



**Global
Efficiency
Intelligence**

Report Sample

**Energy-Efficiency and GHG Emissions Reduction
Potential in Industrial Fan Systems in Iowa, Kansas,
Missouri, Nebraska, and South Dakota**

[Download the full report from this link](#)

Research Director: Ali Hasanbeigi

October 2017

©2017 Global Efficiency Intelligence, LLC.

Mailing Address: P.O. Box 170674, San Francisco, CA 94117 USA

Tel. +1-415-697 9016

E-mail: info@globalefficiencyintel.com

Website: www.globalefficiencyintel.com

LinkedIn: www.linkedin.com/company/global-efficiency-intelligence

Facebook: @ GlobalEfficiencyIntel

About Global Efficiency Intelligence, LLC

Global Efficiency Intelligence, LLC is an energy and environmental consulting and market research firm located in San Francisco, CA. We provide global market-based solutions and in-depth technology, systems, industry, business, and policy analyses. We work with experts in government, industry, non-profits, utilities, academia, and other entities worldwide to conduct our analyses and develop impactful and practical solutions. We use systems thinking, integrative modeling, and data analytics to turn data into actionable information and to provide scientific-engineering solutions. We offer Modeling and Analysis, Policy Design and Evaluation, Technology and Industry Roadmapping, Market Research, and Training and Capacity Building services in the following areas: Energy Efficiency; GHG Emissions Reduction; Water-Energy-Climate Nexus; Manufacturing Resources Efficiency; Demand Response; Smart Manufacturing & Industrial IOT; Emerging Technologies; Deep Electrification and Decarbonization; Supply Chain Energy and Carbon Footprint.

U.S. and Global Industrial Motor Systems Efficiency Initiative

Global Efficiency Intelligence, LLC has been working on a global initiative to study industrial motor systems efficiency in more than 50 countries from all continents worldwide and 30 individual U.S. states. We work with public and private stakeholders, focusing on industrial pumps, fans, and compressed-air systems, which together account for more than 70% of electricity used in industrial motor systems. We conduct country-level analyses, including energy use by motor system type and system size and by manufacturing subsector (e.g., chemical, food, textile, steel, machinery, pulp and paper, etc.) and energy-saving potentials and cost by technology and system size for each country/state. We analyze barriers to and drivers of energy efficiency and system optimization in industrial motor systems in each country/state, including policy making and market implications.

To find more, please visit our website at www.globalefficiencyintel.com

Introduction

Industrial electric motors account for over 70% of electricity consumption in manufacturing in the U.S. Motors are used to drive pumps, fans, compressed air systems, material handling, processing systems and more. Industrial motor systems represent a largely untapped cost-effective source for energy savings that could be realized with existing commercialized technologies. Fan systems are widely used throughout manufacturing industries. In many industrial facilities, fans are among the highest electricity consuming equipment. Inefficiencies in fan systems are common.

One of the major barriers to effective policy making and increased action by states and utilities to improve energy efficiency in industrial fan systems is the lack of information and data on the magnitude and cost-effectiveness of the energy savings potential in industrial fan systems in each state. This lack of information creates an obstacle to developing a comprehensive and effective strategy, roadmap, and programs for improving fan systems efficiency cost-effectively. It is far easier to quantify the incremental energy savings of substituting an energy-efficient motor for a standard motor than it is to quantify the energy savings of applying other energy efficiency and system optimization practices to an existing fan system.

Global Efficiency Intelligence, LLC. conducted a large initiative to study industrial motor systems in 30 states from different U.S. regions. This includes the top 20 U.S. states in terms of industrial energy consumption. We focused on industrial pumps, fans, and compressed-air systems which together account for over 70% of electricity use in U.S. industrial motor systems.

This report by Global Efficiency Intelligence, LLC. focuses on analyzing energy use, energy efficiency, and CO₂ emissions-reduction potential in industrial fan systems in selected West North Central U.S. states of Iowa, Kansas, Missouri, Nebraska, and South Dakota. We have also published similar reports for industrial pump systems and compressed air systems for these West North Central states.

Now that states have different programs to set targets, including passing legislation to enact formal energy efficiency resource standards, setting long-term energy savings targets through utility commissions tailored to each utility, or incorporating energy efficiency as an eligible resource in renewable portfolio standards (RPS), investment in energy efficiency in industrial fan systems to tap into the huge saving potentials quantified in this report can help utilities to meet their targets.

