

This is an update to the [Informal Staff Proposal](#) originally posted on October 14, 2016. Tables 3–6 have been updated to reflect accurate data, and no other information has changed.

Cap-and-Trade Regulation Industry Assistance Factor Calculation Informal Staff Proposal

Together, Assembly Bill 32 (AB 32), Senate Bill 32, and Assembly Bill 197 set an ambitious goal for reducing greenhouse emissions to 40 percent below 1990 levels by 2030 and provide guidance for how those reductions are achieved. To meet these objectives, the State is developing a 2030 Target Scoping Plan to chart the path to achieve the 2030 limit. Comments received on the 2030 Target Scoping Plan and Cap-and-Trade Regulation rulemaking materials will be considered as staff prepares a final regulation for Board consideration in 2017.

In 2011 and 2012, Board Resolutions 11-32 and 12-33 directed Air Resources Board (ARB) staff to investigate potential improvements to industrial allowance allocation to better meet the AB 32 objective to “minimize emissions leakage to the extent feasible.” In response, ARB commissioned three emissions leakage potential studies to inform the development of assistance factors (AF) for Cap-and-Trade Program allowance allocation to manufacturing sectors. Based on these leakage studies, ARB staff proposed in Appendix E¹ of the 2016 Initial Statement of Reasons to the proposed amendments to the Regulation a methodology by which emissions leakage would be assessed and AFs would be developed for the fourth compliance period and beyond. This informal staff proposal details additional calculations based on this methodology and provides industry-specific AFs for stakeholder review and feedback to inform formal 15-day regulatory amendments.

This proposal combines the AF calculation approach described in Appendix E with staff’s current thinking, and results in AFs that are staff’s best calculation of the AFs necessary to minimize emissions leakage. Relative to third compliance period AFs, these revised AFs result in a downward adjustment to AFs for all sectors.² The resulting AFs for studied manufacturing sectors can be found alongside the Cap-and-Trade Regulation third compliance period AFs in Table 8.

Post-2020 AFs are provided for sectors analyzed by the leakage studies, but not for sectors not included in the leakage studies. Non-studied sectors include those industries with NAICS codes starting with 1, 2, 4, and select sectors with NAICS starting with 3.³ Section 4 of Appendix E to the 2016 ISOR included a proposal to assign non-studied sector AFs based on their similarity to studied sectors based on key variables from public sources. Staff had intended to use six-digit NAICS data from the 2007 and 2012 U.S. Census (economic census),⁴ as well as export and import trade data from

¹ <https://www.arb.ca.gov/regact/2016/capandtrade16/appe.pdf>

² Sector-specific AFs are assigned at the North American Industry Classification System (NAICS) six-digit sector level and in some cases by industrial activity (see Tables 8-1 and 8-3 of the proposed Regulation).

³ NAICS 311221, 325194, and 336390

⁴ <https://www.census.gov/econ/census/>

U.S. Census's USA Trade Online (UTO) database.⁵ Staff wants to more fully vet the data before using it to propose AFs for non-studied sectors, in part based on stakeholder feedback. Staff invites comments from interested parties on this process, as well as additional means by which to develop AFs for these non-studied sectors. The section of this proposal entitled "Assistance Factor Components for Non-Studied Sectors" provides an additional discussion on AF development for the non-studied sectors.

Specifics of Post-2020 Emissions Leakage Prevention Methodology

Assistance Factors for Leakage Prevention and Transition Assistance

For all sectors with currently proposed AFs in table 8, AFs for the post-2020 period are calculated by summing an international AF component to minimize potential international leakage and a domestic AF component to minimize potential domestic leakage. Both components range between zero and 100 percent, and they are summed to yield the total AF for a sector as follows:

$$\text{Post-2020 AF} = \text{international AF component} + \text{domestic AF component} \quad (\text{Equ.1})$$

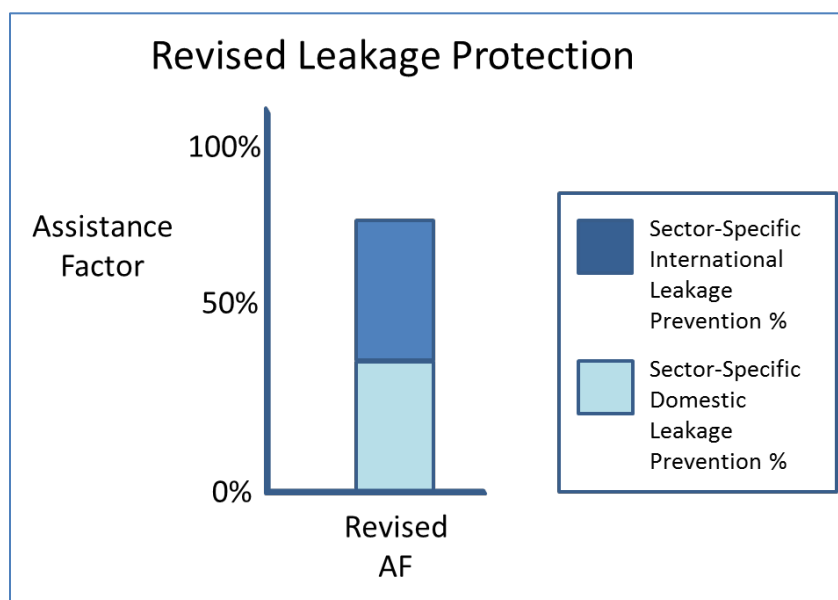


Figure 1. Sector-specific additive international and domestic assistance factors resulting in total revised assistance factor.

International AF Component Calculation

The international AF component is the first component of each sector's total AF used for post-2020 allowance allocation.

⁵ <https://usatrade.census.gov/>

Potential International Emissions Leakage for Certain Manufacturing Sectors without Non-Purchased Fuel⁶ and Process Emissions

As stated in Appendix E to the 2016 Initial Statement of Reasons, international emissions leakage will be identified and minimized by quantifying international market transfer (IMT), a metric developed by Fowlie et al. (2016)⁷ (international leakage study). IMT is the fraction of every dollar decrease in domestic value added in response to a carbon price that is offset by an increase in international production (i.e., IMT measures production leakage). Value added is an approximation of profit; it equals total revenues minus expenses for the sector.

The international leakage study used the carbon content of fuels and electricity to calculate the responsiveness, or elasticity, of domestic shipments, domestic exports, and foreign imports for the sector with respect to changes in domestic energy prices similar to the changes experienced upon implementation of a marginal carbon compliance cost. For example, the elasticity of domestic exports with respect to domestic energy prices (“exp elasticity” below) is the percentage change in domestic exports with respect to a one percent increase in domestic energy prices. In this informal staff proposal, the study-calculated IMTs are referred to as “raw” IMTs.

Accompanying this informal staff proposal is the dataset⁸ the UC Berkeley research team provided to ARB staff. The dataset provides annual raw IMT values (“transfer_rate_p50”⁹) for each year from 2010 to 2015.¹⁰ The equation used to calculate the raw IMT for these sectors in a given year “t,” using data from the dataset, is as follows:

$$\text{Raw IMT}_{i,t} = (\text{imp elasticity ratio}_i \times (\text{imp}_{i,t} / \text{dom ship}_{i,t})) + (\text{exp elasticity ratio}_i \times (\text{exp}_{i,t} / \text{dom ship}_{i,t})) \quad (\text{Equ. 2})$$

Where:

“imp_{i,t}” is the annual value of international imports to the U.S. within sector i for each of 2010 to 2015;¹¹

“imp elasticity ratio_i” is the import elasticity divided by the domestic shipment elasticity for sector i;¹²

⁶ Non-purchased fuel emissions include emissions from fuels not purchased by the facility (e.g., refinery fuel gas).

⁷ <https://www.arb.ca.gov/cc/capandtrade/meetings/20160518/ucb-intl-leakage.pdf>

⁸ <http://www.arb.ca.gov/cc/capandtrade/meetings/20161021/ucb-leakage-study-data.xlsx>

⁹ For full transparency, ARB staff has not retitled the columns of the dataset provided to staff by the international leakage research team.

¹⁰ The elasticities were calculated for the time period of the study dataset (1993-2012), and were paired with domestic value, import and export data from the time period 2010 to 2015.

¹¹ Imp_val, Exp_val and Dom_val in the dataset

¹² Ratio_imp_p50 and ratio_exp_p50 in the dataset

“ exp_i ” is the annual value of international exports from the U.S. within sector i for 2010 to 2015;¹⁰

“exp elasticity ratio $_i$ ” is the export elasticity divided by the domestic shipment elasticity for sector i ;¹¹ and

“dom ship $_{i,t}$ ” is the annual value of domestic shipments for both exports and domestic consumption within sector i for 2010 to 2015.¹⁰

Staff also developed a second estimate of IMT, termed the “regression IMT.” To estimate the regression IMT for each sector, staff ran a pooled linear regression (OLS) between the raw IMT for each manufacturing industry and its trade exposure (TE) and energy intensity. For sectors where dataset raw IMTs were below zero, the raw IMT used in the regression was set equal to zero, and for sectors with IMTs exceeding one, the raw IMT used in the regression was set equal to one. This process provided linear coefficients (i.e., B_0 , B_1 , and B_2) via equation 3:

$$\text{Raw IMT}_{i,t} = B_0 + B_1 \times TE_{i,t} + B_2 \times (\text{energy intensity}_{i,t}) + \text{error}_{i,t} \quad (\text{Equ. 3})$$

Where:

“Raw IMT $_{i,t}$ ” is sector i 's IMT for year t from the dataset;

“TE $_{i,t}$ ” is sector i 's trade exposure for year t from the dataset;

“energy intensity $_{i,t}$ ” is sector i 's energy intensity for year t from the dataset;

“ B_k ” is the industry-wide relationship between variable k , and raw IMT; and

“error $_{i,t}$ ” is the difference between “Raw IMT $_{i,t}$ ” and the right-hand side of the equation excluding “error $_{i,t}$ ” at the OLS-regression-estimated “ B_k ”.

