or emissions from the affected fossil fuel-fired fleet due to the deployment of BSER building blocks three and four. As a result, in the context of developing mass equivalents, we demonstrate potential adjustments to the generation in the denominator of the formula in the June 2014 proposal and October 2014 supplemental proposal that was used to determine the rate-based goal. Some stakeholders have suggested that the methodology for calculating rate-based goals could itself be changed to reflect this type of assumed reduction. If the rate-based goal setting methodology was revised to incorporate the replacement of affected fossil fuel-fired generation by incremental resources under building blocks

The second concept that both approaches share is that the mass equivalent generation level should include generation from whatever set of CO_2 emitting sources are covered under the mass equivalent. This TSD presents two approaches to calculating mass equivalents – one that is applied only to existing affected sources and one that is inclusive of generation from new fossil fuel-fired sources. The incorporation of new sources under the second approach necessitates quantifying a mass equivalent generation level that includes expected future generation from those new fossil fuel-fired sources.

The third concept common to both approaches is that BSER is applied to generation from the historical affected fossil fuel-fired fleet, rather than to a projection of the affected fleet's future performance. Consistent with the rate-based goal setting methodology presented in the proposed CPP, the methodologies presented in this TSD apply the BSER building blocks to 2012 generation levels.

The next subsection, (a), describes the mass equivalent generation level that was developed for existing affected sources only. The following subsection, (b), specifies a generation level used for developing a mass-based equivalent that includes both affected and new fossil fuel-fired sources.

a. Quantifying a Generation Level for Use in the Translation to a Mass-Based Equivalent for Existing Affected Sources

This section outlines an approach to calculating a mass equivalent generation level by using the data from the June 2014 and October 2014 proposal's goal calculation appendices.[10] As an example, the steps described in this section will be applied to data from Ohio (the same state for which EPA included example calculations of the rate-based goals in the Goal Computation TSD, available in the docket to the proposed CPP rule). Final mass equivalent generation levels under this approach can be found for all jurisdictions in Table 1 of the appendix to this TSD; interim values can be found in the 'Rate to Mass Translation' data file posted on the CPP website.[11]

three and four, the generation total embedded in the rate-based goal may not require any adjustment to produce a viable mass equivalent based on historical data.

[10] Appendix 1 of the Goal Computation TSD in the June 2014 proposed rule provides the derivation of the proposed (i.e., Option 1) rate-based goals. Appendix 2 of the supplemental proposal provides the derivation of the three proposed Option 1 rate-based goals. All generation and mass equivalent values presented in this TSD are calculated based on the Option 1 goals from the June 2014 proposal and Option 1A goals from the October 2014 supplemental proposal. Values for the alternative (e.g., Option 2) rate-based goals are provided in the 'Rate to Mass Translation' data file.

[11] Final generation levels and mass equivalents refer to 2029 values under the proposed goals; interim values are average values from 2020-2029.

The starting point under this methodology is to quantify the historical generation from the affected fossil fuel-fired fleet:[12]

- **Historical Affected Fossil Generation** = 2012 Coal Generation + 2012 NGCC Generation + Expected Generation from Under Construction NGCC + 2012 Oil/Gas Steam Generation + 2012 'Other' Fossil Generation[13]
- **Ohio Historical Affected Fossil Generation[14]** = 86,473,075 MWh (Coal) + 20,907,183 MWh (NGCC) + 2,604,017 MWh (Under Construction NGCC) + 321,602 MWh (Oil/Gas Steam) + 214,178 MWh (Other) = 110,520,055 MWh

The application of BSER is expected to reduce generation from the affected fossil fuel-fired fleet as the deployment of incremental resources under building blocks three and four replace generation from affected fossil fuel-fired sources. The continuing operation of existing resources under building block three (RE and at-risk nuclear) is not assumed to affect historical generation levels.[15] This new, adjusted level of affected fossil generation that reflects the deployment of incremental building block three and four resources is defined as:

- **Adjusted Affected Fossil Generation$_{\text{Year X}}$[16]** = Historical Affected Fossil Generation – Incremental RE$_{\text{Year X}}$ – Under Construction Nuclear – Incremental EE$_{\text{Year X}}$
- **Ohio Final Adjusted Affected Fossil Generation[17]** = 110,520,055 MWh (Historical Affected Fossil Generation) – 12,036,972 MWh (2029 Incremental RE) – 0 MWh (Under Construction Nuclear) - 16,284,584 MWh (2029 Incremental EE) = 82,198,499 MWh

Generation from affected fossil fuel-fired sources is only one component of the total generation associated with affected entities. Inclusion of existing and incremental non-fossil generation

[12] All of the generation totals described in this TSD are consistent with the totals presented in Appendix 1 of the Goal Computation TSD; http://www2.epa.gov/carbon-pollution-standards/clean-power-plan-proposed-rule-technical-documents.

