

## Appendix B:

### Leakage Risk Analysis for New and Modified Sectors

#### What is Leakage Risk Analysis?

The California Cap-and-Trade Program was designed such that it would not unduly disadvantage California industry while achieving the emissions reduction goals set forth in the Global Warming Solutions Act of 2006 (AB 32). When introducing an environmental regulation within a jurisdiction, there is the possibility that production costs and prices in that jurisdiction increase relative to those costs in jurisdictions that do not introduce comparable regulations. This can precipitate a shift in demand away from goods produced in the implementing jurisdiction toward goods produced elsewhere. As a result, the reduction in production and emissions in the implementing jurisdiction may be offset by increased production and emissions elsewhere. This offsetting increase in emissions is called emissions leakage.<sup>1</sup> AB 32 directs the Air Resources Board (ARB) to design all greenhouse gas (GHG) regulations to minimize leakage to the extent feasible.<sup>2</sup>

Staff developed ARB's leakage risk analysis methodology in 2010 as part of the Cap-and-Trade Program. This allows for entities covered by the Cap-and-Trade Program to be categorized by leakage risk and receive industry assistance in the form of free allowances based in part on the entity's leakage risk classification. For a thorough understanding of the leakage risk analysis methodology, see Appendix K to the 2010 Cap-and-Trade regulation.<sup>3</sup>

Since that time there have been several new covered entities entering the program whose products are dissimilar enough from previous entrants that new leakage analysis must be performed for those new entrants. Further, there was one industrial sector which was previously analyzed for which newly public data has indicated a change in the leakage risk categorization for entities in that industrial sector. This document describes the leakage risk analysis that staff performed to properly categorize the leakage risk for these covered entities.

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<sup>1</sup> California Global Warming Solutions Act of 2006 (AB 32) HSC § 38505(j)  
[http://www.leginfo.ca.gov/pub/05-06/bill/asm/ab\\_0001-0050/ab\\_32\\_bill\\_20060927\\_chaptered.html](http://www.leginfo.ca.gov/pub/05-06/bill/asm/ab_0001-0050/ab_32_bill_20060927_chaptered.html).

<sup>2</sup> Ibid, § 38562(b)(8).

<sup>3</sup> California Air Resources Board (2010) Cap-and-Trade Regulation Initial Statement of Reasons (ISOR) Appendix K. <http://www.arb.ca.gov/regact/2010/capandtrade10/capv4appk.pdf>.

## Industrial Sector Classification

In order to perform the leakage risk analysis for an entity, staff must first classify the entity by industrial sector in order to apply industrial economic data collected by the U.S. Census Bureau and other government agencies. Staff used the North American Industrial Classification System (NAICS) to group industrial activities at the 6 digit level disaggregation whenever possible, as this is the most disaggregated level of information commonly collected. Because some of the new entrants to the program do not fall under previously analyzed 6 digit level NAICS sectors, it was necessary for staff to perform new leakage analysis for the newly represented sectors. These new sectors include the following:

- 212299 - All Other Metal Ore Mining<sup>4</sup>
- 324121 - Asphalt Paving Mixture and Block Manufacturing
- 325193 - Ethyl Alcohol Manufacturing
- 332510 - Hardware manufacturing
- 336414 - Guided Missile and Space Vehicle Manufacturing
- 332112 - Nonferrous Forging

Further, this analysis includes one sector that was re-categorized due to newly available public data:

- 327993 - Mineral Wool Manufacturing

## Leakage Risk Metrics

After determining the NAICS sector of a covered entity, two metrics are employed to determine leakage risk classification for an industrial sector: emissions intensity (EI) and trade exposure (TE).

The EI metric is used to measure the amount of GHG emissions generated per the value added for an industrial sector in the creation of its products:

$$EI = \text{metric tons CO}_2\text{e} / \text{\$million value added} \quad (1)$$

Emissions data is collected by ARB either through ARB's own mandatory reporting program (MRR) or from the Interagency Report on International Competitiveness and

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<sup>4</sup> In this case, the analysis is specific to mining of rare earth metals due to uniqueness of the covered entity and lack of data for the overall sector.