The linear coefficients estimated in equation 3 were then used to calculate the regression IMT value for a sector based on its TE and energy intensity. Each industry's regression IMT was calculated using equation 4, where est B_k is the estimated value of B_k from the pooled OLS regression above:

$$\text{Regression IMT}_{i,t} = \text{est}B_0 + \text{est}B_1 \times (TE_{i,t}) + \text{est}B_2 \times (\text{energy intensity}_{i,t}) \quad (\text{Equ. 4})$$

Staff used single multi-year IMT values based on the average of 2010 through 2015 annual raw and regression IMTs. This averaging was weighted by domestic shipments (i.e., IMTs from years with more sector-specific domestic economic activity were given more weight in staff's calculation of the multi-year IMT). Table 1 shows the raw IMT,

regression IMT, and the IMT value used to calculate the total AF in equation 1 for each sector.

When calculating the total AF for a sector, staff set the international assistance factor component equal to the average of the raw IMT and regression IMT. Regression IMT values were applied in this manner because, as described in the international leakage study, some of the raw IMT values were noisy and not in line with expectations (e.g., high trade exposure but low raw IMT). Figure E.2 shows the regression IMTs calculated by equation 4 for given combinations of energy intensity and TE.

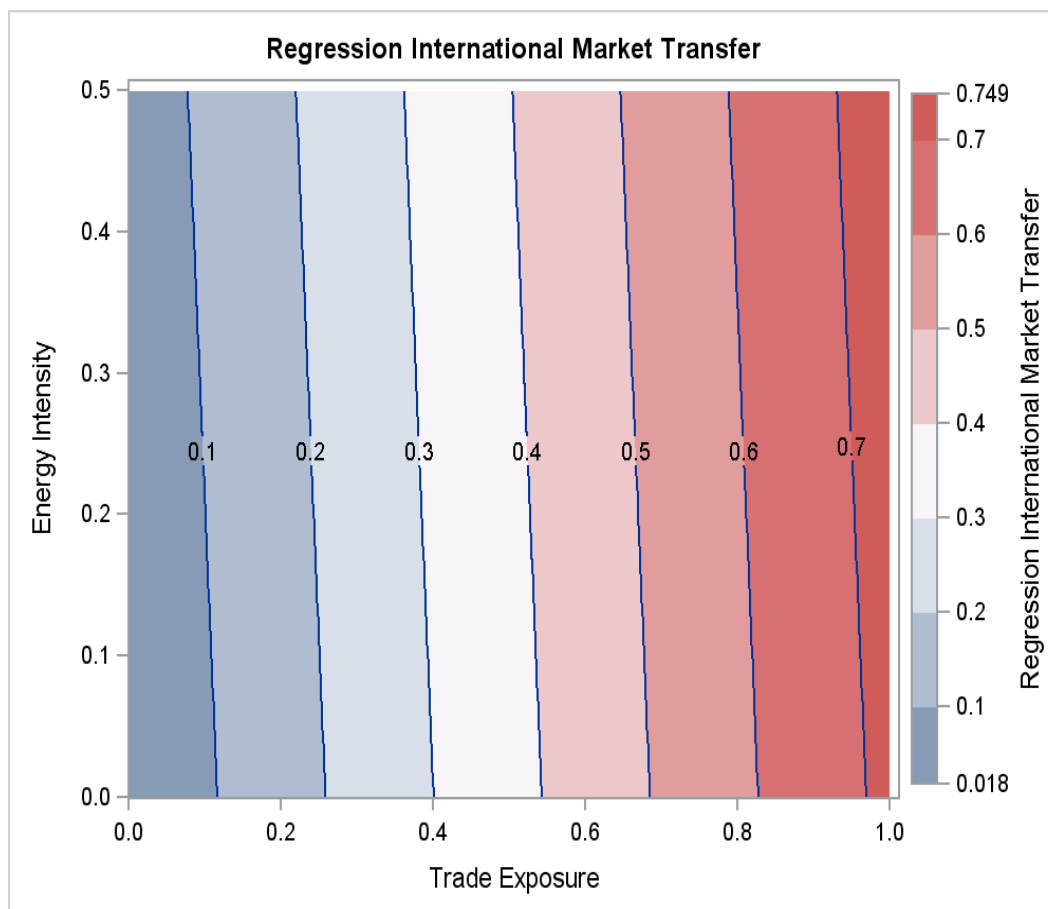


Figure 2. Regression IMTs based on industry energy intensity (y-axis) and trade exposure (x-axis).

Figure 3 shows a raw IMT and regression IMT for a hypothetical sector. The raw IMT is 0.07 and the regression IMT—calculated from the sector's energy intensity, trade exposure, and equation 4—is 0.15. When calculating the total AF by equation 1 for this hypothetical sector, the international AF component would be assigned at the average of these two values: 0.11.

IMT Determination

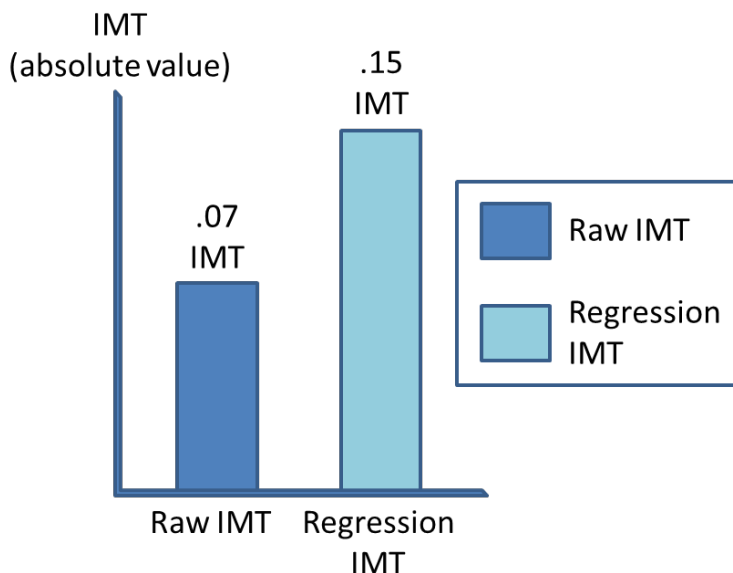


Figure 3. Raw IMT and regression IMT for a hypothetical sector.

Potential International Emissions Leakage for Manufacturing Sectors with Non-Purchased Fuel and/or Process Emissions

For sectors that have non-purchased fuel emissions and/or process emissions in addition to energy-related emissions, staff used an upward adjustment to the energy intensity used to estimate the sector's regression IMT (i.e., the energy intensity in equation 4 was increased). Non-purchased fuel emissions include emissions from fuels not reported to the U.S. Census Bureau as part of the Annual Survey of Manufacturing (ASM) data used by the international leakage study to establish sector-specific energy expenditures¹³. For example, refinery fuel gas is a byproduct of onsite processes at refineries. Refineries do not purchase this fuel, so it is not included in the ASM data, but emissions from combusting refinery fuel gas incur a compliance obligation in the Program. Process emissions are non-combustion emissions, such as the calcination emissions arising from cement production. For sectors with non-purchased fuel and process emissions, Table 2 provides the ratio of emissions captured by the international leakage study to total emissions based on data collected under ARB's Mandatory Greenhouse Gas Reporting Regulation (MRR). For these sectors, the revised energy intensity used to develop each sector's regression IMT was calculated as:

$$\text{Revised equation 4 energy intensity} = \text{study energy intensity} / F \quad (\text{Equ. 5})$$

¹³ The ASM, and thus IMT, includes coal and coke expenditures, so an adjustment has not been applied to the IMT for coal and coke consumption; these fuels have not been included in the domestic leakage study, however, so an upward adjustment was applied to the domestic AF factors for the cement sector as discussed in section three.

Where:

“study energy intensity” is the energy intensity calculated by the international leakage study based on ASM purchased fuel data; and

“F” is the fraction of total emissions from the consumption of purchased fuels based on MRR data (i.e., 1 – non-purchased fuels). These are the values presented in Table 2.

Potential Domestic Emissions Leakage for the Manufacturing Sector

Potential Domestic Leakage for Manufacturing Sectors without Non-Purchased Fuels and/or without Process Emissions: Developing Domestic Drops

The domestic leakage study¹⁴ used plant-level U.S. Census data to simulate the effects of a carbon price-driven increase in operating costs on manufacturing sectors in California through increased electricity and natural gas prices. The study measured the decrease in output, value added, and employment for each sector. The increase in California operating cost is driven by increased electricity and natural gas prices, which escalate with allowance prices. The domestic leakage study simulated industry responses for a marginal compliance cost of \$24.88 per MTCO₂e in 2016 dollars with varying domestic AF components. This represents the 2030 price floor in 2016 dollars. In developing domestic AF components, staff is applying the lower 2022 floor price of \$17, in real 2015 dollars, used by the Standardized Regulatory Impact Assessment (SRIA)¹⁵.

Staff used the output and value added responses to an allowance value to assess potential domestic emissions leakage caused by the Program. Staff also developed and applied two additional domestic leakage estimates. Similar to the regression IMT, these are based on industry-wide regressions of the drop in value added or output on each industry's energy intensity, termed regressed domestic value added drop and regressed output drop respectively. Each of these four methods is referred to as a domestic drop (DD) methodology. Staff is basing each sector's DD for application in developing the revised AFs on the average of domestic value added drop, domestic output drop, regressed domestic value added drop, and regressed domestic output drop.