[13] 'Other' fossil generation includes sources that are likely subject to 111(d) rulemaking, but not subject to BSER building block abatement measures (e.g., IGCC, high utilization CTs, and useful thermal output at cogeneration units); generation and emissions from 'other' fossil fuel-fired sources are also included in the calculation of the proposed rate-based goals.

[14] Example equations presented in this TSD may not sum due to rounding; please refer to the 'Rate to Mass Translation' data file for complete calculations.

[15] The components for determining the adjusted affected fossil generation level can be found in Table 1 of the appendix.

[16] In two states (Washington and Idaho), the proposal identified incremental generation under building blocks three and four that exceed the amount of affected fossil fuel-fired generation in 2012. A strict application of this equation for those states would yield a negative number for adjusted affected fossil generation; instead, the approach is modified to limit the minimum amount of adjusted affected fossil generation to zero. It should be noted that a zero value for adjusted affected fossil generation does not imply a zero mass equivalent because the emissions intensity associated with the mass equivalent generation level is defined by the (non-zero) rate-based goal.

[17] 'Final' generation totals and mass equivalents refer to values for 2029.

connected to building blocks three and four is necessary to fully define the mass equivalent generation level:

- **Mass Equivalent Generation Level$_{\text{Year X}}$** = Adjusted Affected Fossil Generation$_{\text{Year X}}$ + BSER Building Block Three Generation$_{\text{Year X}}$[18] + BSER Building Block Four Avoided Generation$_{\text{Year X}}$[19]
- **Ohio Final Mass Equivalent Generation Level** = 82,198,499 MWh (2029 Adjusted Affected Fossil Generation) + 14,768,671 MWh (2029 Building Block Three Generation) + 16,284,584 MWh (2029 Building Block Four Avoided Generation) = 113,251,754 MWh

b. Quantifying a Generation Level for Use in the Translation to a Mass-Based Equivalent for Existing Affected and New Fossil Fuel-Fired Sources

EPA's illustrative approach to developing mass equivalent generation levels inclusive of new fossil fuel-fired sources assumes those new sources contribute an amount of incremental generation that is equal to projected demand growth.[20] To calculate projections of future demand, EPA assigns an annual average growth rate based on regional demand projections from the Energy Information Administration's (EIA's) 2013 Annual Energy Outlook (AEO2013).[21] Using regional demand projections from EIA's AEO2013 is consistent with the methodology used to develop incremental EE deployment levels under building block four, as well as the demand projections underlying the illustrative compliance scenarios presented in the CPP's regulatory impact analysis (RIA). To quantify a sales level for all future years, the annual average growth rate is applied to each jurisdiction's historical 2012 power sector sales. Under this approach, projected sales for any future year are:

- **Projected Sales$_{\text{Year X}}$** = Historical 2012 Sales * (1 + Regional Growth Rate)$^{(\text{Year X} - 2012)}$
- **Ohio Final Projected Sales** = 153,780 GWh * 1.0044898$^{(2029-2012)}$ = 165,949 GWh

To convert projected sales to a generation increment, transmission losses and the generation from under construction NGCC facilities must be accounted for. The incremental demand for new generation is:

[18] Building block three generation equals generation from existing RE, incremental RE, at-risk nuclear, and under construction nuclear.
[19] Building block four avoided generation equals avoided generation from incremental EE.
[20] Both methodologies for quantifying a mass equivalent generation level described in this TSD assume that incremental resources under building blocks three and four replace historical generation from affected fossil fuel-fired sources and those incremental resources are therefore unavailable to meet new demand for electricity.
[21] Growth rates are the annual average growth rate at the Electricity Market Module (EMM) region level for 2012-2029. Alaska, Hawaii, Guam and Puerto Rico are not included in EMM projections. Assigned growth rates for Alaska and Hawaii reflect the average growth rate of the lower 48 states from 2012-2029; Puerto Rico and Guam are assigned a zero percent growth rate. A map displaying the 22 EMM regions can be found at http://www.eia.gov/forecasts/aeo/pdf/nerc_map.pdf; a listing of the EMM region assigned is provided in the 'Rate to Mass Translation' data file. Jurisdictions that are in multiple EMM regions are assigned the growth rate of the region that encompasses the largest portion of that jurisdiction's territory.

