

Highlights

Double Economic Output

The industrial sector halved energy intensity from 1977 to 2018, while more than doubling economic output.

Combined Heat and Power Potential

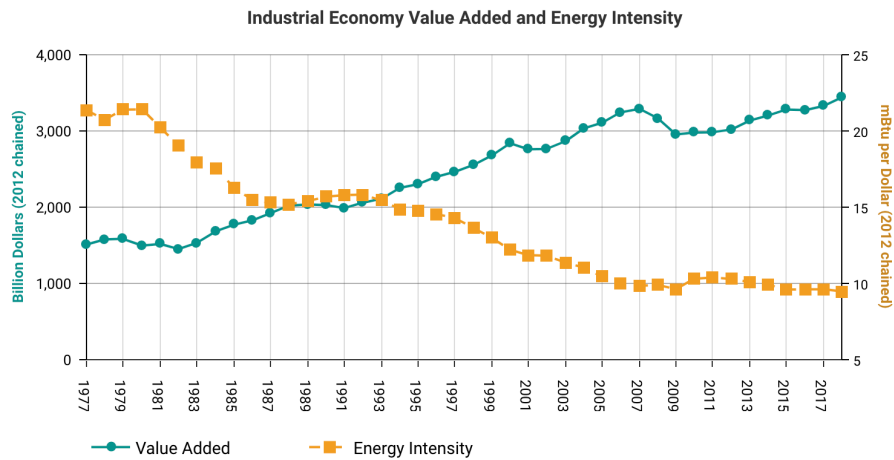
Although combined heat and power (CHP) can typically increase the efficiency of a traditional power plant and boiler system by 50%, the technical potential for deployment of CHP is far greater. For example, the CHP potential is 75% greater than existing capacity in the chemicals industry

Industrial Energy Programs

Programs such as Better Plants and ENERGY STAR® for industry have led to higher levels of facility certification and nearly 5 quads of primary energy savings.

38 Industrial Energy Intensity

Industrial energy intensity has halved since 1970, while driving economic gains



Source: ACEEE, based on EIA data

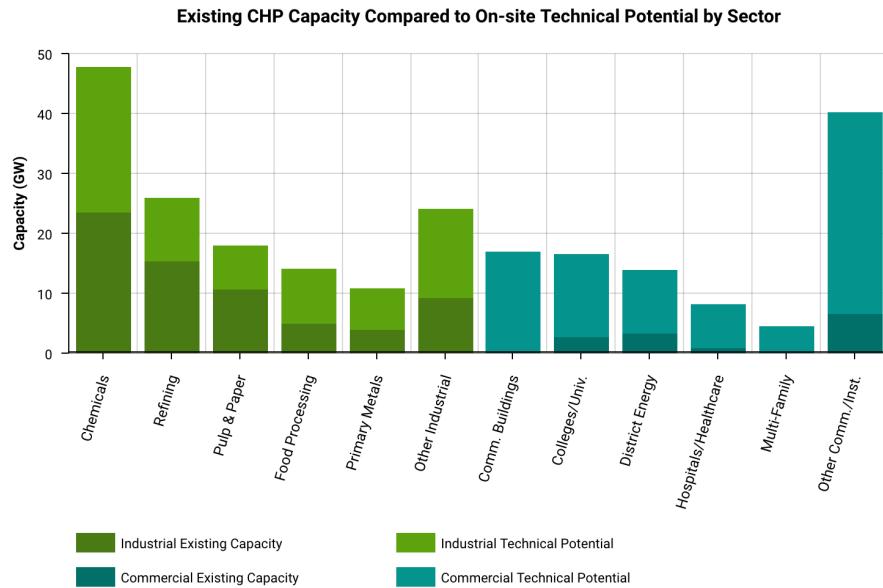
The U.S. industrial sector consumes more total energy than any other end-use sector, and is responsible for 22% of total U.S. greenhouse gas emissions.¹ It was also responsible for slightly more than 17% of the U.S. gross domestic product in 2018. As a result, this sector is a natural space to invest in energy efficiency; from 1977 to 2018, the industry halved energy intensity, while more than doubling value added. Energy efficiency contributed to this trend, with the