Domestic value added drop, the first DD methodology, can be found in Table A1 of the domestic leakage study, which is reproduced as Table 3. Table 3 presents domestic value added drop values for a range of domestic AF component values from zero, indicating no allowance allocation, up to 90 percent allowance allocation in 10 percent

¹⁴ <https://www.arb.ca.gov/cc/capandtrade/meetings/20160518/rff-domestic-leakage.pdf>

¹⁵ <https://www.arb.ca.gov/regact/2016/capandtrade16/appc.pdf>

increments.¹⁶ Domestic value added drop for a given sector generally decrease to smaller negative values as the AF increases from left to right in the table, indicating that domestic value added decreases less in response to a marginal compliance cost as AF values increase. For the industrial sectors studied, Figure 4 plots the domestic value added drops from the first column of Table 3 (i.e., those with an AF equal to zero, indicating no allowance allocation at the 2030 price floor) relative to natural gas and electricity expenditures and a \$24.88 per MTCO₂e marginal compliance cost.



Figure 4. Percent reduction in California value added for various industrial sectors with AF equal to zero and a \$24.88 per MTCO₂e marginal compliance cost from the domestic leakage study.

As discussed in Appendix E, the authors of the domestic leakage study (Resources for the Future) also supplied information on domestic output drop in response to a \$24.88 marginal compliance cost; this is reproduced as Table 4. Similar to Table 3, Table 4 presents domestic output drops for a range of domestic AF component values from zero

¹⁶ Rounding results in higher AFs than those that would prevent a 7 percent drop (at the 2022 floor price) in the relevant metric (i.e., if a 7 percent domestic (study) output drop is experienced at a 36 percent AF, the domestic AF component as measured by the study's output metric would be 40 percent, not 30 percent).

up to 90 percent, and increasing allowance allocation generally decreases the domestic output drop. Figure 5 plots the domestic output drops from the first column of Table 4 (i.e., those with an AF equal to zero, indicating no allowance allocation at the 2030 price floor) relative to natural gas and electricity expenditures and a \$24.88 per MTCO₂e marginal compliance cost.

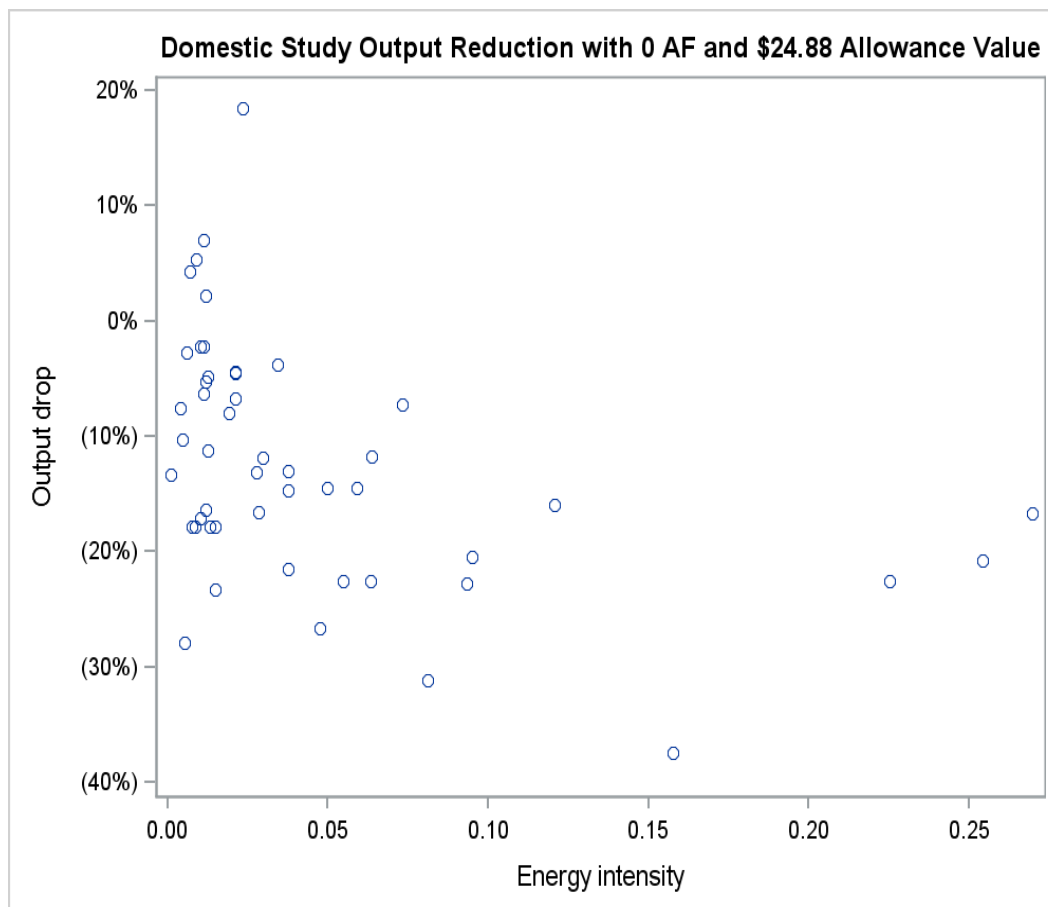


Figure 5. Percent reduction in California output for various industrial sectors with AF equal to zero and a \$24.88/MTCO₂e marginal compliance cost from the domestic leakage study.

As can be seen in Figures 4 and 5, the domestic leakage study calculated counterintuitive positive domestic value added and domestic output responses to increased energy prices for some California sectors. Staff has developed a methodology to provide allocation for sectors with these counterintuitive responses. Broadly, when sectors had unexpectedly limited or positive changes in value added and/or output in response to the compliance cost, staff adjusted the response downward to match an average level of decrease in value added and / or output based on sectors with similar energy intensities. While these individual sectors showed positive responses, the trend of the overall manufacturing sector conforms with expectations: value added and output decrease in response to increased energy prices, and the

impacts are more negative for sectors with higher energy intensities. For sectors with high energy intensities, value added drops (Figure 4), and output drops (Figure 5) from the domestic leakage study were very negative.

Figures 4 and 5 generally show a curved negative relationship between value added and energy intensity, and output drop and energy intensity. Informed by this relationship, staff developed a regression to correlate domestic value added drop to energy intensity (Equation 7 with resulting values in the second column of Table 5). Staff also developed a correlation of domestic output drop to energy intensity (Equation 8 with resulting values in the second column of Table 6). In the sectors for which value added drop and / or output drop were positive, the drops were lowered to zero. This has the effect of increasing allocation for some sectors.¹⁷

The domestic value added drop regression is a pooled linear regression (OLS) with all studied sectors' domestic value added drop at a zero assistance factor (the first column of Table 4) regressed on the natural log of the sector's energy intensity. The regression equation is as follows:

$$DVA_{i,study,0} = B_0 + B_1 \times \ln(\text{energy intensity}_i) + \text{error}_i \quad (\text{Equ. 6})$$

Where:

" $DVA_{i,study,0}$ " is the domestic value added drop for sector "i" with zero assistance factor from the domestic leakage study, which can be found in Table 3; and

" error_i " is the difference between $DVA_{i,study,0}$ and the right-hand side of the equation, excluding error_i .

The regressed domestic value added drop with a zero assistance factor for a sector is then calculated by the following equation:

$$DVA_{i,regressed,0} = \text{est}B_0 + \text{est}B_1 \times \ln(\text{energy intensity}_i) \quad (\text{Equ. 7})$$

Where:

" $DVA_{i,regressed,0}$ " is the regression domestic value added drop for sector "i" with zero assistance factor, which are presented in Table 5, and

" $\text{est}B_k$ " is the OLS estimate of the coefficient B_k resulting from the pooled OLS regression of equation 6.

¹⁷ When the left-hand-side of equations 6 and 9 are more negative, $\text{est}B_k$ in equations 7 and 9 are more negative, resulting in greater (more negative) regressed value added and regressed output drops.

With the regression domestic value added drop at zero assistance factor established for each sector, staff then populated Table 5 for increasing values of AF based on the following formula:

$$DVA_{i,regressed,X} = DVA_{i,regressed,0} \times (1 - X) \quad (\text{Equ. 8})$$

Where:

“ $DVA_{i,regressed,X}$ ” is the regression domestic value added drop for sector “i” with an assistance factor equal to X, where X is one of the various AF values reported in Table 5.

Regressed output drop is calculated using the same general method as regressed value added drop:

$$\text{Output Drop}_{i,study,0} = B_0 + B_1 \times \ln(\text{energy intensity}_i) + \text{error}_i \quad (\text{Equ. 9})$$

Where:

“ $\text{Output Drop}_{i,study,0}$ ” is the domestic output drop for sector “i” with zero assistance factor from the domestic leakage study, which can be found in Table 4; and

“ error_i ” is the difference between $DVA_{i,study,0}$ and the right-hand side of the equation, excluding error_i .

Each sector’s regressed domestic output drop with a zero assistance factor is then calculated by the following equation:

$$\text{Output Drop}_{i,regressed,0} = \text{est}B_0 + \text{est}B_1 \times \ln(\text{energy intensity}_i) \quad (\text{Equ. 10})$$

Where:

“ $\text{Output Drop}_{i,regressed,0}$ ” is the regression domestic output drop for sector “i” with zero assistance factor, which are presented in Table 6, and

“ $\text{est}B_k$ ” is the OLS estimate of the coefficient B_k resulting from equation 9.

With the regression domestic out drop at zero assistance factor established for each sector, staff then populated the remainder of Table 6 for increasing values of AF based on the following equation:

$$\text{Output Drop}_{i,regressed,X} = \text{Output Drop}_{i,regressed,0} \times (1 - X) \quad (\text{Equ. 11})$$

Where:

“Output Drop_{i,regressed,X}” is the regression domestic output drop for sector “i” with an assistance factor equal to X, where X is one of the various AF values reported in Table 6.