- **Incremental Demand for New Generation$_{\text{Year X}}$** = (Projected Sales$_{\text{Year X}}$ – Historical 2012 Sales) * (1 + Percent Transmission Losses[22]) – Assumed Generation from Under Construction NGCC EGUs[23]
- **Ohio Final Incremental Demand for New Generation** = (165,949 GWh – 153,780 GWh)* 1.0751 – 2,597 GWh[24] = 10,486 GWh

Final incremental demand levels for new generation are provided in Table 2 of the appendix; interim demand levels are available in the 'Rate to Mass Translation' data file posted on the CPP website.

The final step in producing a mass equivalent generation level inclusive of new fossil fuel-fired sources is to add the incremental demand for new generation to generation from existing affected sources, building block three generation, and building block four avoided generation. The final mass equivalent generation incorporating new fossil fuel-fired sources is:

- **Mass Equivalent Generation Incorporating New Sources$_{\text{Year X}}$** = Adjusted Affected Fossil Generation$_{\text{Year X}}$ + BSER Building Block Three Generation$_{\text{Year X}}$ + BSER Building Block Four Generation$_{\text{Year X}}$ + Incremental Demand for New Generation$_{\text{Year X}}$
- **Ohio Final Mass Equivalent Generation Incorporating New Sources =** 82,198,499 MWh (2029 Adjusted Affected Fossil Generation) + 14,768,671 MWh (2029 Building Block Three Generation) + 16,284,584 MWh (2029 Building Block Four Avoided Generation) + 10,485,798 MWh = 123,737,553 MWh

Final mass equivalent generation levels incorporating new sources are provided in Table 3 of the appendix; interim mass equivalent generation levels incorporating new sources are available in the 'Rate to Mass Translation' data file posted on the CPP website.

III. Establishing Mass-Based Equivalents

With a fully defined emissions rate (proposed rate-based goal) and generation level (mass equivalent generation), the mass-based equivalent calculation is:

$$Mass\ Equivalent = Proposed\ Emission\ Rate\ Goal * Mass\ Equivalent\ Generation\ Level$$

- **Final CPP Mass-Based Equivalent for Ohio Affected Sources** = 1,338.341 lbs/MWh (Proposed 2029 Emission Rate-Based Goal) * 113,251,754 MWh (Final Mass Equivalent Generation) = 68,751 Thousand Metric Tons

[22] Consistent with the methodology used to establish each the rate-based CO_2 goal, transmission losses are assumed to be 7.51%.
[23] Under construction NGCC EGUs are assumed to operate at a 55% capacity factor to satisfy future demand requirements.
[24] The generation value for under construction NGCC in this equation does not match the generation value for NGCC in the historical affected fossil generation because 2012 was a leap year and 2029 is not.

- **Final CPP Mass-Based Equivalent for Ohio Affected and New Sources** = 1,338.341 lbs/MWh (Proposed 2029 Emission Rate-Based Goal)[25] * 123,737,553 MWh (Final Mass Equivalent Generation Incorporating New Sources) = 75,116 Thousand Metric Tons

Final and interim mass-based equivalents are provided in Tables 4 and 5 of the appendix.

[25] The inclusion of new fossil fuel-fired sources does not impact the proposed emission rate-based goal.