Emission Leakage (IAR).<sup>5</sup> Value added data is taken from the U.S. Census Bureau's Annual Survey of Manufacturers (ASM) and 2007 Economic Census,<sup>6</sup> or the National Bureau of Economic Research.<sup>7</sup> In the event of conflicting data, staff referred to the most recent numbers for the ASM. In the previous leakage analysis applied to original entrants to the Cap-and-Trade Program in 2010, staff used data corresponding to 2008 when applying emissions data from taken from the MRR and 2005 data when applying emissions data taken from the IAR.<sup>8</sup> Unless these data are not available, these are the dates from which EI data are analyzed in this document as well.

Upon calculating the EI for a sector from the formula given in equation 1 above, the EI metric is categorized into the following four levels:

- High: > 5000 mtCO<sub>2</sub>e/\$M value added
- Medium: 4999 to 1000 mtCO<sub>2</sub>e/\$M value added
- Low: 999 to 100 mtCO<sub>2</sub>e/\$M value added
- Very Low: < 100 mtCO<sub>2</sub>e/\$M value added

The TE metric uses trade share to measure the level of competition from entities outside the jurisdiction of the Cap-and-Trade Program and the ability of covered entities to pass through compliance costs. Trade share is reported as a percentage and measured as follows:

$$\text{trade share} = (\text{imports} + \text{exports}) / (\text{shipments} + \text{imports}) \quad (2)$$

U.S. Import and Export data is taken from the International Trade Commission<sup>9</sup> (ITC) and Total Value of Shipments data is taken from taken from the U.S. Census Bureau's Annual Survey of Manufacturers and 2007 Economic Census, or the National Bureau of Economic Research. In the analysis completed for the initial set of industrial covered entities, staff used data corresponding to an average value for each input for over the years 2003 to 2008.<sup>10</sup> Unless these data are not available, these are the dates from which TE data are analyzed in this document as well.

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<sup>5</sup> U.S. EPA (2009) Interagency Report on International Competitiveness and Emission Leakage, Data Annex. Retrieved June 30, 2013 from

<http://www.epa.gov/climatechange/EPAactivities/economics/legislativeanalyses.html#interagencyReport>.

<sup>6</sup> U.S. Census Bureau's American Finder. Retrieved August 23, 2013 from

<http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml>

<sup>7</sup> National Bureau of Economic Research, NBER-CES Manufacturing Industry Database (1958-2009) 1997 NAICS version. Retrieved June 20, 2013 from <http://www.nber.org/data/nberces5809.html>

<sup>8</sup> These calculations can be found in the 2010 Appendix K to the 2010 Cap-and-Trade Regulation previously referenced in footnote 3.

<sup>9</sup> International Trade Commission Interactive Tariff and Trade DataWeb. Retrieved August 23, 2013 from <http://dataweb.usitc.gov/>

<sup>10</sup> These calculations can be found in the 2010 Appendix K to the 2010 Cap-and-Trade Regulation previously referenced in footnote 3.

Upon calculating the trade share for a sector from the formula given in equation 2 above, the TE metric is categorized into the following three levels:

- High: > 19 %
- Medium: 19 to 10%
- Low: < 10%

### Leakage Risk Categories

The leakage risk is category is determined by the combination of the EI and TE metrics from the previous section. This is demonstrated in Table 1.

**Table 1 Leakage Risk Categorization**

Leakage Risk	Emissions Intensity	Trade Exposure
High	High	High Medium Low
	Medium	High
Medium	Medium	Medium Low
	Low	High Medium
Low	Low	Low
	Very Low	High Medium Low

For example from this table it is clear that an emission intensity category of high combined with any trade exposure category will result in a leakage risk category of high. Whereas an emissions intensity category of very low combined with any combination of trade exposure category would result in a leakage risk category of low. An emissions intensity category of either low or medium would need to be check against the specific category of trade exposure to determine the corresponding leakage risk category.

