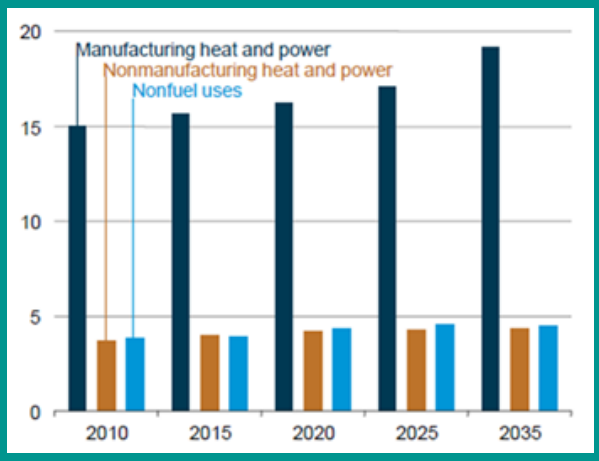
Advancing Energy Productivity in Manufacturing

The paper was prepared by the Industrial Work Group of the Commission to discuss energy productivity trends, projections, opportunities, and barriers in the American manufacturing sector. This paper aims to inform ACNEEP in its consideration of energy productivity policy options.

Introduction

Manufacturing is vital to American economic well-being, accounting for over 11% of GDP, 60% of exports, and directly employing nearly 12 million with above average wages and benefits. The sector consumes 26 quadrillion Btu or about 27% of national energy use. Department of Energy scenarios project roughly a one-third improvement in energy productivity for manufacturing by 2035, but more is possible. Enhancing energy productivity is well aligned with improving American industrial productivity and competitiveness. A look at energy productivity opportunities and barriers can help illuminate paths toward an energy-efficient, environmentally sound, and economically prosperous future for American manufacturing.

Industrial *delivered* energy consumption by application, 2010-2035 (quadrillion Btu)



Source: AEO 2012, fig 82, p. 81.

Investment

Uncertainties and risks, capital constraints, corporate strategy and public policy affect decisions to invest in energy productivity as they do other investment decisions. While specific energy productivity investments can yield good returns, in many cases energy productivity gains can be a co-benefit of investments undertaken for other purposes. Energy productivity can grow as part of a broader modernization of manufacturing, allowing simultaneous improvements in productivity and competitiveness, product quality, and energy and environmental performance. For example, the growth of scrap-using electric arc furnace mini-mills plus new direct-reduction iron making processes in integrated mills has raised the energy productivity and competitiveness of U.S. iron and steel. Promising opportunities exist across the manufacturing sector.

Technology

Energy productivity improvements stem from shop-floor tweaks as well as research and development (R&D). Both new technology and the spread of existing best practices offer large scope for enhancing competitiveness and energy productivity. Opportunities exist for widely applicable technologies (such as boilers and automated controls) as well as for processes specific to individual industries. Material efficiency and recycling is integral to energy productivity. Energy productivity should be viewed holistically since the production of a more energy-intensive product or material can sometimes yield greater savings on a life-cycle basis as compared to a previous or alternative product or material.

Human Behavior

This report addresses three major behavioral factors that affect decisions to apply energy productivity improvements in industry. These include motivation and management (the role of organizational structures and incentives); knowledge, skills, and training; and perceptions of risks and benefits (including a role for technical assistance to raise confidence in promising practices and technologies).

Governance

Policies, management systems, industry standards and professional norms play important roles. Government can encourage investment and management decisions that enhance energy productivity through, for example, tax provisions, direct and indirect support of R&D, technology demonstration and validation, technical assistance, well-crafted regulations and promoting energy management systems.

Opportunities

Energy efficiency is often the cheapest energy resource and should receive more attention. It can be a co-benefit of productivity and product quality investments. The scope for expanding the use of current best practice is large and the potential for new manufacturing technology is even greater. It is technologically and economically feasible to usefully recover and recycle large amounts of otherwise wasted energy and materials. Energy management systems, R&D, technical assistance, well-crafted regulation and utility-industry partnerships offer promise. The AEO 2012 reference case projects a **49-percent increase in industrial shipments** between 2010 and 2035, but only a **15 percent increase in energy consumption** but greater productivity is possible.

Barriers

The opportunities, however, are met by barriers. Very high rate-of-return demands impede investment as can the first cost of new technology. Companies don't always motivate employees to seek and implement energy saving ideas. Tax and depreciation rules can discourage capital modernization. U.S. industrial energy R&D and technical assistance support are modest. Regulations, including those governing utilities, provide varied, uneven incentives for energy productivity investment.

Conclusion

The potential for improving American manufacturing energy productivity is very large. Needed investments would also enhance competitiveness and national economic well-being. They can improve environmental performance too. However, the hurdles are significant. Both public policy and private sector decisions can help the nation reach its energy productivity and manufacturing competitiveness potential.