IV. Appendix

Table 1: Final Mass Equivalent Generation Level for Existing Affected Sources (MWh)[26]

	Historical Affected Fossil Generation	BSER Building Block Three Generation (Incremental)	BSER Building Block Three Generation (Existing)	BSER Building Block Four Avoided Generation	Final Mass Equivalent Generation Level
Alabama	99,537,272	11,516,247	5,106,082	8,785,234	104,643,354
Alaska	3,162,202	123,131	39,958	622,817	3,202,160
Arizona	52,171,488	1,965,673	3,516,139	9,215,884	55,687,627
Arkansas	46,201,403	3,048,452	2,502,407	4,890,534	48,703,810
California	116,004,809	11,183,859	31,001,494	22,924,771	147,006,302
Colorado	44,226,308	4,647,738	6,192,082	5,658,360	50,418,389
Connecticut	15,764,474	2,447,850	1,637,662	3,767,583	17,402,136
Delaware	7,663,274	907,301	131,051	529,068	7,794,325
Florida	197,040,669	17,585,816	6,146,902	21,348,682	203,187,571
Fort Mojave	1,360,093	0	0	4,724	1,360,093
Georgia	78,647,028	26,344,420	5,106,777	12,149,397	83,753,806
Guam	713,075	0	0	162,866	713,075
Hawaii	5,846,229	122,112	924,815	949,330	6,771,044
Idaho	1,639,922	682,185	2,514,502	1,324,481	4,521,168
Illinois	87,763,971	9,445,344	13,678,002	17,952,530	101,441,973
Indiana	101,683,754	4,000,719	3,546,367	12,564,129	105,230,121
Iowa	34,797,763	0	8,843,705	5,730,306	43,641,468
Kansas	29,612,590	3,632,285	5,795,382	4,123,417	35,407,972
Kentucky	87,450,251	1,380,676	332,879	9,317,877	87,783,130
Louisiana	63,550,051	4,461,577	3,415,267	7,654,779	66,965,319
Maine	4,112,445	0	3,611,728	1,507,396	7,724,173
Maryland	19,887,662	5,083,916	1,685,686	4,653,837	21,573,348
Massachusetts	26,236,160	6,770,058	2,159,679	5,234,817	28,395,839
Michigan	76,784,775	4,270,420	5,613,348	13,262,541	82,398,123
Minnesota	27,832,261	0	8,728,734	7,095,830	36,560,995
Mississippi	50,281,217	3,949,240	2,141,064	4,920,527	52,422,281
Missouri	77,794,081	1,464,950	1,848,236	8,741,141	79,642,317
Montana	14,704,923	1,460,954	1,261,752	1,624,321	15,966,675
Navajo	29,629,453	0	0	66,525	29,629,453
Nebraska	25,122,145	2,472,665	1,921,592	3,448,297	27,043,737

[26] The state generation totals presented in this TSD are consistent with the data in Appendix 1 of the Goal Computation TSD (http://www2.epa.gov/carbon-pollution-standards/clean-power-plan-proposed-rule-technical-documents), which demonstrate the derivation of the proposed (i.e., Option 1) rate-based goals. Generation totals for U.S. territories and areas of Indian country with affected EGUs are consistent with the Option 1A rate-based goals presented in the October 2014 supplemental proposal. Generation totals associated with alternative rate-based goals for all affected jurisdictions are provided in the 'Rate to Mass Translation' data file posted on the CPP website.

Nevada	28,394,937	3,437,309	2,968,630	3,908,761	31,363,568
New Hampshire	8,300,824	3,440,938	1,956,900	1,286,054	10,257,724
New Jersey	25,087,907	8,866,751	2,896,752	5,889,351	27,984,658
New Mexico	19,292,945	2,148,144	2,573,851	2,641,866	21,866,796
New York	63,251,690	19,069,478	7,603,065	16,847,624	70,854,754
North Carolina	77,031,073	8,964,257	4,999,544	12,169,414	82,030,617
North Dakota	28,186,691	179,905	5,280,052	1,536,491	33,466,743
Ohio	110,520,055	12,036,972	2,731,699	16,284,584	113,251,754
Oklahoma	67,548,140	7,058,594	8,520,724	6,362,323	76,068,865
Oregon	14,188,366	5,360,143	7,207,229	5,727,910	21,395,596
Pennsylvania	142,523,873	30,871,737	8,939,513	18,188,845	151,463,386
Puerto Rico	19,983,504	0	0	1,890,703	19,983,504
Rhode Island	8,140,017	374,215	101,895	935,118	8,241,912
South Carolina	40,089,998	24,924,416	5,091,813	8,553,402	45,181,812
South Dakota	2,950,257	0	1,818,850	1,028,768	4,769,107
Tennessee	40,922,593	12,339,440	2,382,994	7,634,031	43,305,587
Texas	342,653,237	51,945,805	36,307,703	38,157,030	378,960,939
Utah	32,899,850	1,273,345	1,099,724	3,524,028	33,999,574
Ute	3,090,433	0	0	43,635	3,090,433
Virginia	47,510,651	8,833,564	4,003,719	6,269,112	51,514,370
Washington	10,582,589	9,511,207	8,721,051	11,178,874	29,411,132
West Virginia	70,344,849	8,976,473	1,296,563	3,349,795	71,641,412
Wisconsin	42,564,851	3,636,123	3,770,063	7,322,473	46,334,914
Wyoming	43,970,291	5,058,889	4,369,107	1,775,751	48,339,398

