

Argonne National Laboratory Study: The Impact of Potential Climate Change Commitments on Energy Intensive Industries, July 1997

Six energy intensive industries were studied to provide technical information to the US negotiators for the UN climate change negotiations. The six industries were paper, steel, oil refining, chemicals, aluminum and cement. These industries are of interest to labor because each has a large share of unionized workers and good pay and benefits.

In each industry, the effect of an energy cost rise resulting from a carbon tax was studied, that might be expected to result from implementation of a climate treaty. (The carbon permit trading system called for by the Kyoto Protocol is equivalent to a carbon tax.) The estimate of the energy price increase is in line with the estimates in the Data Resource Incorporated (DRI) "Case 2" and the Energy Information Agency's "1990 +9%" case.

The energy taxes are phased in during the years 2000 to 2010.

Steel

The energy cost of steel would be \$48 per ton without the energy tax and a much higher \$128 per ton with the tax. The energy price increases could exceed the profit margin on steel. During prosperous years the profit per ton is \$60 for integrated mills and \$40 from mills using the electric arc furnace.

According to the study: "The imposition of increased energy costs will devastate the US steel industry without a significant decrease in worldwide energy related emissions from steel making. Production will simply be shifted to developing countries and may possibly lead to higher levels of overall pollution due to lower standards in those countries."

Steel mills along the Chicago-Pittsburg corridor would experience the largest cost increase because they rely more heavily on coal, which would more than double in price with the assumed energy price tax.

Competition to the US steel industry comes primarily from Europe, Canada and Japan. The fuel price increases would affect these countries but not developing countries including Korea, Brazil, Mexico and China. American, Australian, and European producers are expected to invest in steel making capacity in developing countries. Capacity in these countries would grow over time and displace US production as energy prices rise.

Increased importation of steel slabs would occur first, because this is the most energy intensive product. As developing countries expand their manufacture of steel slabs, they will improve their ability to produce other steel products and compete in a larger segment of the market.

Technological change may reduce energy use by 10-15% per ton of steel produced, but this would not compensate for the cost advantage of countries not required to reduce

emissions. *Shipments from U.S. steel producers might be cut about 30% with an accompanying employment loss of approximately 100,000 jobs.*

Petroleum Refining

No Greenfield refineries have been constructed in the US in several years. Climate policies that increase costs will accelerate the trend to locate in non-participating countries and threaten existing refineries.

The cost of using oil, natural gas and electricity would increase dramatically as energy costs rise. American refineries and those in other OECD countries would be placed at a major cost disadvantage relative to their worldwide competitors. Refiners located in the US would be devastated because they would not be competitive with refineries located in developing countries.

Energy price increases would not have the same effect on all refineries. Older, marginally profitable refineries would be more vulnerable than refineries that have been refurbished with new investments. Refiners that produce specialized products would be less vulnerable. Midwest and Rocky Mountain refineries are relatively isolated from import competition and therefore less impacted than those on the east, gulf and the west coasts.

Demand reduction due to increased energy prices is would be likely to cause a loss of 20% of industry output. Shifting of refinery production out of the U.S. would probably not cut and could well raise net GHG emissions from the global petroleum supply industry. It would be disastrous in terms of U.S. energy security since the result would be a much greater reliance on foreign petroleum products.

Paper

Countries with no new climate obligations will have an advantage over the US. Even in the base case of no policy changes, the global market for paper and pulp is expanding rapidly outside of the US and in less developed countries. New mills located in the Southern Hemisphere typically have large scale and efficient facilities, low cost labor, and wood. Higher fuel prices would greatly damage the competitiveness of the US industry.

Plants in the paper industry vary greatly by region and even within region. Integrated mills currently have the advantage of being able to use self-generated fuels for a large share of their energy needs. Smaller, less integrated plants and those that use coal would be most affected by energy price increases. Numerous small mills would close.

Mill closure could constrain recycling markets. Recycling could also be deterred by the possibility that the value of wastepaper as a fuel could exceed its value as a source of fiber in a scenario of high fossil fuel prices.

Overall, the domestic paper and pulp industry would experience serious negative employment and output effects in response to the assumed increases in energy prices, as imports into the U.S. would displace domestic production. A large cost increase could

not be absorbed without a major technological breakthrough in energy efficiency, which is unlikely.

Aluminum

No Greenfield primary aluminum plants have been built in the US since 1980 and no new plants are expected to be constructed. Nine smelters have closed in the past 50 years with 22 smelters remaining. Currently, the U.S. imports about 31% of its aluminum and 44% comes from domestic primary production.

Primary aluminum production is highly energy intensive, with heavy use of electricity. Almost all of the smelters in the eastern US use electricity from coal-fired power plants. Smelters in the Northwest use hydro generated electricity. Employment in the industry is sensitive to any change in electricity price.

Future growth in the aluminum industry will take place in countries with low cost energy, especially hydropower. A climate treaty would give Canada a further cost advantage. Plants could also be built in the Middle East, where they would be oil-fired.

Implementation of the Kyoto Protocol could make all of the aluminum plants in the U.S. non-competitive by 2010 and ***all plants would be shut down by 2015. There are about 18,000 workers in primary aluminum.***

Chemicals

The chemical industry employs more than a million workers including 579,000 production workers and 95,000 scientists and engineers. With an increasing tendency to see competition on a global basis, most large companies have the flexibility to shift production between countries and place their investments anywhere in the world where economics dictate.

Without the climate treaty, the US industry will retain its domestic health, although they will have a declining share in the world market. With a climate treaty, growth in the high energy segments of the chemical industry will take place most rapidly in developing countries. Production in Saudi Arabia and other countries in the Middle East may grow rapidly because of the availability of low cost natural gas.

A policy action that affects the domestic chemical industry and not the developing countries would have a serious impact on production in the US. With energy price increases affecting only developed countries, production would be moved out of the US and other OECD countries. ***About 20-30% of the energy-intensive basic chemical industry would move to developing countries over 15 to 30 years as capital is replaced, with accompanying job losses that could be as high as 200,000*** compared to predicted future baseline levels.

The healthy trade surplus in chemicals would turn to a large trade deficit.

Cement

New investments in cement capacity have taken place in existing plants in recent decades. Although the number of plants has declined from 179 in 1974 to 118 in 1993, capacity has declined only by 10 percent. Cement demand depends largely on construction, which responds to the overall production in the US.

Imports greatly exceed exports of cement with most imports coming from Canada, Spain, Venezuela and Greece. About two-thirds of cement plants in the U.S. are foreign owned.

Employment in the cement industry in 1994 totaled 16,700 including 12,400 production workers.

The Kyoto Protocol could easily raise fuel costs by 150 percent raising the price of domestically produced cement by 20 percent. US exports would decline substantially and imports into the U.S. would increase at the expense of domestic output and employment. Imports would increase to 46% of the U.S. market by the year 2010 compared with 20 percent without the fuel price increases. ***Job losses of up to 5,800 would take place.***

No region of the country would be safe from job loss due to imports because almost all the large markets are accessible by water. Although cement is typically produced and consumed within a small radius, it can be transported by water world-wide at relatively low cost.