Applying Domestic Drops to Obtain Domestic Assistance Factor Components

As discussed in Appendix E, the four methodologies to estimate DD conservatively assume a one-for-one tradeoff between a decline in California output and an increase in non-California domestic output. Because of this one-for-one assumption, staff cannot simply translate the DD values from Tables 3 through 6 into the domestic AF component for each sector in the same way that the IMT values could be translated into the international AF component. Instead, staff has applied a cutoff DD value of minus 7 percent based on the 2022 floor price used in the SRIA of \$17 dollars. In the tables supplied by the researchers assuming a higher \$24.88 dollar allowance value, this 7 percent DD at the 2022 floor price is equivalent to a 10.245 percent DD in Tables 3 through 6 that assume the 2030 floor price.

To set a domestic AF component value for each sector, staff estimated the domestic AF component implied by each of the four DD estimates (value added drop, output drop, regressed value added drop, and regressed output drop). This is the domestic AF component necessary to reduce the DDs in Tables 3 through 6 to less than 10.245 percent in absolute value. Using each methodology and corresponding Tables 3 through 6, the domestic AF component is increased from zero in ten percent increments until the DD value in the respective Table 3, 4, 5 or 6 is above the 2022-floor-price-implied cutoff value of minus 10.245 percent (e.g., the DD value reaches a value of -9 percent). For example, Table 6 shows that for NAICS 325199, the 20AF column results in a regressed domestic output drop greater than 10.245 in absolute value, whereas the 30AF column results in less than 10.245 in absolute value (-9.6). Thus, the domestic AF component implied by the regressed domestic output drop methodology for NAICS 325199 is 30 percent.

Applying Domestic Drops to Obtain Domestic Assistance Factor Components in Manufacturing Sectors with Non-Purchased Fuel, Coal and Coke Energy Consumption, and/or Process Emissions

For sectors with non-purchased fuel, coal and or coke fuel inputs, and / or process emissions, the energy intensity used to calculate the regressed value added drop and regressed output drop (i.e., in two of the four DD estimation methodologies) was adjusted upward. Regressed value added and regressed output increase (become more negative) in energy intensity. This upward adjustment results in a higher domestic AF component for these sectors relative to excluding consideration of non-purchased fuel, Coal and Coke energy, and/or process emissions. The percentage of total emissions from purchased fuel emissions for these sectors is presented in Table 2.

Domestic Assistance Factor Component for Studied Sectors

Table 7 lists the four domestic AF components determined by each of the four DD approaches. The average of these four values is applied as the domestic AF component, which is presented in the final column of Table 7. This Table 7 domestic AF component for each sector is used to calculate the total assistance factor, which is also presented in Table 8.

Assistance Factor Components for Non-Studied Sectors

Staff initially intended to use data from the 2007 and 2012 economic census as well as U.S. Census's UTO database to calculate AFs for non-studied sectors. In the rare earth mining sector (NAICS 212299), however, the 2007 UTO domestic exports exceed the 2007 economic census' domestic shipments (inclusive of domestic exports and shipments for domestic consumption). Since this data anomaly is present in one or both of these datasets used for staff's initial non-studied sector AF approach, staff is concerned there could be additional as-of-yet unresolved data issues in the non-studied sector public data. Basing AFs on incorrect data would lead to potential inappropriate assignment of AFs for other mining sectors. Staff is following up with U.S. Census Bureau staff on these data sources, but has chosen not to release post-2020 AFs for all of the non-studied sectors until staff either has resolved this data issue or identified another approach with which to calculate AFs for the non-studied sectors. Staff seeks stakeholder input on this approach or alternate methodological approaches for the rare earth mining, and potentially other non-studied, sectors (i.e., sectors with TBDs in the post-2020 column of table 8).

Highlight of Key Assumptions

Figure 6 highlights key assumptions used in developing the revised post-2020 AFs in Table 8.

Item	Topic	CP4 AFs
1.	Price for domestic drop	7% domestic drop at 2022 floor price (SRIA price of 17 dollars), equivalent to a 10.245% domestic drop at 2030 floor price
2.	Domestic AF: studied sectors	Average non-rounded domestic AF out of the four methodologies
3.	Domestic AF: studied sectors	Study DDs decreased to zero when positive for purposes of estimating regression DDs
4.	International IMT: studied sectors	Average of Berkeley and regression IMT
5.	Non-studied emissions (international AF component calculations)	Non-studied emissions = "Process" + "non-purchased fuel" emissions
6.	Non-studied emissions (domestic AF component calculations)	Non-studied emissions = "Process" + "Coal" + "Coke" + "non-purchased fuel" emissions

Figure 6. Key assumptions for AFs for stakeholder review and feedback.

Table 1. International assistance factor component for manufacturing sectors.

NAICS Code	Activity Name	Raw IMT	Regression IMT	Average IMT
311423	Dehydrated Garlic Processing	10%	10%	10%
311423	Dehydrated Onion Processing	10%	10%	10%
311423	Dehydrated Chili Pepper Processing	10%	10%	10%
311423	Dehydrated Spinach Processing	10%	10%	10%
311423	Dehydrated Parsley Processing	10%	10%	10%
311512	Milk, Buttermilk, Skim Milk, and Ultrafiltered Milk Processing	5%	5%	5%
311512	Butter Processing	5%	5%	5%
311512	Intermediate Dairy Ingredients Processing	5%	5%	5%
311514	Cream Processing	12%	11%	12%
311514	Condensed Milk Processing	12%	11%	12%
311514	Nonfat Dry Milk and Skimmed Milk Powder (Low Heat) Processing	12%	11%	12%
311514	Nonfat Dry Milk and Skimmed Milk Powder (Medium Heat and High Heat) Processing	12%	11%	12%
311514	Buttermilk Powder Processing	12%	11%	12%
311514	Dairy Product Solids for Animal Feed Processing	12%	11%	12%
311615	Whole Chicken and Chicken Parts Processing	4%	5%	5%
311615	Poultry Deli Product Processing	4%	5%	5%
311615	Protein Meal and Fat Processing	4%	5%	5%
311911	Pistachio Processing	3%	5%	4%
311911	Almond Processing	3%	5%	4%

NAICS Code	Activity Name	Raw IMT	Regression IMT	Average IMT
311919	Fried Potato Chips Processing	2%	3%	3%
311919	Baked Potato Chips Processing	2%	3%	3%
311919	Corn Chips Processing	2%	3%	3%
311919	Corn Curls Processing	2%	3%	3%
311919	Pretzel Processing	2%	3%	3%
312120	Brewing	10%	11%	10%
312120	Lager Beer Manufacturing	10%	11%	10%
312130	Distilled Spirits Production	24%	17%	20%
312130	Dry Color Concentrate Production	24%	17%	20%
312130	Grape Juice Concentrate Production	24%	17%	20%
312130	Grape Seed Extract Production	24%	17%	20%
312130	Liquid Color Concentrate Production	24%	17%	20%
322121	Bathroom Tissue Manufacturing	7%	9%	8%
322121	Facial Tissue Manufacturing	7%	9%	8%
322121	Delicate Task Wipers Manufacturing	7%	9%	8%
322121	Paper Towel Manufacturing	7%	9%	8%
322130	Recycled Boxboard Manufacturing	10%	11%	11%
322130	Recycled Linerboard (Testliner) Manufacturing	10%	11%	11%
322130	Recycled Medium (Fluting) Manufacturing	10%	11%	11%
324110	Petroleum Refining	12%	11%	11%
324121	Asphalt Paving Mixture and Block manufacturing	1%	3%	2%
325120	On-purpose Hydrogen Gas Production	4%	8%	6%

NAICS Code	Activity Name	Raw IMT	Regression IMT	Average IMT
325120	Liquid Hydrogen Production	4%	8%	6%
325188	All Other Basic Inorganic Chemical Manufacturing	32%	29%	30%
325193	Ethyl Alcohol Manufacturing	4%	6%	5%
325199	All Other Basic Organic Chemical Manufacturing	26%	25%	26%
325311	Nitric Acid Production	23%	29%	26%
325311	Calcium Ammonium Nitrate Solution Production	23%	29%	26%
325412	Pharmaceutical and Medicine Manufacturing	30%	22%	26%
325414	Biological Product (Except Diagnostic) Manufacturing	43%	29%	36%
327211	Flat Glass Manufacturing	23%	23%	23%
327213	Container Glass Manufacturing	9%	13%	11%
327310	Cement Manufacturing	4%	18%	11%
327410	Dolime Manufacturing	1%	10%	5%
327420	Plaster Manufacturing	3%	6%	5%
327420	Stucco Manufacturing	3%	6%	5%
327993	Fiber Glass Manufacturing	11%	13%	12%
331111	Steel Production Using an Electric Arc Furnace	14%	17%	15%
331221	Hot Rolled Steel Sheet Production	2%	4%	3%
331221	Pickled Steel Sheet Production	2%	4%	3%
331221	Cold Rolled and Annealed Steel Sheet Production	2%	4%	3%
331221	Galvanized Steel Sheet Production	2%	4%	3%

NAICS Code	Activity Name	Raw IMT	Regression IMT	Average IMT
331221	Tin Steel Sheet Production	2%	4%	3%
331314	Aluminum and Aluminum Alloy Billet Manufacturing	1%	3%	2%
331492	Lead Acid Battery Recycling	5%	7%	6%
331511	Iron Foundries	7%	9%	8%
331511	Ductile Iron Pipe Manufacturing	7%	9%	8%
332510	Hardware Manufacturing	36%	31%	34%
333611	Testing of Turbines and Turbine Generator Sets	66%	32%	49%
336411	Aircraft Manufacturing	0%	7%	3%
336414	Guided Missile and Space Vehicle Manufacturing	2%	4%	3%

Table 2. Fraction of total emissions from purchased fuels for studied sectors with non-purchased fuel consumption and/or process emissions.