Table 2: Incremental Demand for New Generation in 2029 (GWh)[27]

	Historical 2012 Sales	Regional Growth Rate (2012-2029)	Projected 2029 Sales	Expected Generation From Under Construction NGCC Facilities (2029)	Incremental Demand for New Generation (2029)
Alabama	86,239	1.08%	103,563	-	18,625
Alaska	6,418	0.80%	7,348	-	1,000
Arizona	76,275	1.31%	95,141	-	20,283
Arkansas	46,912	0.90%	54,646	-	8,315
California	262,824	0.92%	306,906	8,938	38,455
Colorado	54,145	1.28%	67,257	964	13,134
Connecticut	29,844	0.29%	31,348	-	1,617
Delaware	11,530	0.55%	12,659	-	1,214

[27] Exact, non-rounded values for sales, generation, and growth rates are available in the 'Rate to Mass Translation' data file.

Florida	221,261	1.14%	268,106	5,574	44,789
Fort Mojave	48	1.31%	60	-	13
Georgia	131,220	1.08%	157,581	-	28,340
Guam	1,563	0.00%	1,563	-	-
Hawaii	9,643	0.80%	11,041	-	1,503
Idaho	23,920	1.06%	28,606	-	5,039
Illinois	144,869	0.45%	156,332	-	12,325
Indiana	105,788	0.45%	114,160	-	9,000
Iowa	46,190	0.53%	50,522	-	4,657
Kansas	40,302	0.50%	43,878	-	3,845
Kentucky	89,249	1.00%	105,782	3,084	14,691
Louisiana	84,731	0.90%	98,699	-	15,018
Maine	11,788	0.29%	12,381	-	639
Maryland	62,384	0.55%	68,493	-	6,567
Massachusetts	55,834	0.29%	58,647	-	3,025
Michigan	105,880	0.32%	111,747	-	6,308
Minnesota	68,748	0.53%	75,195	-	6,932
Mississippi	48,424	0.90%	56,408	723	7,860
Missouri	82,536	0.40%	88,352	-	6,253
Montana	13,955	1.06%	16,689	-	2,939
Navajo	676	1.31%	843	-	180
Nebraska	30,921	0.53%	33,821	-	3,118
Nevada	35,369	1.06%	42,298	-	7,450
New Hampshire	10,922	0.29%	11,472	-	592
New Jersey	75,208	0.55%	82,573	-	7,917
New Mexico	23,317	1.31%	29,084	-	6,200
New York	144,501	0.25%	150,702	-	6,667
North Carolina	128,555	1.13%	155,678	10,836	18,324
North Dakota	14,727	0.53%	16,109	-	1,485
Ohio	153,780	0.45%	165,949	2,597	10,486
Oklahoma	59,465	0.89%	69,165	-	10,429
Oregon	47,200	1.06%	56,448	-	9,942
Pennsylvania	146,244	0.55%	160,564	-	15,395
Puerto Rico	18,150	0.00%	18,150	-	-
Rhode Island	7,768	0.29%	8,160	-	421
South Carolina	78,055	1.13%	94,523	-	17,705
South Dakota	11,749	0.53%	12,851	-	1,185
Tennessee	96,684	1.00%	114,595	-	19,256
Texas	366,154	0.89%	425,373	-	63,667
Utah	29,943	1.06%	35,810	-	6,307
Ute	470	1.06%	562	-	99
Virginia	107,825	1.13%	130,574	9,289	15,168
Washington	93,230	1.06%	111,496	-	19,638
West Virginia	30,872	0.45%	33,315	-	2,626
Wisconsin	69,542	0.40%	74,363	-	5,183
Wyoming	16,995	1.06%	20,325	1,060	2,520