## Leakage Analysis for Newly Covered Sectors

Staff applied the leakage metrics described earlier to industrial sectors representing the activities of new entrants to the Cap-and-Trade Program. The EI data, EI value and the resulting EI category can be found below in Table 2.

**Table 2 Emissions Intensity Summary Data for New Sectors**

NAICS Code	Description	Emissions* (MMTCO <sub>2</sub> e)	Value Added ** (\$ millions)	Emissions Intensity (EI) (MTCO <sub>2</sub> e***/\$ millions)	EI Category
212299****	All Other Metal Ore Mining	0.5*****	ND*****	ND*****	Medium
324121	Asphalt Paving Mixture and Block Manufacturing	8.6	3,425	2,511	Medium
325193	Ethyl Alcohol Manufacturing	7.9	3,152	2,506	Medium
332510	Hardware manufacturing	1.1	5,791	190	Low
336414	Guided Missile and Space Vehicle Manufacturing	1.0	6,677	150	Low
332112	Nonferrous Forging	0.9	1,114	808	Low

\* Emissions are national data obtained from U.S. EPA's Interagency Report with units in million metric tons CO<sub>2</sub> equivalent (MMTCO<sub>2</sub>e).

\*\* Value added are national data obtained from National Bureau of Economic Research, NBER-CES Manufacturing Industry Database (1958-2009) 1997 NAICS version, and are an average of the values reported from 2004 to 2006.

\*\*\* Units in metric tons of CO<sub>2</sub> equivalent (MTCO<sub>2</sub>e).

\*\*\*\* The emissions intensity reported here is specific to the activity of mining rare earth metals which is only a small part of sector 212299.

\*\*\*\*\* Emissions are a future projection based upon engineering analysis due to the transitional state of the facility.

\*\*\*\*\* Because the activity of mining of rare earth metals is unique to only one facility in the United States, and this data is not available anywhere else, this data is treated as confidential.

The EI analysis for the sector with NAICS code 212299 is specific to the activity of mining of rare earth metals. There currently exists only one facility in the United States and California that staff is aware of whose primary activity is the mining of Rare Earth Metals. Further, due to dynamically changing industry conditions, staff needed to rely on future emissions projections based upon an engineering analysis of ongoing capital improvements to the facility and future production capacity estimates. Due to the confidential nature of this data, only the emissions estimate and EI categorization are provided in this document. Because of these complexities, future entrants to the Cap-and-Trade program under the NAICS code of 212299 may require a new EI analysis due to the uniqueness of this sector and the activity of mining of rare earth metals.

The trade share data, trade share value and the resulting TE category can be found below in Table 3.

**Table 3 Trade Exposure Summary Data for New Sectors\***

NAICS Code	Description	Total Value of Shipments** (\$ millions)	Value of Exports FASV*** (\$ millions)	Value of Imports LDPV**** (\$ millions)	Trade Share	Trade Exposure Category
<u>212299</u>	All Other Metal Ore Mining	2,301	1,300	1,345	72.5%	High
<u>324121</u>	Asphalt Paving Mixture and Block Manufacturing	10,232	74	76	1.5%	Low
<u>325193</u>	Ethyl Alcohol Manufacturing	9,230	183	922	10.9%	Medium
<u>332510</u>	Hardware manufacturing	9,966	2,059	5,206	47.9%	High
<u>336414</u>	Guided Missile and Space Vehicle Manufacturing	14,610	11	54	0.4%	Low
<u>33211(2)*****</u>	Nonferrous Forging	29,074	355	357	2.4%	Low

\* Data averaged from 2003 to 2008.

\*\* Value of shipments are national data obtained from National Bureau of Economic Research, NBER-CES Manufacturing Industry Database (1958-2009) 1997 NAICS version.