Key analyses and results included:

- Electricity use by manufacturing subsector (NAICS code 31-33) in each state studied
- Electricity use for motor systems and fan systems by manufacturing subsector (NAICS code 31-33) in each state studied
- Electricity use by industrial fan system by size in each state studied
- Market barriers to energy efficiency in industrial motor and fan systems
- Energy Efficiency Cost Curves for industrial fan systems for each state using ten major energy efficiency measures
- Energy saving potential and cost of conserved energy (US\$/MWh-saved) for each efficiency measures in each state studied
- The cost-effective and total technical energy efficiency potential in industrial fan systems in each state studied
- Energy saving potential for each energy efficiency measure by system size
- GHG emissions reduction potential for each efficiency measure in each state
- Sensitivity of the results with respect to changes in electricity prices and discount rates
- Implications for markets, utilities, and policy makers

Who should read this report?

- Utilities
- Government energy and environmental agencies
- State regulators and policy makers
- Energy Service Companies (ESCOs)
- Demand Response (DR) service and technology providers
- Energy management service and technology providers
- Motor, fan, and fan systems service and technology providers
- Energy efficiency equipment vendors
- Climate and environmental NGOs and think tanks
- Investor community

Table of Contents

Executive Summary

1. Introduction
2. Market Barriers to Energy Efficiency in Motor and Fan Systems
3. Energy Use in Industrial Motor and Fan Systems in each State, by Manufacturing Subsector
 - 3.1. Industrial Electricity Use in each State by Manufacturing Subsector
 - 3.2. Industrial Motor Systems Electricity Use in each State by Manufacturing Subsectors
 - 3.3. Electricity Use in Industrial Fan Systems in each State by Manufacturing Subsectors
 - 3.4. Electricity Use in Industrial Fan Systems in each State by System Size
4. Energy Efficiency Potential and Cost in Industrial Fan Systems in each State
 - 4.1. Energy-Efficiency Cost Curve for Industrial Fan Systems in Iowa
 - 4.2. Energy-Efficiency Cost Curve for Industrial Fan Systems in Kansas
 - 4.3. Energy-Efficiency Cost Curve for Industrial Fan Systems in Missouri
 - 4.4. Energy-Efficiency Cost Curve for Industrial Fan Systems in Nebraska
 - 4.5. Energy-Efficiency Cost Curve for Industrial Fan Systems in South Dakota
 - 4.6. Sensitivity Analyses
5. Summary and Implications for Markets, Utilities, and Policy Makers
 - 5.1. Summary
 - 5.2. Implications for Markets, Utilities, and Policy Makers

Appendices

- Appendix 1. List of acronyms
- Appendix 2. List of Figures and Tables
- Appendix 3. Methodology and Scope of the Study
- Appendix 4. Bibliography and References
- Appendix 5. Related Reports from Global Efficiency Intelligence, LLC.

List of Figure

Figure 1. Global total final electricity use by end use in 2014

Figure 2. Electric motor systems energy use profile

Figure 3. Final electricity consumption in motor-driven systems in the IEA's New Policies and 450 Scenarios

Figure 4. Illustration of two industrial electric motor-driven systems: (a) normal and (b) efficient

Figure 5. A typical fan system

Figure 6. Industrial electricity use by manufacturing subsector (NAICS code 31-33) in Iowa in 2015

Figure 7. Industrial electricity use by manufacturing subsector (NAICS code 31-33) in Kansas in 2015

Figure 8. Industrial electricity use by manufacturing subsectors (NAICS code 31-33) in Missouri in 2015

Figure 9. Industrial electricity use by manufacturing subsector (NAICS code 31-33) in Nebraska in 2015

Figure 10. Industrial electricity use by manufacturing subsector (NAICS 31-33) in South Dakota in 2015

Figure 11. Share of motor systems from total electricity use in manufacturing in Iowa, Kansas, Missouri, Nebraska, and South Dakota in 2015

Figure 12. Estimated industrial fan systems electricity use by manufacturing subsectors (NAICS code 31-33) In Iowa in 2015

Figure 13. Estimated industrial fan systems electricity use by manufacturing subsectors (NAICS code 31-33) In Kansas in 2015

Figure 14. Estimated industrial fan systems electricity use by manufacturing subsectors (NAICS code 31-33) In Missouri in 2015