1 EPA (2019), [Sources of Greenhouse Gas Emissions](#)

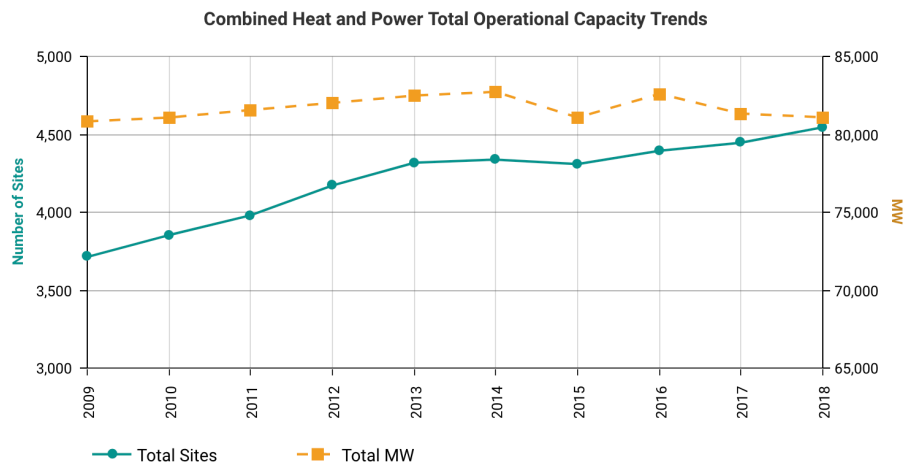
deployment of strategies for the better utilization of assets, greater deployments of combined heat and power, smart manufacturing and strategic energy management, and other strategies.²

39 Combined Heat And Power

The industrial sector has largely driven CHP investments, a tool to enhance energy efficiency; Commercial installations have significant potential



Source: DOE (2019), [CHP Installation Database](#); DOE (2016), [Combined Heat and Power Technical Potential in the United States](#)



Source: DOE/ICF, via BloombergNEF (2018), [CHP Installation Database](#)

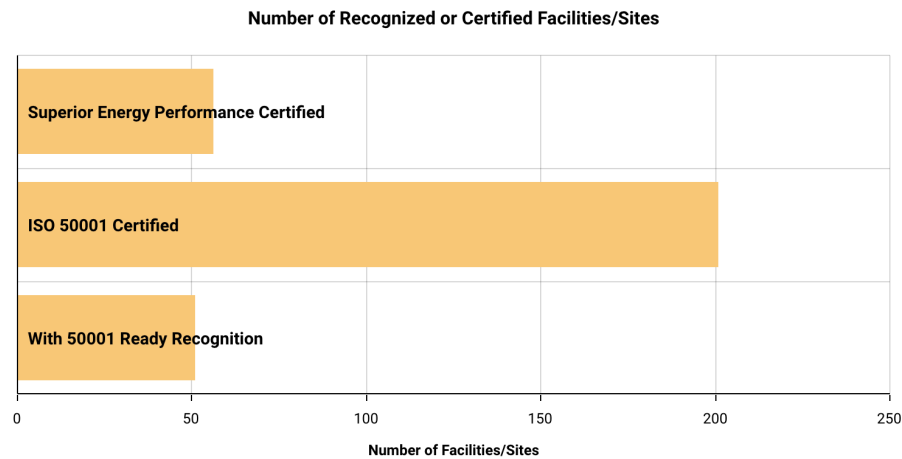
[Combined heat and power \(CHP\) technologies](#) are accompanied by significant efficiency gains: where a traditional system may reach 50% energy efficiency, CHP can often reach 75% efficiency. Most CHP installations are used for industrial applications, such as chemicals, refining, paper, primary metals, food processing, and other industrial processes, and natural gas

2 ACEEE (2017), [Energy efficiency and industry: the national trend](#)

is the most common CHP fuel, accounting for approximately 70% of U.S. CHP capacity in 2019.³ ⁴ However, a wide variety of other commercial institutions are estimated to have significant untapped technical potential, collectively adding up to over 30 GW of potential capacity.⁵ The total electrical capacity of CHP generation has remained largely constant from 2009 to 2018, though the number of sites has increased by approximately 22% over the same time period, largely driven by minor decreases in larger industrial installations, and increases in smaller commercial installations.