Table 3: Final Mass Equivalent Generation Level for Existing Affected and New Sources (MWh)

	Mass Equivalent Generation Level for Affected Sources	Incremental Demand for New Generation	Mass Equivalent Generation Level for Affected and New Sources
Alabama	104,643,354	18,625,370	123,268,725
Alaska	3,202,160	999,956	4,202,116
Arizona	55,687,627	20,283,128	75,970,755
Arkansas	48,703,810	8,314,743	57,018,553
California	147,006,302	38,454,957	185,461,259
Colorado	50,418,389	13,133,634	63,552,023
Connecticut	17,402,136	1,616,721	19,018,856
Delaware	7,794,325	1,213,786	9,008,111
Florida	203,187,571	44,788,698	247,976,269
Fort Mojave	1,360,093	12,764	1,372,857
Georgia	83,753,806	28,340,253	112,094,059
Guam	713,075	-	713,075
Hawaii	6,771,044	1,502,513	8,273,557
Idaho	4,521,168	5,038,527	9,559,695
Illinois	101,441,973	12,324,551	113,766,524
Indiana	105,230,121	8,999,839	114,229,960
Iowa	43,641,468	4,657,387	48,298,855
Kansas	35,407,972	3,844,550	39,252,521
Kentucky	87,783,130	14,691,398	102,474,529
Louisiana	66,965,319	15,017,752	81,983,071
Maine	7,724,173	638,561	8,362,734
Maryland	21,573,348	6,567,269	28,140,617
Massachusetts	28,395,839	3,024,661	31,420,500
Michigan	82,398,123	6,307,587	88,705,710
Minnesota	36,560,995	6,931,860	43,492,855
Mississippi	52,422,281	7,860,099	60,282,380
Missouri	79,642,317	6,252,748	85,895,064
Montana	15,966,675	2,939,474	18,906,149
Navajo	29,629,453	179,767	29,809,220
Nebraska	27,043,737	3,117,742	30,161,479
Nevada	31,363,568	7,450,116	38,813,683
New Hampshire	10,257,724	591,669	10,849,394
New Jersey	27,984,658	7,917,277	35,901,936
New Mexico	21,866,796	6,200,450	28,067,246
New York	70,854,754	6,667,260	77,522,014
North Carolina	82,030,617	18,323,738	100,354,356
North Dakota	33,466,743	1,484,956	34,951,699
Ohio	113,251,754	10,485,798	123,737,553
Oklahoma	76,068,865	10,428,942	86,497,807

Oregon	21,395,596	9,942,253	31,337,849
Pennsylvania	151,463,386	15,395,241	166,858,627
Puerto Rico	19,983,504	-	19,983,504
Rhode Island	8,241,912	420,830	8,662,742
South Carolina	45,181,812	17,704,703	62,886,514
South Dakota	4,769,107	1,184,701	5,953,808
Tennessee	43,305,587	19,255,678	62,561,264
Texas	378,960,939	63,666,577	442,627,517
Utah	33,999,574	6,307,238	40,306,812
Ute	3,090,433	99,002	3,189,435
Virginia	51,514,370	15,168,202	66,682,572
Washington	29,411,132	19,638,144	49,049,276
West Virginia	71,641,412	2,626,384	74,267,796
Wisconsin	46,334,914	5,183,311	51,518,225
Wyoming	48,339,398	2,519,886	50,859,284

Table 4: Interim and Final Mass Equivalents – Existing Affected Sources[28]

	Interim Mass Equivalent (Thousand Metric Tons)	Final Mass Equivalent (Thousand Metric Tons)
Alabama	54,441	50,267
Alaska	1,593	1,457
Arizona	18,559	17,734
Arkansas	21,384	20,096
California	37,052	35,805
Colorado	26,495	25,335
Connecticut	4,712	4,265
Delaware	3,226	2,972
Florida	73,209	68,221
Fort Mojave	528	528
Georgia	33,850	31,676
Guam	561	513
Hawaii	4,232	4,010
Idaho	472	468
Illinois	62,868	58,471
Indiana	76,689	73,090
Iowa	26,554	25,749

[28] The state mass equivalents presented in this TSD are consistent with the data in Appendix 1 of the Goal Computation TSD (http://www2.epa.gov/carbon-pollution-standards/clean-power-plan-proposed-rule-technical-documents), which demonstrate the derivation of the proposed (i.e., Option 1) rate-based goals. Mass equivalents for U.S. territories and areas of Indian country with affected EGUs are consistent with the Option 1A rate-based goals presented in the October 2014 supplemental proposal. Mass equivalents associated with alternative rate-based goals for all affected jurisdictions are provided in the 'Rate to Mass Translation' data file posted on the CPP website.