NAICS Code	Activity Name	Fraction of Total Emissions from Consumption of Purchased Fuels[#]
311313	Beet Sugar Manufacturing	80%
324110	Petroleum Refineries	60%
324199	All Other Petroleum and Coal Products Manufacturing	90%
325120	Industrial Gas Manufacturing	60%
325311	Nitrogenous Fertilizer Manufacturing	25%
327211	Flat Glass Manufacturing	75%
327213	Glass Container Manufacturing	75%
327310	Cement Manufacturing	13%
327410	Lime Manufacturing	30%
327993	Mineral Wool Manufacturing	85%
331111	Iron and Steel Mills	65%
331492	Secondary Smelting, Refining, and Alloying of Nonferrous Metal (except Copper and Aluminum)	25%

[#] Equal to the fraction "F" in equation 5.

Table 3. Domestic Value Added DDs for Each Studied Sector at Assistance Factors from Zero to 90 Percent (Percentages).

NAICS Code	0AF	10AF	20AF	30AF	40AF	50AF	60AF	70AF	80AF	90AF
311313	-2.9	-2.6	-2.4	-2.1	-1.8	-1.5	-1.2	-0.9	-0.6	-0.3
311421	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	0.0	0.0	0.0
311423	-3.4	-3.0	-2.7	-2.4	-2.1	-1.8	-1.4	-1.1	-0.7	-0.4
311512	-15.5	-14.0	-12.5	-11.0	-9.4	-7.9	-6.4	-4.8	-3.2	-1.6
311513	3.0	2.8	2.5	2.2	1.9	1.6	1.3	1.0	0.7	0.3
311514	-6.4	-5.8	-5.2	-4.6	-3.9	-3.3	-2.7	-2.0	-1.3	-0.7
311615	-22.6	-20.5	-18.3	-16.1	-13.9	-11.7	-9.4	-7.1	-4.8	-2.4
311911	-14.5	-13.1	-11.7	-10.3	-8.9	-7.4	-6.0	-4.5	-3.0	-1.5
311919	-2.1	-2.0	-1.8	-1.7	-1.5	-1.3	-1.0	-0.8	-0.6	-0.3
312120	-15.5	-14.0	-12.5	-11.0	-9.4	-7.9	-6.4	-4.8	-3.2	-1.6
312130	3.9	3.6	3.2	2.8	2.5	2.1	1.7	1.3	0.9	0.4
322121	-15.9	-14.4	-12.9	-11.3	-9.8	-8.2	-6.6	-5.0	-3.3	-1.7
322130	-29.2	-26.4	-23.6	-20.8	-17.9	-15.0	-12.1	-9.1	-6.1	-3.1
324110	-7.8	-7.1	-6.3	-5.6	-4.8	-4.0	-3.2	-2.4	-1.6	-0.8
324121	-2.6	-2.3	-2.1	-1.9	-1.6	-1.4	-1.1	-0.8	-0.6	-0.3
324199	-14.8	-13.4	-11.9	-10.5	-9.1	-7.6	-6.1	-4.6	-3.1	-1.6
325120	-15.4	-13.9	-12.5	-11.0	-9.5	-7.9	-6.4	-4.8	-3.2	-1.6
325188	-14.5	-13.1	-11.7	-10.3	-8.9	-7.4	-6.0	-4.5	-3.0	-1.5
325193	-20.9	-18.9	-16.9	-14.8	-12.8	-10.7	-8.6	-6.5	-4.4	-2.2
325199	-11.8	-10.7	-9.6	-8.4	-7.2	-6.1	-4.9	-3.7	-2.5	-1.2
325311	-11.2	-10.1	-9.0	-7.9	-6.8	-5.7	-4.5	-3.4	-2.3	-1.1
325412	-8.4	-7.6	-6.8	-6.0	-5.1	-4.3	-3.5	-2.6	-1.8	-0.9
325414	5.7	5.1	4.6	4.1	3.5	3.0	2.4	1.8	1.2	0.6
327211	-20.9	-18.9	-16.9	-14.8	-12.8	-10.7	-8.6	-6.5	-4.4	-2.2
327213	-35.7	-32.3	-28.9	-25.4	-21.9	-18.4	-14.8	-11.1	-7.5	-3.8
327310	-24.7	-22.3	-20.0	-17.6	-15.1	-12.7	-10.2	-7.7	-5.2	-2.6

NAICS Code	0AF	10AF	20AF	30AF	40AF	50AF	60AF	70AF	80AF	90AF
327410	-20.9	-18.9	-16.9	-14.8	-12.8	-10.7	-8.6	-6.5	-4.4	-2.2
327420	-13.9	-12.6	-11.2	-9.9	-8.5	-7.1	-5.7	-4.3	-2.9	-1.5
327993	-24.8	-22.4	-20.1	-17.6	-15.2	-12.7	-10.2	-7.7	-5.2	-2.6
331111	-24.8	-22.4	-20.0	-17.6	-15.2	-12.7	-10.2	-7.7	-5.2	-2.6
331221	16.1	14.6	13.1	11.6	10.0	8.4	6.8	5.1	3.5	1.7
331314	-14.1	-12.8	-11.4	-10.0	-8.7	-7.3	-5.8	-4.4	-3.0	-1.5
331492	-13.7	-12.4	-11.1	-9.8	-8.4	-7.1	-5.7	-4.3	-2.9	-1.4
331511	-20.0	-18.1	-16.2	-14.2	-12.3	-10.3	-8.3	-6.2	-4.2	-2.1
332510	-0.5	-0.5	-0.4	-0.4	-0.3	-0.3	-0.2	-0.2	-0.1	0.0
333611	-15.5	-14.0	-12.5	-11.0	-9.4	-7.9	-6.4	-4.8	-3.2	-1.6
336111	-25.2	-22.8	-20.3	-17.9	-15.4	-12.9	-10.4	-7.8	-5.2	-2.6
336411	-6.6	-6.0	-5.4	-4.7	-4.1	-3.4	-2.8	-2.1	-1.4	-0.7
336414	-0.5	-0.5	-0.4	-0.4	-0.3	-0.3	-0.2	-0.2	-0.1	-0.1

Table 4. Domestic Output DDs for Each Studied Sector at Assistance Factors from Zero to 90 Percent (Percentages).

NAICS Code	0AF	10AF	20AF	30AF	40AF	50AF	60AF	70AF	80AF	90AF
311313	-4.5	-4.1	-3.7	-3.2	-2.8	-2.3	-1.9	-1.4	-1.0	-0.5
311421	-6.7	-6.1	-5.5	-4.9	-4.2	-3.5	-2.9	-2.2	-1.5	-0.7
311423	-4.4	-4.0	-3.6	-3.2	-2.7	-2.3	-1.9	-1.4	-0.9	-0.5
311512	-17.8	-16.1	-14.4	-12.7	-10.9	-9.2	-7.4	-5.6	-3.7	-1.9
311513	2.2	2.0	1.8	1.6	1.4	1.2	1.0	0.7	0.5	0.2
311514	-8.1	-7.3	-6.5	-5.7	-5.0	-4.2	-3.4	-2.5	-1.7	-0.9
311615	-23.3	-21.1	-18.9	-16.7	-14.4	-12.1	-9.7	-7.3	-4.9	-2.5
311911	-17.1	-15.5	-13.9	-12.2	-10.5	-8.8	-7.1	-5.4	-3.6	-1.8
311919	-2.2	-2.1	-2.0	-1.8	-1.6	-1.4	-1.2	-0.9	-0.6	-0.3
312120	-17.8	-16.1	-14.4	-12.7	-10.9	-9.2	-7.4	-5.6	-3.7	-1.9
312130	4.3	3.9	3.5	3.1	2.7	2.2	1.8	1.4	0.9	0.5
322121	-14.6	-13.2	-11.8	-10.4	-8.9	-7.5	-6.0	-4.5	-3.0	-1.5
322130	-31.2	-28.2	-25.2	-22.2	-19.1	-16.1	-12.9	-9.7	-6.5	-3.3
324110	-13.2	-11.9	-10.7	-9.4	-8.1	-6.8	-5.5	-4.1	-2.8	-1.4
324121	-3.8	-3.4	-3.1	-2.7	-2.4	-2.0	-1.6	-1.2	-0.8	-0.4
324199	-13.3	-12.1	-10.8	-9.5	-8.2	-6.8	-5.5	-4.1	-2.8	-1.4
325120	-16.7	-15.1	-13.5	-11.9	-10.3	-8.6	-6.9	-5.2	-3.5	-1.8
325188	-14.5	-13.2	-11.8	-10.4	-8.9	-7.5	-6.0	-4.5	-3.0	-1.5
325193	-22.6	-20.5	-18.3	-16.1	-13.9	-11.6	-9.4	-7.1	-4.7	-2.4
325199	-16.6	-15.1	-13.5	-11.9	-10.2	-8.6	-6.9	-5.2	-3.5	-1.8
325311	-20.8	-18.8	-16.8	-14.8	-12.7	-10.7	-8.6	-6.5	-4.3	-2.2
325412	-10.3	-9.4	-8.4	-7.4	-6.4	-5.3	-4.3	-3.2	-2.2	-1.1
325414	5.3	4.8	4.3	3.8	3.3	2.8	2.3	1.7	1.2	0.6
327211	-22.6	-20.5	-18.3	-16.1	-13.9	-11.6	-9.4	-7.1	-4.7	-2.4
327213	-37.5	-33.9	-30.3	-26.7	-23.0	-19.3	-15.5	-11.7	-7.9	-4.0
327310	-20.5	-18.5	-16.5	-14.5	-12.5	-10.5	-8.4	-6.3	-4.2	-2.1