\*\*\* Free alongside ship value are national data, obtained from the International Trade Commission (ITC).

\*\*\*\* Landed duty paid value are national data, obtained from the ITC.

\*\*\*\*\* Sector data was aggregated to 5 digits NAICS level due to lack of ITC data at 6 digit NAICS level.

Staff applied TE analysis of the broader sector of 212299 based upon publicly available data to the activity of rare earth mining because, based upon engineering analysis for the years 2003 to 2008, it appears conservative and applying special analysis for this activity would not alter the TE category at the present time.

Staff needed to use a TE analysis aggregated to the 5 digit NAICS code level for sector 332112 due to a lack of publicly available import and export data on this sector at the ITC.

The EI and TE leakage metrics are combined per the strategy given in Table 1 to generate the leakage risk category for each new sector covered under the Cap-and-Trade program. These leakage categories are given below in Table 4.

**Table 4 Leakage Categorization Summary for New Sectors**

NAICS Code	Description	Emissions Intensity		Trade Exposure		Leakage Categorization
<u>212299*</u>	All Other Metal Ore Mining	ND**	Medium	72.5%	High	High
<u>324121</u>	Asphalt Paving Mixture and Block Manufacturing	2511	Medium	1.5%	Low	Medium
<u>325193</u>	Ethyl Alcohol Manufacturing	2506	Medium	10.9%	Medium	Medium
<u>332112</u>	Nonferrous Forging	808	Low	2.4%	Low	Low
<u>332510</u>	Hardware manufacturing	190	Low	47.9%	High	Medium
<u>336414</u>	Guided Missile and Space Vehicle Manufacturing	150	Low	0.4%	Low	Low

\* The leakage category reported here for sector 212299 is specific to the activity of mining rare earth metals which is only a small part of sector 212299.

\*\* Because the activity of mining of rare earth metals is unique to only one facility in the United States, and this data is not available anywhere else, this data is treated as confidential.

### Changes to Leakage Risk Classification of Existing Sectors

Staff analyzed newly available data on the TE metric for those NAICS sectors for which data was available. From this analysis, staff found that since the original 2010 TE analysis for the sector 327993 (Mineral Wool Manufacturing), imports and exports have been rising relative to total value of shipments such that the trade share given in equation 2 earlier in this paper has risen for this sector such that TE has gone from a five year average of 17.5%<sup>11</sup> to the most recent five year average of 21.0%. This can be seen in Table 5.

**Table 5 Moving Average Trade Share for Mineral Wool Manufacturing Sector**

NAICS Code	2002 - 2007	2003 - 2008	2004 - 2009	2005 - 2010	2006 - 2011
<u>327993</u>	16.3%	17.5%	18.7%	19.8%	21.0%

<sup>11</sup> This was the value reported in Appendix K to the 2010 Cap-and-Trade Regulation previously referenced in footnote 3.

This trend is further illustrated below in Table 6 for this sector when looking at the TE metric applied annually over the most recent decade for which data is available.

**Table 6 Annual Trade Share Trend for Mineral Wool Manufacturing Sector**

NAICS Code	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
<u>327993</u>	14.0%	14.9%	16.1%	16.9%	17.3%	18.0%	21.6%	23.2%	23.7%	24.0%

The trend in Table 5 clearly indicates a gradual change in trade share that moves this sector to a high TE categorization. The most recent TE, when combined per the strategy in Table 1 with the previously determined EI category of medium, results in a new leakage categorization for this sector of high. This can be seen below in Table 7.

**Table 7 New Leakage Risk Category for Mineral Wool Manufacturing Sector**

NAICS Code	Description	Emissions Intensity		Trade Exposure		Leakage Categorization
<u>327993</u>	Mineral Wool Manufacturing	1102	Medium	21.0%	High	High

Staff did not find any similar trend for other sectors for which public data was available that resulted in a similar shift of TE categorization.