40 Strategic Energy Management

Facilities that have been certified to ISO 50001 demonstrate improved energy performance



Sources: DOE (2019), [Recognized Facilities](#); ISO (2018), [Survey of certifications to management system standards](#)

[ISO 50001](#) is an internationally-recognized voluntary standard to support continuously-improving energy performance. DOE's [50001 Ready](#) is a simpler, self-guided energy management program. Facilities that have been certified to ISO 50001 and can demonstrate improved energy performance are eligible to be certified to DOE's Superior Energy Performance (SEP) program. SEP-certified facilities have improved energy performance 4.6% annually, on average, through mostly (75%) no/low cost operational improvements.⁶ While the early adopters of ISO 50001 are realizing significant savings, there is enormous market potential for ISO 50001 to grow. Internationally, it is estimated that full ISO 50001 implementation could drive a cumulative energy savings of 59 quads, over \$600 billion in energy costs, and avoid 6,500 Mt of carbon dioxide emissions to 2030.⁷

³ DOE (2019), [Combined Heat and Power Basics](#)

⁴ EPA (2019), [What Is CHP?](#)

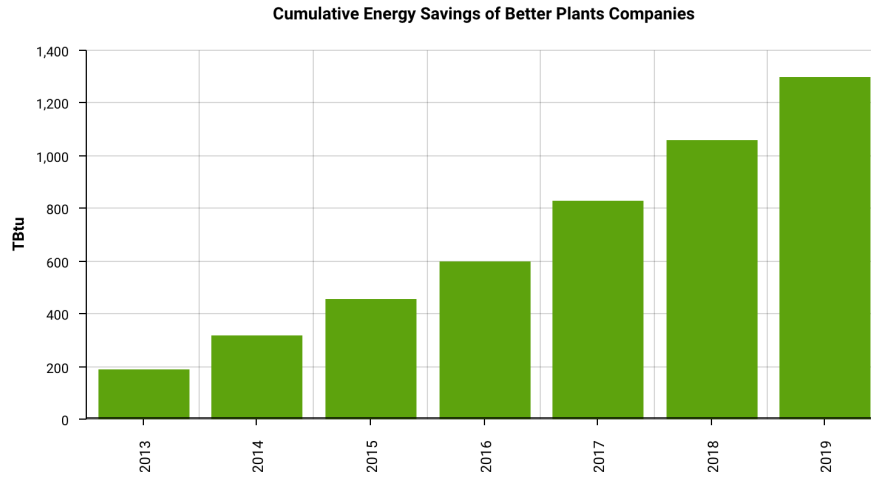
⁵ The "Other Industrial" includes an aggregate of smaller-capacity categories of industrial facilities, including Agriculture, Mining, Oil/Gas Extraction and all other facilities listed in Table III-3 of DOE's 2016 report titled "Combined Heat and Power Technical Potential in the United States." The "Other Comm./Inst." bar shown above includes an aggregate of smaller-capacity categories of commercial facilities, including Utilities, Unknown and all other facilities (aside from Comm. Buildings, Colleges/Univ., District Energy, Hospitals/Healthcare, and Multi-Family which are separately shown in the chart) listed in Table III-4 of the DOE 2016 report.

⁶ Paul Scheihing (2019), Presentation: Accelerating Energy Savings with ISO 50001

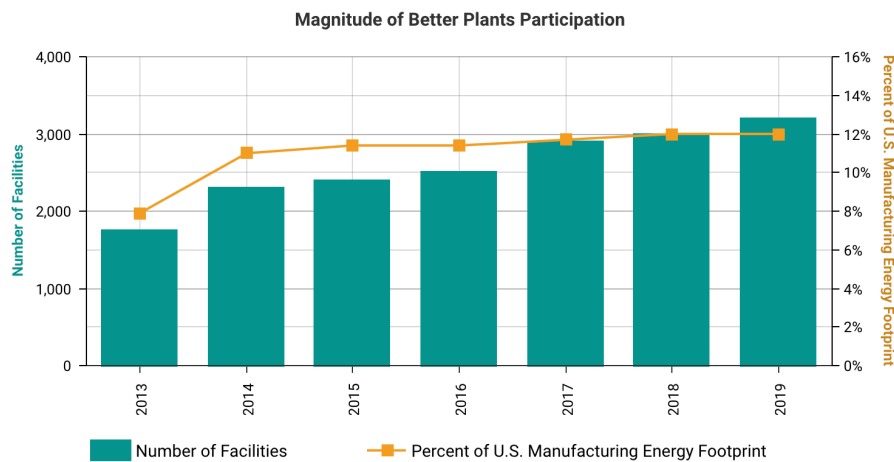
⁷ LBNL (2016), [Global Impact Estimation of ISO 50001 Energy Management System for Industrial and Service Sectors](#)