NAICS Code	0AF	10AF	20AF	30AF	40AF	50AF	60AF	70AF	80AF	90AF
327410	-22.6	-20.5	-18.3	-16.1	-13.9	-11.6	-9.4	-7.1	-4.7	-2.4
327420	-16.0	-14.4	-12.9	-11.4	-9.8	-8.2	-6.6	-5.0	-3.4	-1.7
327993	-22.8	-20.6	-18.4	-16.2	-14.0	-11.7	-9.4	-7.1	-4.7	-2.4
331111	-26.7	-24.1	-21.6	-19.0	-16.4	-13.7	-11.0	-8.3	-5.6	-2.8
331221	18.4	16.7	15.0	13.2	11.4	9.6	7.8	5.9	4.0	2.0
331314	-11.7	-10.6	-9.5	-8.4	-7.2	-6.0	-4.9	-3.7	-2.5	-1.2
331492	-7.3	-6.6	-5.8	-5.1	-4.4	-3.7	-2.9	-2.2	-1.5	-0.7
331511	-21.6	-19.5	-17.4	-15.4	-13.2	-11.1	-8.9	-6.7	-4.5	-2.3
332510	-2.3	-2.0	-1.8	-1.6	-1.4	-1.2	-0.9	-0.7	-0.5	-0.2
333611	-17.8	-16.1	-14.4	-12.7	-10.9	-9.2	-7.4	-5.6	-3.7	-1.9
336111	-27.9	-25.2	-22.5	-19.8	-17.1	-14.3	-11.5	-8.7	-5.8	-2.9
336411	-7.6	-6.9	-6.2	-5.4	-4.7	-3.9	-3.2	-2.4	-1.6	-0.8
336414	-2.8	-2.5	-2.2	-2.0	-1.7	-1.4	-1.2	-0.9	-0.6	-0.3

Table 5. Regressed domestic value added DD for each studied sector at assistance factors from zero to 90 percent (percentages).

NAICS Code	0AF	10AF	20AF	30AF	40AF	50AF	60AF	70AF	80AF	90AF
311313	-11.4	-10.3	-9.1	-8.0	-6.8	-5.7	-4.6	-3.4	-2.3	-1.1
311421	-11.4	-10.2	-9.1	-8.0	-6.8	-5.7	-4.6	-3.4	-2.3	-1.1
311423	-11.4	-10.2	-9.1	-8.0	-6.8	-5.7	-4.6	-3.4	-2.3	-1.1
311512	-9.7	-8.8	-7.8	-6.8	-5.8	-4.9	-3.9	-2.9	-1.9	-1.0
311513	-9.4	-8.5	-7.6	-6.6	-5.7	-4.7	-3.8	-2.8	-1.9	-0.9
311514	-11.1	-10.0	-8.9	-7.8	-6.6	-5.5	-4.4	-3.3	-2.2	-1.1
311615	-10.1	-9.1	-8.1	-7.1	-6.1	-5.1	-4.1	-3.0	-2.0	-1.0
311911	-8.9	-8.0	-7.1	-6.3	-5.4	-4.5	-3.6	-2.7	-1.8	-0.9
311919	-8.9	-8.0	-7.1	-6.3	-5.4	-4.5	-3.6	-2.7	-1.8	-0.9
312120	-10.2	-9.2	-8.2	-7.1	-6.1	-5.1	-4.1	-3.1	-2.0	-1.0
312130	-7.5	-6.8	-6.0	-5.3	-4.5	-3.8	-3.0	-2.3	-1.5	-0.8
322121	-14.4	-12.9	-11.5	-10.1	-8.6	-7.2	-5.8	-4.3	-2.9	-1.4
322130	-16.1	-14.5	-12.9	-11.3	-9.6	-8.0	-6.4	-4.8	-3.2	-1.6
324110	-12.4	-11.1	-9.9	-8.7	-7.4	-6.2	-4.9	-3.7	-2.5	-1.2
324121	-13.1	-11.8	-10.5	-9.2	-7.8	-6.5	-5.2	-3.9	-2.6	-1.3
324199	-0.3	-0.3	-0.3	-0.2	-0.2	-0.2	-0.1	-0.1	-0.1	0.0
325120	-20.2	-18.2	-16.2	-14.2	-12.1	-10.1	-8.1	-6.1	-4.0	-2.0
325188	-15.0	-13.5	-12.0	-10.5	-9.0	-7.5	-6.0	-4.5	-3.0	-1.5
325193	-14.7	-13.2	-11.8	-10.3	-8.8	-7.4	-5.9	-4.4	-2.9	-1.5
325199	-12.4	-11.2	-9.9	-8.7	-7.5	-6.2	-5.0	-3.7	-2.5	-1.2
325311	-20.0	-18.0	-16.0	-14.0	-12.0	-10.0	-8.0	-6.0	-4.0	-2.0
325412	-6.1	-5.5	-4.9	-4.3	-3.7	-3.0	-2.4	-1.8	-1.2	-0.6
325414	-8.4	-7.6	-6.7	-5.9	-5.0	-4.2	-3.4	-2.5	-1.7	-0.8
327211	-19.6	-17.7	-15.7	-13.7	-11.8	-9.8	-7.8	-5.9	-3.9	-2.0
327213	-18.4	-16.5	-14.7	-12.9	-11.0	-9.2	-7.4	-5.5	-3.7	-1.8
327310	-21.0	-18.9	-16.8	-14.7	-12.6	-10.5	-8.4	-6.3	-4.2	-2.1

NAICS Code	0AF	10AF	20AF	30AF	40AF	50AF	60AF	70AF	80AF	90AF
327410	-15.2	-13.7	-12.2	-10.6	-9.1	-7.6	-6.1	-4.6	-3.0	-1.5
327420	-17.5	-15.7	-14.0	-12.2	-10.5	-8.7	-7.0	-5.2	-3.5	-1.7
327993	-16.6	-14.9	-13.2	-11.6	-9.9	-8.3	-6.6	-5.0	-3.3	-1.7
331111	-14.2	-12.8	-11.4	-10.0	-8.5	-7.1	-5.7	-4.3	-2.8	-1.4
331221	-11.7	-10.6	-9.4	-8.2	-7.0	-5.9	-4.7	-3.5	-2.3	-1.2
331314	-15.2	-13.7	-12.2	-10.7	-9.1	-7.6	-6.1	-4.6	-3.0	-1.5
331492	-15.7	-14.1	-12.6	-11.0	-9.4	-7.9	-6.3	-4.7	-3.1	-1.6
331511	-13.4	-12.1	-10.7	-9.4	-8.0	-6.7	-5.4	-4.0	-2.7	-1.3
332510	-9.2	-8.3	-7.3	-6.4	-5.5	-4.6	-3.7	-2.8	-1.8	-0.9
333611	-7.9	-7.1	-6.3	-5.5	-4.7	-3.9	-3.1	-2.4	-1.6	-0.8
336111	-6.6	-6.0	-5.3	-4.7	-4.0	-3.3	-2.7	-2.0	-1.3	-0.7
336411	-5.5	-4.9	-4.4	-3.8	-3.3	-2.7	-2.2	-1.6	-1.1	-0.5
336414	-7.0	-6.3	-5.6	-4.9	-4.2	-3.5	-2.8	-2.1	-1.4	-0.7

Table 6. Regressed domestic output DD for each studied sector at assistance factors from zero to 90 percent (percentages).

NAICS Code	0AF	10AF	20AF	30AF	40AF	50AF	60AF	70AF	80AF	90AF
311313	-12.8	-11.5	-10.2	-8.9	-7.7	-6.4	-5.1	-3.8	-2.6	-1.3
311421	-12.8	-11.5	-10.2	-8.9	-7.7	-6.4	-5.1	-3.8	-2.6	-1.3
311423	-12.8	-11.5	-10.2	-8.9	-7.7	-6.4	-5.1	-3.8	-2.6	-1.3
311512	-11.1	-10.0	-8.9	-7.8	-6.7	-5.6	-4.5	-3.3	-2.2	-1.1
311513	-10.9	-9.8	-8.7	-7.6	-6.5	-5.4	-4.3	-3.3	-2.2	-1.1
311514	-12.5	-11.2	-10.0	-8.7	-7.5	-6.2	-5.0	-3.7	-2.5	-1.2
311615	-11.5	-10.4	-9.2	-8.1	-6.9	-5.8	-4.6	-3.5	-2.3	-1.2
311911	-10.4	-9.3	-8.3	-7.3	-6.2	-5.2	-4.1	-3.1	-2.1	-1.0
311919	-10.4	-9.3	-8.3	-7.3	-6.2	-5.2	-4.1	-3.1	-2.1	-1.0
312120	-11.6	-10.4	-9.3	-8.1	-7.0	-5.8	-4.6	-3.5	-2.3	-1.2
312130	-9.0	-8.1	-7.2	-6.3	-5.4	-4.5	-3.6	-2.7	-1.8	-0.9
322121	-15.7	-14.1	-12.5	-11.0	-9.4	-7.8	-6.3	-4.7	-3.1	-1.6
322130	-17.3	-15.6	-13.9	-12.1	-10.4	-8.7	-6.9	-5.2	-3.5	-1.7
324110	-13.7	-12.3	-11.0	-9.6	-8.2	-6.9	-5.5	-4.1	-2.7	-1.4
324121	-14.4	-13.0	-11.5	-10.1	-8.6	-7.2	-5.8	-4.3	-2.9	-1.4
324199	-2.0	-1.8	-1.6	-1.4	-1.2	-1.0	-0.8	-0.6	-0.4	-0.2
325120	-21.4	-19.3	-17.1	-15.0	-12.8	-10.7	-8.6	-6.4	-4.3	-2.1
325188	-16.2	-14.6	-13.0	-11.4	-9.7	-8.1	-6.5	-4.9	-3.2	-1.6
325193	-16.0	-14.4	-12.8	-11.2	-9.6	-8.0	-6.4	-4.8	-3.2	-1.6
325199	-13.8	-12.4	-11.0	-9.6	-8.3	-6.9	-5.5	-4.1	-2.8	-1.4
325311	-21.2	-19.1	-17.0	-14.8	-12.7	-10.6	-8.5	-6.4	-4.2	-2.1
325412	-7.6	-6.8	-6.1	-5.3	-4.6	-3.8	-3.0	-2.3	-1.5	-0.8
325414	-9.9	-8.9	-7.9	-6.9	-5.9	-4.9	-3.9	-3.0	-2.0	-1.0
327211	-20.8	-18.7	-16.6	-14.6	-12.5	-10.4	-8.3	-6.2	-4.2	-2.1
327213	-19.6	-17.6	-15.7	-13.7	-11.7	-9.8	-7.8	-5.9	-3.9	-2.0
327310	-22.1	-19.9	-17.7	-15.5	-13.3	-11.1	-8.8	-6.6	-4.4	-2.2

