Energy Trends in Selected Manufacturing Sectors:

Opportunities and Challenges for Environmentally Preferable Energy Outcomes








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3. Sector Energy Scenarios

Insights

Each of the 12 sectors addressed in this analysis has implemented various energy efficiency and clean energy improvements that are reflected in their "base case" assessments. Many have committed to further energy intensity reductions through one or more public-private partnerships, including Climate VISION. There are continued energy efficiency and clean energy opportunities for each sector, both through existing technologies and in the development of new technologies and processes.

Chapter 3. Sector Energy Scenarios

Drawing on current energy consumption data and industry trends, as well as future energy consumption projections made in two reports produced by the U.S. Department of Energy (DOE), *Scenarios for a Clean Energy Future* (CEF) and EIA's 2006 *Annual Energy Outlook* (AEO 2006), Chapter 3 develops "base case" and "best case" energy scenarios for the 12 sectors addressed in this analysis.

Each sector summary is composed of the following elements:

- ***Base Case Scenario:***
  - *Situation Assessment*: Discusses high-level trends affecting sector energy use, including economic production, geographic distribution, investments in energy efficiency and/or clean fuels, and voluntary commitments to energy efficiency and/or greenhouse gas (GHG) reduction.
  - *Expected Future Trends*: Assesses business-as-usual energy consumption trends in terms of fuel use and energy intensity through 2020. For the eight sectors modeled in DOE's National Energy Modeling System (NEMS)—aluminum, cement, chemicals, food, forest products, iron and steel, metal finishing,[hhh] and petroleum refining—the trends assessment includes

CEF Projections

We have included CEF reference case and advanced energy projections for sector energy consumption to facilitate the assessment of possible fuel-switching trends under business-as-usual and environmentally preferable energy scenarios. However, in several cases CEF energy consumption data differ significantly from 2002 Manufacturing Energy Consumption Survey (MECS) data presented in Chapter 2 and from information industry representatives have provided regarding current energy consumption. Such differences may be due to a number of factors, most importantly the age of the CEF study (published in 2000 and using energy consumption data from 1998) and differences in how sectors are defined. (To the extent possible, we have noted how CEF sector definitions differ from EPA/North American Industrial Classification Code (NAICS) definitions in footnotes.) Thus, we place greater emphasis on relative energy consumption and fuel mix changes under the CEF scenarios, rather than absolute energy consumption values. In addition, we include AEO 2006 projections in the base case scenarios to identify areas where recent energy trends may be likely to produce substantially different future outcomes than those projected by CEF in 2000.

[hhh] Projections are for the larger NAICS category, fabricated metal products (NAICS 332).

reference case (i.e., "business-as-usual") energy consumption projections made in the CEF report and AEO 2006.

- *Environmental Implications*: Discusses National Emissions Inventory (NEI) data on current energy-related criteria air pollutant (CAP) emissions and carbon dioxide emissions projections from AEO 2006. Reviews how expected future energy trends are likely to affect energy-related emissions.

- ***Best Case Scenario:***
  - *Opportunities*: Evaluates the viability of each of the five energy efficiency and clean energy opportunities discussed in Section 2.2.6: cleaner fuels, increased combined heat and power (CHP), equipment retrofit/replacement, process improvement, and research and development (R&D). For each sector, the viability of each opportunity is rated "low," "medium," or "high" based on conclusions drawn from the reference material reviewed in connection with this analysis. It is important to note that such rankings are a qualitative (and necessarily subjective) assessment of the viability of each opportunity based on research conducted, rather than a quantitative assessment of energy-savings potential. Where applicable, regulatory and other barriers to implementing the opportunities are discussed.
  - *Optimal Future Trends*: Assesses likely changes from the base case scenario that would occur under an environmentally preferable energy scenario (i.e., increased energy efficiency and/or cleaner fuels) in terms of fuel mix, energy intensity, and energy consumption changes that effect energy-related criteria air pollutants and carbon emissions. For the eight sectors modeled in NEMS, this section also summarizes CEF advanced case projections.
  - *Environmental Implications*: Discusses how the environmentally preferable energy scenario differs from the business-as-usual scenario in terms of CAP and GHG (carbon dioxide) emissions.

Why Compare the CEF Reference Case and Advanced Case Projections?

The industrial manufacturing chapter of the CEF study provides sector-level energy consumption projections under both a business-as-usual reference case and an advanced energy case, which captures the impact of a wide range of policies to promote environmentally preferable energy outcomes.

For the purposes of this analysis, absolute changes in energy consumption (as projected by CEF) are less important than relative differences between the two scenarios.

Reporting the CEF projections in Chapter 3 allows us to envision how a "best case" energy scenario might look at the sector level, and how it compares with a "base case" energy scenario.

- ***Other Reference Materials Consulted:***
  - Lists additional data sources and reference materials used in this analysis.

Appendix A provides an overview of the energy consumption projections used in this analysis (CEF and AEO 2006), methodologies and assumptions, and a brief overview of similarities and differences between the two projections. On the whole, because it employs more recent energy consumption and economic data, AEO 2006 produces a more realistic projection for the business-as-usual scenario. However, we include the CEF projections for two primary reasons: (1) AEO 2006 does not provide sufficient sector-level detail for its "high technology" case to allow development of an advanced energy scenario that could be compared with the reference case; and (2) CEF projections are a closer approximation of a "best case" scenario because they produce a slower rate of increase in industrial energy consumption and a faster decrease in industrial energy intensity than the AEO 2006 high technology case.

The CEF advanced case projections are based on six policy elements that promote more aggressive energy efficiency and clean energy improvement through: (1) expanded voluntary federal programs such as the CHP Challenge and ENERGY STAR; (2) expanded federal informational programs such as energy assessments and equipment labeling; (3) expanded investment-enabling programs such as state grant programs, utility incentive programs, and tax rebates and credits; (4) mandatory efficiency standards for motors; (5) expanded federal demonstration and R&D programs; and (6) a domestic carbon emissions trading program. Arguably even more aggressive policies could be envisioned under a “best case” energy scenario. However, we have not found other analyses that provide detailed sector-level energy consumption projections under comparable business-as-usual and environmentally preferable energy scenarios for the industries featured in this analysis.