Kansas	25,346	24,081
Kentucky	73,409	70,203
Louisiana	28,808	26,823
Maine	1,377	1,323
Maryland	13,186	11,613
Massachusetts	8,435	7,414
Michigan	45,868	43,403
Minnesota	15,106	14,474
Mississippi	17,397	16,449
Missouri	58,558	55,792
Montana	13,630	12,828
Navajo	26,757	26,731
Nebraska	19,577	18,142
Nevada	9,915	9,209
New Hampshire	2,541	2,262
New Jersey	8,213	6,741
New Mexico	10,977	10,391
New York	20,415	17,649
North Carolina	40,068	36,918
North Dakota	27,577	27,069
Ohio	74,614	68,751
Oklahoma	32,133	30,892
Oregon	3,952	3,614
Pennsylvania	81,022	72,272
Puerto Rico	13,321	12,805
Rhode Island	3,072	2,924
South Carolina	17,218	15,816
South Dakota	1,731	1,602
Tennessee	24,624	22,837
Texas	146,705	135,937
Utah	21,244	20,384
Ute	2,804	2,787
Virginia	20,650	18,923
Washington	2,728	2,862
West Virginia	56,814	52,636
Wisconsin	26,916	25,275
Wyoming	39,649	37,590

Table 5: Interim and Final Mass Equivalents – Existing Affected and New Sources[29]

	Interim Mass Equivalent (Thousand Metric Tons)	Final Mass Equivalent (Thousand Metric Tons)
Alabama	61,335	59,214
Alaska	1,948	1,912
Arizona	23,365	24,193
Arkansas	23,996	23,527
California	43,370	45,171
Colorado	31,250	31,935
Connecticut	5,027	4,661
Delaware	3,588	3,435
Florida	84,104	83,259
Fort Mojave	532	532
Georgia	41,995	42,394
Guam	561	513
Hawaii	4,906	4,899
Idaho	868	990
Illinois	68,371	65,574
Indiana	81,433	79,341
Iowa	28,605	28,496
Kansas	27,331	26,696
Kentucky	81,470	81,953
Louisiana	33,425	32,839
Maine	1,460	1,432
Maryland	16,045	15,148
Massachusetts	9,080	8,204
Michigan	48,411	46,725
Minnesota	17,175	17,218
Mississippi	19,194	18,916
Missouri	61,887	60,173
Montana	15,420	15,190
Navajo	26,873	26,893
Nebraska	21,201	20,233
Nevada	11,591	11,396
New Hampshire	2,646	2,392
New Jersey	9,857	8,649
New Mexico	13,184	13,337
New York	21,791	19,310

[29] The state mass equivalents presented in this TSD are consistent with the data in Appendix 1 of the Goal Computation TSD (http://www2.epa.gov/carbon-pollution-standards/clean-power-plan-proposed-rule-technical-documents), which demonstrate the derivation of the proposed (i.e., Option 1) rate-based goals. 2012 historical emissions from affected EGUs and mass equivalents for U.S. territories and areas of Indian country with affected EGUs are consistent with the Option 1A rate-based goals presented in the October 2014 supplemental proposal. 2012 historical emissions from affected EGUs and mass equivalents associated with alternative rate-based goals for all affected jurisdictions are provided in the 'Rate to Mass Translation' data file posted on the CPP website.

North Carolina	44,871	45,165
North Dakota	28,465	28,270
Ohio	79,112	75,116
Oklahoma	35,290	35,127
Oregon	5,250	5,293
Pennsylvania	86,920	79,618
Puerto Rico	13,321	12,805
Rhode Island	3,186	3,074
South Carolina	22,001	22,014
South Dakota	2,040	2,000
Tennessee	32,425	32,992
Texas	164,279	158,775
Utah	24,063	24,165
Ute	2,868	2,876
Virginia	23,856	24,494
Washington	4,367	4,772
West Virginia	58,317	54,566
Wisconsin	29,091	28,102
Wyoming	40,878	39,550