NAICS Code	0AF	10AF	20AF	30AF	40AF	50AF	60AF	70AF	80AF	90AF
327410	-16.5	-14.8	-13.2	-11.5	-9.9	-8.2	-6.6	-4.9	-3.3	-1.6
327420	-18.7	-16.8	-14.9	-13.1	-11.2	-9.3	-7.5	-5.6	-3.7	-1.9
327993	-17.8	-16.0	-14.2	-12.5	-10.7	-8.9	-7.1	-5.3	-3.6	-1.8
331111	-15.5	-14.0	-12.4	-10.9	-9.3	-7.8	-6.2	-4.7	-3.1	-1.6
331221	-13.1	-11.8	-10.5	-9.2	-7.9	-6.6	-5.2	-3.9	-2.6	-1.3
331314	-16.5	-14.9	-13.2	-11.6	-9.9	-8.3	-6.6	-5.0	-3.3	-1.7
331492	-17.0	-15.3	-13.6	-11.9	-10.2	-8.5	-6.8	-5.1	-3.4	-1.7
331511	-14.7	-13.3	-11.8	-10.3	-8.8	-7.4	-5.9	-4.4	-2.9	-1.5
332510	-10.6	-9.5	-8.5	-7.4	-6.4	-5.3	-4.2	-3.2	-2.1	-1.1
333611	-9.3	-8.4	-7.5	-6.5	-5.6	-4.7	-3.7	-2.8	-1.9	-0.9
336111	-8.1	-7.3	-6.5	-5.7	-4.9	-4.1	-3.3	-2.4	-1.6	-0.8
336411	-7.0	-6.3	-5.6	-4.9	-4.2	-3.5	-2.8	-2.1	-1.4	-0.7
336414	-8.5	-7.7	-6.8	-6.0	-5.1	-4.3	-3.4	-2.6	-1.7	-0.9

Table 7. Studied sector domestic assistance factor component from the four DD estimation approaches, and the assigned domestic assistance factor component.

NAICS Code	Activity Name	Output Domestic AF Component	Value Added Domestic AF Component	Regression Value Added Domestic AF Component	Regression Output Domestic AF Component	Assigned Domestic AF Component
311313	Beet Sugar Manufacturing	0	0	0.2	0.2	0.1
311421	Aseptic Tomato Paste Processing	0	0	0.2	0.2	0.1
311421	Aseptic Whole and Diced Tomato Processing	0	0	0.2	0.2	0.1
311421	Non-Aseptic Tomato Juice Processing	0	0	0.2	0.2	0.1
311421	Non-Aseptic Tomato Paste and Tomato Puree Processing	0	0	0.2	0.2	0.1
311421	Non-Aseptic Whole and Diced Tomato Processing	0	0	0.2	0.2	0.1
311423	Dehydrated Chili Pepper Processing	0	0	0.2	0.2	0.1
311423	Dehydrated Garlic Processing	0	0	0.2	0.2	0.1
311423	Dehydrated Onion Processing	0	0	0.2	0.2	0.1
311423	Dehydrated Parsley Processing	0	0	0.2	0.2	0.1
311423	Dehydrated Spinach Processing	0	0	0.2	0.2	0.1
311512	Butter Processing	0.5	0.4	0	0.1	0.25
311512	Intermediate Dairy Ingredients Processing	0.5	0.4	0	0.1	0.25
311512	Milk, Buttermilk, Skim Milk, and Ultrafiltered Milk Processing	0.5	0.4	0	0.1	0.25
311513	Cheese Processing	0	0	0	0.1	0.025
311513	Deproteinized Whey Processing	0	0	0	0.1	0.025
311513	Lactose Processing	0	0	0	0.1	0.025
311513	Whey Protein Concentrate Processing	0	0	0	0.1	0.025
311514	Buttermilk Powder Processing	0	0	0.1	0.2	0.075
311514	Condensed Milk Processing	0	0	0.1	0.2	0.075

NAICS Code	Activity Name	Output Domestic AF Component	Value Added Domestic AF Component	Regression Value Added Domestic AF Component	Regression Output Domestic AF Component	Assigned Domestic AF Component
311514	Cream Processing	0	0	0.1	0.2	0.075
311514	Dairy Product Solids for Animal Feed Processing	0	0	0.1	0.2	0.075
311514	Nonfat Dry Milk and Skimmed Milk Powder (Low Heat) Processing	0	0	0.1	0.2	0.075
311514	Nonfat Dry Milk and Skimmed Milk Powder (Medium Heat and High Heat) Processing	0	0	0.1	0.2	0.075
311615	Poultry Deli Product Processing	0.6	0.6	0	0.2	0.35
311615	Protein Meal and Fat Processing	0.6	0.6	0	0.2	0.35
311615	Whole Chicken and Chicken Parts Processing	0.6	0.6	0	0.2	0.35
311911	Almond Processing	0.5	0.4	0	0.1	0.25
311911	Pistachio Processing	0.5	0.4	0	0.1	0.25
311919	Baked Potato Chips Processing	0	0	0	0.1	0.025
311919	Corn Chips Processing	0	0	0	0.1	0.025
311919	Corn Curls Processing	0	0	0	0.1	0.025
311919	Fried Potato Chips Processing	0	0	0	0.1	0.025
311919	Pretzel Processing	0	0	0	0.1	0.025
312120	Brewing	0.5	0.4	0	0.2	0.275
312120	Lager Beer Manufacturing	0.5	0.4	0	0.2	0.275
312130	Distilled Spirits Production	0	0	0	0	0
312130	Dry Color Concentrate Production	0	0	0	0	0
312130	Grape Juice Concentrate Production	0	0	0	0	0
312130	Grape Seed Extract Production	0	0	0	0	0
312130	Liquid Color Concentrate Production	0	0	0	0	0
322121	Bathroom Tissue Manufacturing	0.4	0.4	0.3	0.4	0.375

NAICS Code	Activity Name	Output Domestic AF Component	Value Added Domestic AF Component	Regression Value Added Domestic AF Component	Regression Output Domestic AF Component	Assigned Domestic AF Component
322121	Delicate Task Wipers Manufacturing	0.4	0.4	0.3	0.4	0.375
322121	Facial Tissue Manufacturing	0.4	0.4	0.3	0.4	0.375
322121	Paper Towel Manufacturing	0.4	0.4	0.3	0.4	0.375
322130	Recycled Boxboard Manufacturing	0.7	0.7	0.4	0.5	0.575
322130	Recycled Linerboard (Testliner) Manufacturing	0.7	0.7	0.4	0.5	0.575
322130	Recycled Medium (Fluting) Manufacturing	0.7	0.7	0.4	0.5	0.575
324110	Petroleum Refining	0.3	0	0.2	0.3	0.2
324121	Asphalt Paving Mixture and Block manufacturing	0	0	0.3	0.3	0.15
324199	Coke Calcining	0.3	0.4	0	0	0.175
325120	Liquid Hydrogen Production	0.5	0.4	0.5	0.6	0.5
325120	On-purpose Hydrogen Gas Production	0.5	0.4	0.5	0.6	0.5
325188	All Other Basic Inorganic Chemical Manufacturing	0.4	0.4	0.4	0.4	0.4
325193	Ethyl Alcohol Manufacturing	0.6	0.6	0.4	0.4	0.5
325199	All Other Basic Organic Chemical Manufacturing	0.4	0.2	0.2	0.3	0.275
325311	Calcium Ammonium Nitrate Solution Production	0.6	0.1	0.5	0.6	0.45
325311	Nitric Acid Production	0.6	0.1	0.5	0.6	0.45
325412	Pharmaceutical and Medicine Manufacturing	0.1	0	0	0	0.025
325414	Biological Product (Except Diagnostic) Manufacturing	0	0	0	0	0
327211	Flat Glass Manufacturing	0.6	0.6	0.5	0.6	0.575

NAICS Code	Activity Name	Output Domestic AF Component	Value Added Domestic AF Component	Regression Value Added Domestic AF Component	Regression Output Domestic AF Component	Assigned Domestic AF Component
327213	Container Glass Manufacturing	0.8	0.8	0.5	0.5	0.65
327310	Cement Manufacturing	0.6	0.6	0.6	0.6	0.6
327410	Dolime Manufacturing	0.6	0.6	0.4	0.4	0.5
327420	Plaster Manufacturing	0.4	0.3	0.5	0.5	0.425
327420	Stucco Manufacturing	0.4	0.3	0.5	0.5	0.425
327993	Fiber Glass Manufacturing	0.6	0.6	0.4	0.5	0.525
331111	Steel Production Using an Electric Arc Furnace	0.7	0.6	0.3	0.4	0.5
331221	Cold Rolled and Annealed Steel Sheet Production	0	0	0.2	0.3	0.125
331221	Galvanized Steel Sheet Production	0	0	0.2	0.3	0.125
331221	Hot Rolled Steel Sheet Production	0	0	0.2	0.3	0.125
331221	Pickled Steel Sheet Production	0	0	0.2	0.3	0.125
331221	Tin Steel Sheet Production	0	0	0.2	0.3	0.125
331314	Aluminum and Aluminum Alloy Billet Manufacturing	0.2	0.3	0.4	0.4	0.325
331492	Lead Acid Battery Recycling	0	0.3	0.4	0.4	0.275
331511	Ductile Iron Pipe Manufacturing	0.6	0.6	0.3	0.4	0.475
331511	Iron Foundries	0.6	0.6	0.3	0.4	0.475
332510	Hardware Manufacturing	0	0	0	0.1	0.025
333611	Testing of Turbines and Turbine Generator Sets	0.5	0.4	0	0	0.225
336111	Automobile Manufacturing	0.7	0.7	0	0	0.35
336411	Aircraft Manufacturing	0	0	0	0	0
336414	Guided Missile and Space Vehicle Manufacturing	0	0	0	0	0

Table 8. Domestic assistance factor component, international assistance factor component, and overall Table 8-1 (“Compliance Period 3 AF”) and Table 8-3 (“Post-2020 AF”) assistance factor.