41 Better Plants

Better Plants participants make up 12% of the U.S. manufacturing footprint and have cumulatively saved 1.3 quads since 2011



Source: DOE (2013–2019), [Better Plants Program Information](#)



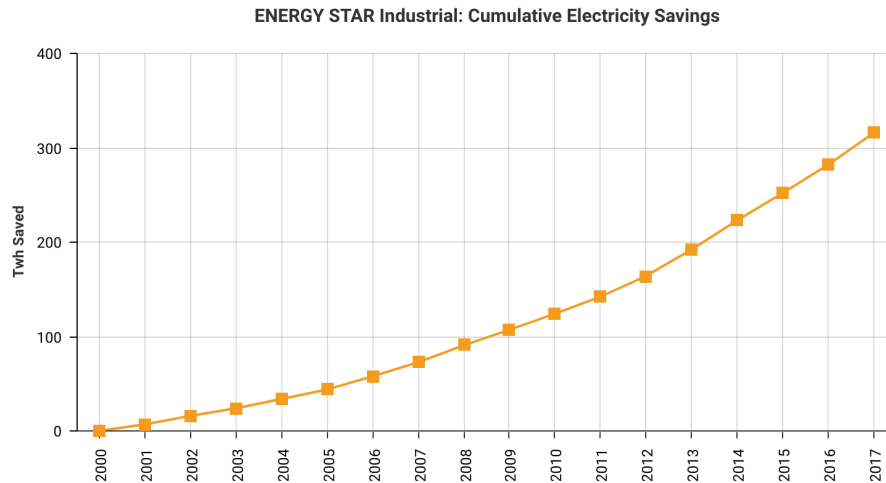
Source: DOE (2013–2019), [Better Plants Program Information](#)

The [Better Plants Program](#)'s 220+ partners make up 12% of the U.S. manufacturing energy footprint, span a [diverse set of subsectors](#), and have already saved a cumulative 1.3 quads since the program's inception.⁸ However, while Better Plants participants have increased in number from 2015 to 2019, participants constitute a largely flat 12% of the U.S. manufacturing energy footprint.

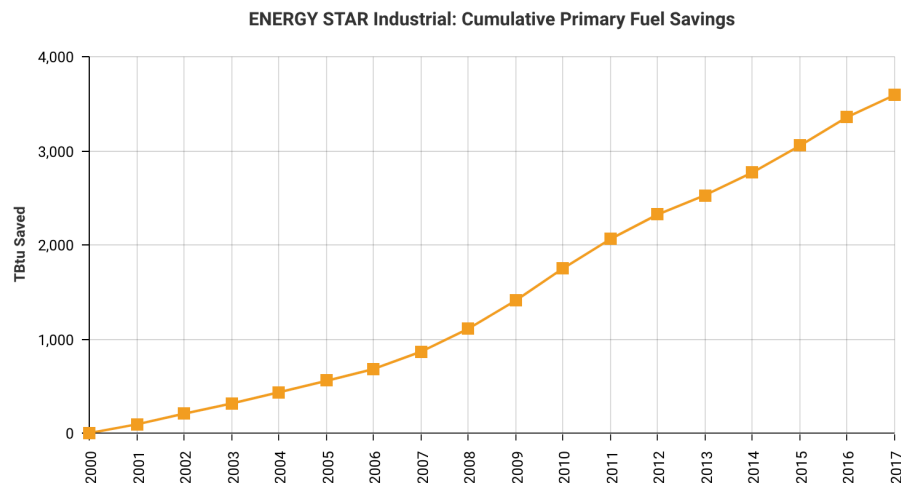
8 DOE (2019), [Better Plant Program Information](#)

42 ENERGY STAR® in Industry

The ENERGY STAR® program for industrial plants saved \$3 billion in energy costs in 2017



Source: EPA (2019)



Source: EPA (2019)

In 2017 alone, the ENERGY STAR® program for industrial plants helped businesses save 34 billion kilowatt-hours of electricity, avoid \$3 billion in energy costs, and achieve 40 million metric tons of greenhouse gas reductions, by partnering with hundreds of companies to deploy ENERGY STAR® strategic energy management (SEM) resources to develop an organizational culture on continuous improvement of energy performance. EPA has convened 31 “[Industrial Sector Focuses](#)” to collaborate and develop industry-specific resources.⁹ Since 2000, associated cumulative savings were 316 TWh of electricity and more than 3.5 quads of primary fuel savings in 2017.