Methods for Identifying Energy-Intensive Industries and Related Trades

Just Transition Working Group
Business Impacts Subgroup Staff Working Group

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EXECUTIVE SUMMARY

The purpose of this technical memorandum is to summarize the methods employed to "identify energy-intensive industries and related trades," as required by the Climate Leadership and Community Protection Act (CLCPA) §75-0103. These methods include calculating the energy intensity, emissions intensity and trade intensity for all U.S. Manufacturing and Mining industries, as well as identifying employment and occupational trends within these industries based on a combination of publicly available Federal and State data sources.

I. METHODS TO IDENTIFY ENERGY-INTENSIVE INDUSTRIES

Step 1: Research Existing Calculation Methods and Data Sources

The Business Impacts Subgroup Staff Working Group ("Staff") reviewed five jurisdictions' approaches and methodology to calculating energy intensity and related measures (California, Canada, European Union, United States and Australia). A clear focus was placed on the Californian[1] and United States' American Clean Energy and Security Act (ACES)[2] methodologies as being the most applicable for New York State. Based on the review of the EITE calculation methodologies, Staff identified the below methodology, which was based primarily on the ACES method with New York State-specific adjustments. Calculations were performed by Staff based in part on data compiled by The Cadmus Group LLC.

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[1] See: California Air Resources Board, Leakage Analysis: 2010 Regulation, Appendix K to the Initial Statement of Reasons.

[2] For additional details, see *The Effects of H.R. 2454 on International Competitiveness and Emission Leakage in Energy-Intensive Trade-Exposed Industries: An Interagency Report Responding to a Request from Senators Bayh, Specter, Stabenow, McCaskill, and Brown*, December 2, 2009.

Step 2: Calculate Energy Intensity and Identify NAICS Sectors to Evaluate

Staff used the Annual Survey of Manufacturers and the U.S. Economic Census reports, employing the most appropriate North American Industrial Classification System (NAICS) codes as unique identifiers, to calculate the energy intensity of Manufacturing and Mining sectors in the United States. Using the sum of dollars spent on electricity and fuel divided by the total value of shipments, for each of these sectors, Staff calculated the energy intensity of each industry as dollars spent over value produced.

Step 3: Calculate Direct Combustion Emissions

Using primarily the fuel consumption data found in the 2018 EIA Manufacturers Energy Consumption Survey (MECS) report, Staff calculated the emissions from direct combustion for each industry in Manufacturing and Mining at the six-digit NAICS code level. Where NAICS codes at the six-digit level were not available from the EIA MECS report, Staff followed the alternative methods employed under the ACES approach as outlined by the U.S. EPA.[3]

 Step 4: Calculate Indirect Electricity Emissions

Using primarily the electricity consumption data found in the EIA MECS report, Staff calculated the emissions from indirect electricity use for each Manufacturing and Mining industry. Where NAICS codes at the six-digit level were not available in this report, Staff followed the alternative methods employed under the ACES approach as outlined by the U.S. EPA.[4]

Step 5: Calculate Direct Emissions from Industrial Processes

Staff reviewed the EPA GHG Inventory Team's methodology for calculating emissions from direct industrial processes. Based on this review, Staff employed two methods for calculating direct emissions from industrial processes for each industry, using available data in the following order of priority:

- Method 1: Takes the total value of shipments to estimate production weight and applies process emission factors to the estimated weight. The process emission factors are dependent upon production weight, which is estimated at the 6-digit NAICs level by dividing the total expenditures by a 2018 price per unit.
- Method 2: Where Method 1 was insufficient, the total process emissions from the 2009 ACES report were divided by the then dollar value of shipments, and the same factor was applied to the 2018 dollar value of shipments.

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[3] U.S. Environmental Protection Agency Office of Air & Radiation. *Estimation of Eligible Sectors and Emissions under H.R. 2454*, February 23, 2010.
[4] *Ibid.*

Step 6: Calculate Emissions Intensity

Staff calculated emissions intensity for each industry by summing together all three emission estimates and multiplying it by the New York State Value of Carbon ($125), then dividing the product by the industry's Value of Shipments.

Step 7: Calculate Trade Intensity

Staff compiled data on international trade for each industry at the six-digit NAICS level. Trade intensity was calculated as the sum of imports and exports divided by the sum of value of shipments and imports for each industry.

Step 8: Addressing Data Gaps

After calculating each industry's energy intensity, emission intensity and trade exposure/intensity, Staff identified remaining data gaps where information was not available at the six-digit NAICS level. In such cases, Staff sought to estimate the most accurate intensity possible by, first, seeing if such data was available under an alternative data source[5], and/or, second, by identifying the highest digit NAICS code-level for which all data was available, and then subtracting out any known lower-digit levels to produce the most accurate estimate possible for each six-digit NAICS industry.

By way of example, if two 6-digit codes lacked adequate data for an intensity calculation at the U.S. Industry level, Staff would then review whether data existed at the 5-digit code level. If data was still suppressed or unavailable, Staff would calculate intensity at the 4-digit code level. In some cases, certain 6-digit code data was available, while other 6-digit codes under the same 4-digit code were unavailable; in these cases, Staff would begin with the 4-digit code totals and then subtract out the known 6-digit code totals, to produce a more accurate imputed estimate of the intensity of any missing 6-digit code(s).