NAICS	Activity Name	Compliance Period 3 AF	Domestic AF Component	International AF Component	Post-2020 AF
211111	Natural Gas Processing >25 Mmscf/day	1	TBD ¹⁸	TBD	TBD
211111	Non-Thermal Crude Oil	1	TBD	TBD	TBD
211111	Thermal EOR Crude Oil	1	TBD	TBD	TBD
211112	Natural Gas Liquid Processing	1	TBD	TBD	TBD
212299	Rare Earth Production	1	TBD	TBD	TBD
212391	Mining and Manufacturing of Soda Ash and Related Products	1	TBD	TBD	TBD
212399	Diatomaceous Earth Mining	1	TBD	TBD	TBD
212399	Freshwater Diatomite Filter Aids Manufacturing	1	TBD	TBD	TBD
311221	Wet Corn Milling	1	TBD	TBD	TBD
311313	Beet Sugar Manufacturing	0.75	0.10	0.11	0.21
311421	Aseptic Tomato Paste Processing	0.75	0.10	0.13	0.23
311421	Aseptic Whole and Diced Tomato Processing	0.75	0.10	0.13	0.23
311421	Non-Aseptic Tomato Juice Processing	0.75	0.10	0.13	0.23
311421	Non-Aseptic Tomato Paste and Tomato Puree Processing	0.75	0.10	0.13	0.23
311421	Non-Aseptic Whole and Diced Tomato Processing	0.75	0.10	0.13	0.23
311423	Dehydrated Chili Pepper Processing	0.75	0.10	0.10	0.20
311423	Dehydrated Garlic Processing	0.75	0.10	0.10	0.20
311423	Dehydrated Onion Processing	0.75	0.10	0.10	0.20

¹⁸ Table 8 TBDS will be added in a future formal 15-day amendment proposal.

NAICS	Activity Name	Compliance Period 3 AF	Domestic AF Component	International AF Component	Post-2020 AF
311423	Dehydrated Parsley Processing	0.75	0.10	0.10	0.20
311423	Dehydrated Spinach Processing	0.75	0.10	0.10	0.20
311512	Butter Processing	0.75	0.25	0.05	0.30
311512	Intermediate Dairy Ingredients Processing	0.75	0.25	0.05	0.30
311512	Milk, Buttermilk, Skim Milk, and Ultrafiltered Milk Processing	0.75	0.25	0.05	0.30
311513	Cheese Processing	0.75	0.03	0.03	0.05
311513	Deproteinized Whey Processing	0.75	0.03	0.03	0.05
311513	Lactose Processing	0.75	0.03	0.03	0.05
311513	Whey Protein Concentrate Processing	0.75	0.03	0.03	0.05
311514	Buttermilk Powder Processing	0.75	0.08	0.12	0.19
311514	Condensed Milk Processing	0.75	0.08	0.12	0.19
311514	Cream Processing	0.75	0.08	0.12	0.19
311514	Dairy Product Solids for Animal Feed Processing	0.75	0.08	0.12	0.19
311514	Nonfat Dry Milk and Skimmed Milk Powder (Low Heat) Processing	0.75	0.08	0.12	0.19
311514	Nonfat Dry Milk and Skimmed Milk Powder (Medium Heat and High Heat) Processing	0.75	0.08	0.12	0.19
311615	Poultry Deli Product Processing	0.75	0.35	0.05	0.40
311615	Protein Meal and Fat Processing	0.75	0.35	0.05	0.40
311615	Whole Chicken and Chicken Parts Processing	0.75	0.35	0.05	0.40
311911	Almond Processing	0.75	0.25	0.04	0.29
311911	Pistachio Processing	0.75	0.25	0.04	0.29
311919	Baked Potato Chips Processing	0.75	0.03	0.03	0.05
311919	Corn Chips Processing	0.75	0.03	0.03	0.05

NAICS	Activity Name	Compliance Period 3 AF	Domestic AF Component	International AF Component	Post-2020 AF
311919	Corn Curls Processing	0.75	0.03	0.03	0.05
311919	Fried Potato Chips Processing	0.75	0.03	0.03	0.05
311919	Pretzel Processing	0.75	0.03	0.03	0.05
312120	Brewing	0.75	0.28	0.10	0.38
312120	Lager Beer Manufacturing	0.75	0.28	0.10	0.38
312130	Distilled Spirits Production	0.75	0	0.20	0.20
312130	Dry Color Concentrate Production	0.75	0	0.20	0.20
312130	Grape Juice Concentrate Production	0.75	0	0.20	0.20
312130	Grape Seed Extract Production	0.75	0	0.20	0.20
312130	Liquid Color Concentrate Production	0.75	0	0.20	0.20
322121	Bathroom Tissue Manufacturing	1	0.38	0.08	0.46
322121	Delicate Task Wipers Manufacturing	1	0.38	0.08	0.46
322121	Facial Tissue Manufacturing	1	0.38	0.08	0.46
322121	Paper Towel Manufacturing	1	0.38	0.08	0.46
322130	Recycled Boxboard Manufacturing	1	0.58	0.11	0.68
322130	Recycled Linerboard (Testliner) Manufacturing	1	0.58	0.11	0.68
322130	Recycled Medium (Fluting) Manufacturing	1	0.58	0.11	0.68
324110	Petroleum Refining	0.75	0.20	0.11	0.31
324121	Asphalt Paving Mixture and Block manufacturing	0.75	0.15	0.02	0.17
324199	Coke Calcining	1	0.18	0.03	0.20
325120	Liquid Hydrogen Production	0.75	0.50	0.06	0.56
325120	On-purpose Hydrogen Gas Production	0.75	0.50	0.06	0.56
325188	All Other Basic Inorganic Chemical	1	0.40	0.30	0.70

NAICS	Activity Name	Compliance Period 3 AF	Domestic AF Component	International AF Component	Post-2020 AF
	Manufacturing				
325193	Ethyl Alcohol Manufacturing	0.75	0.50	0.05	0.55
325199	All Other Basic Organic Chemical Manufacturing	1	0.28	0.26	0.53
325311	Calcium Ammonium Nitrate Solution Production	1	0.45	0.26	0.71
325311	Nitric Acid Production	1	0.45	0.26	0.71
325412	Pharmaceutical and Medicine Manufacturing	0.5	0.03	0.26	0.28
325414	Biological Product (Except Diagnostic) Manufacturing	0.75	0	0.36	0.36
327211	Flat Glass Manufacturing	1	0.58	0.23	0.81
327213	Container Glass Manufacturing	1	0.65	0.11	0.76
327310	Cement Manufacturing	1	0.60	0.11	0.71
327410	Dolime Manufacturing	1	0.50	0.05	0.55
327420	Plaster Manufacturing	0.75	0.43	0.05	0.47
327420	Stucco Manufacturing	0.75	0.43	0.05	0.47
327993	Fiber Glass Manufacturing	1	0.53	0.12	0.65
331111	Steel Production Using an Electric Arc Furnace	1	0.50	0.15	0.65
331221	Cold Rolled and Annealed Steel Sheet Production	0.75	0.13	0.03	0.15
331221	Galvanized Steel Sheet Production	0.75	0.13	0.03	0.15
331221	Hot Rolled Steel Sheet Production	0.75	0.13	0.03	0.15
331221	Pickled Steel Sheet Production	0.75	0.13	0.03	0.15
331221	Tin Steel Sheet Production	0.75	0.13	0.03	0.15
331314	Aluminum and Aluminum Alloy Billet Manufacturing	0.75	0.33	0.02	0.35
331492	Lead Acid Battery Recycling	0.75	0.28	0.06	0.33
331511	Ductile Iron Pipe Manufacturing	0.75	0.48	0.08	0.56

NAICS	Activity Name	Compliance Period 3 AF	Domestic AF Component	International AF Component	Post-2020 AF
331511	Iron Foundries	0.75	0.48	0.08	0.56
332112	Nonferrous Metal Forging	0.5	0.25	0.06	0.31
332112	Seamless Rolled Ring	0.5	0.25	0.06	0.31
332510	Hardware Manufacturing	0.75	0.03	0.34	0.36
333611	Testing of Turbines and Turbine Generator Sets	0.75	0.23	0.49	0.72
336111	Automobile Manufacturing	TBD	0.35	0.58	0.93
336411	Aircraft Manufacturing	0.5	0	0.03	0.03
336414	Guided Missile and Space Vehicle Manufacturing	0.5	0	0.03	0.03
4881	Support Activities for Air Transportation	0.5	TBD	TBD	TBD
111419	Other Food Crops Grown Under Cover	TBD	TBD	TBD	TBD
325194	Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing	1	TBD	TBD	TBD
336390	Other Motor Vehicle Parts Manufacturing	TBD	TBD	TBD	TBD