II. METHODS TO IDENTIFY RELATED TRADES

In general, related trades were identified based on the simple compilation of data, with minor exceptions

Step 1: Identify the Total New York State Jobs, Establishments and Worker Wages

The number of total New York State jobs, establishments, and quarterly worker wages for each six-digit NAICS industry was estimated based on one of two methods, in order of priority, based on data availability:

- Method 1: Relies on the total number of jobs in New York State for each six-digit NAICS industry as per the Quarterly Census of Employment and Wages (QCEW), Q3, 2020, as per the New York State Department of Labor.

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[5] For example, where data for a manufacturing industry was unavailable under the Annual Survey of Manufacturers, Staff generally reviewed the Economic Census to determine if data existed at the six-digit level.

- Method 2: Where QCEW data was not able to be employed due to data confidentiality issues, for such industries, Staff relied on data from a third party provider, EMSI, and used the most recent data available at each six-digit NAICS industry, Q2, 2020.

To calculate Annualized Average Worker Wages, an industry's total wages for the quarter were annualized by multiplying them by four, and were then divided by the number of total New York State jobs for that industry.

Step 2: Identify the Top Occupations or Related Trades

Based on the aforementioned analyses, Staff identified the top New York State occupations across the following categories of U.S. industries:

- All Manufacturing industries;
- All Mining and Natural Resource Industries;
- Top 30 Energy Intensive Industries
- Top 30 Emissions-Intensive Industries
- Top 30 Trade-Intensive Industries

The source for identifying the occupational data was the New York State Department of Labor Occupational Employment Statistics (OES) survey, 2016-2019.

III. ASSUMPTIONS TO IDENTIFY ENERGY-INTENSIVE INDUSTRIES AND RELATED TRADES

A. Data Sources

- Value of Shipments, Electricity and Fuel Expenditures:
    - U.S. Annual Survey of Manufacturers (2018);
    - U.S. Economic Census: Mining (2017)
- Imports and Exports:
    - U.S. International Trade Commission (2018)
- Electricity and Fuel Consumption:
    - U.S. EIA Manufacturing Energy Consumption Survey (2018)
    - U.S. Annual Survey of Manufacturers (2018)
    - U.S. Economic Census (2017)
- Process Emissions:
    - **Emissions factors:**
        - IPCC Emissions Factors Database
        - U.S. EPA Office of Air & Radiation, *Estimation of Eligible Sectors and Emissions under H.R. 2454* (2010)
    - **Global Warming Potential source:**
        - Intergovernmental Panel on Climate Change (IPCC), Fifth Assessment (AR5) 20-year figures
    - **Pricing**
        - International Monetary Fund Commodity Pricing
        - United States Geological Survey
- Employment, Establishments and Worker Wages
    - New York State Department of Labor, Quarterly Census of Employment and Wages (QCEW), Q3 2020
    - EMSI Data Run 2021.1, QCEW Data 2020 Q2 (most recent)
- Occupations
    - New York State Department of Labor Occupational Employment Statistics (OES) survey, 2016-2019.

B. Intensity Measures

- **Energy intensity:** the ratio of an industry's *energy costs* relative to its *size*, or economic activity.

$$\frac{\$ \text{ Cost of Electricity} + \$ \text{ Cost of Fuel}}{\$ \text{ Value of Shipments, Sales or Revenue}} = \% \text{ Energy Intensity}$$

- **Emissions intensity**: the ratio of an industry's *emissions produced* relative to its *size*, or economic activity.

$$\frac{\text{Emissions (tCO2e) x } \$ \text{ Value of Carbon (\$125)}}{\$ \text{ Value of Shipments, Sales or Revenues}} = \% \text{ Emission Intensity}$$

- **Trade exposure:** the ratio of an industry's cross-border *trade activity* relative to its total market *size*.

$$\frac{\$ \text{ Imports} + \$ \text{ Exports}}{\$ \text{ Value of Shipments, Sales or Revenues} + \$ \text{ Imports}} = \% \text{ Trade Exposure}$$

C. Other Inputs:

- Value of Carbon:
  - NYS DEC Value of Carbon Guidance: $125 (2020)
- GHG Emission Factors
  - A combination of U.S.-level and NYS-specific factors were applied to estimate electricity, fuel combustion emissions and non-combustion process emissions across industries.

D. Key Limitations:

- Industry data was available at the U.S.-level only
- Industry data was available for Manufacturing, Mining sectors only
- Certain data was unavailable at 6-digit NAICS industry and has been estimated based on 4-digit or 5-digit NAICS-level.
- Trade data was available at the international trade-level only
- Electricity and fuel combustion GHG emissions were based on estimates of the amounts of electricity and fuel consumed.
- Process GHG emissions were estimated only for a subset of industries likely to have significant process emissions based on estimated production volumes.
- The NYS value of carbon was used to quantify GHG emissions intensity due to the lack of an applicable emission price.