Figure 15. Estimated industrial fan systems electricity use by manufacturing subsectors (NAICS code 31-33) In Nebraska in 2015

Figure 16. Estimated industrial fan systems electricity use by manufacturing subsectors (NAICS code 31-33) In South Dakota in 2015

Figure 17. Estimated industrial fan systems electricity use by system size in Iowa in 2015

Figure 18. Estimated industrial fan systems electricity use by system size in Kansas in 2015

Figure 19. Estimated industrial fan systems electricity use by system size in Missouri in 2015

Figure 20. Estimated industrial fan systems electricity use by system size in Nebraska in 2015

Figure 21. Estimated industrial fan systems electricity use by system size in South Dakota in 2015

Figure 22. Energy Efficiency Cost Curve for industrial fan systems in Iowa

Figure 23. Comparison of energy saving potential (GWh/yr) for each efficiency measure in Iowa when each measure is implemented in isolation or is implemented along with other measures

Figure 24. Energy Efficiency Cost Curve for industrial fan systems in Kansas

Figure 25. Comparison of energy saving potential (GWh/yr) for each efficiency measure in Kansas when each measure is implemented in isolation or is implemented along with other measures

Figure 26. Energy Efficiency Cost Curve for industrial fan systems in Missouri

Figure 27. Comparison of energy saving potential (GWh/yr) for each efficiency measure in Missouri when each measure is implemented in isolation or is implemented along with other measures

Figure 28. Energy Efficiency Cost Curve for industrial fan systems in Nebraska

Figure 29. Comparison of energy saving potential (GWh/yr) for each efficiency measure in Nebraska when each measure is implemented in isolation or is implemented along with other measures

Figure 30. Energy Efficiency Cost Curve for industrial fan systems in South Dakota

Figure 31. Comparison of energy saving potential (GWh/yr) for each efficiency measure in South Dakota when each measure is implemented in isolation or is implemented along with other measures

List of Tables

Table 1. Industrial fan system electricity-savings potential in five West North Central U.S. states in 2015

Table 2. Share of motor systems and fan systems electricity use in each U.S. manufacturing subsector

Table 3. Industrial motor systems electricity use by manufacturing subsectors (NAICS code 31-33) for each state studied in 2015

Table 4. Share of fan systems from total electricity use in manufacturing and from industrial motor systems electricity use in each state in 2015

Table 5. Cumulative annual electricity saving and CO₂ emission reduction potential for efficiency measures in industrial fan systems in Iowa ranked by final CCE

Table 6. Total annual cost-effective and technical energy saving and CO₂ emissions reduction potential in industrial fan systems in Iowa

Table 7. Cumulative annual electricity saving potential for efficiency measures in industrial fan systems in Iowa by system size (GWh/yr)

Table 8. Cumulative annual electricity saving and CO₂ emission reduction potential for efficiency measures in industrial fan systems in Kansas ranked by final CCE

Table 9. Total annual cost-effective and technical energy saving and CO₂ emissions reduction potential in industrial fan systems in Kansas

Table 10. Cumulative annual electricity saving potential for efficiency measures in industrial fan systems in Kansas by system size (GWh/yr)

Table 11. Cumulative annual electricity saving and CO₂ emission reduction potential for efficiency measures in industrial fan systems in Missouri ranked by their final CCE

Table 12. Total annual cost-effective and technical energy saving and CO₂ emissions reduction potential in industrial fan systems in Missouri

Table 13. Cumulative annual electricity saving potential for efficiency measures in industrial fan systems in Missouri by system size (GWh/yr)

Table 14. Cumulative annual electricity saving and CO₂ emission reduction potential for efficiency measures in industrial fan systems in Nebraska ranked by their final CCE

Table 15. Total annual cost-effective and technical energy saving and CO₂ emissions reduction potential in industrial fan systems in Nebraska

Table 16. Cumulative annual electricity saving potential for efficiency measures in industrial fan systems in Nebraska by system size (GWh/yr)

Table 17. Cumulative annual electricity saving and CO₂ emission reduction potential for efficiency measures in industrial fan systems in South Dakota ranked by their final CCE

Table 18. Total annual cost-effective and technical energy saving and CO₂ emissions reduction potential in industrial fan systems in South Dakota

Table 19. Cumulative annual electricity saving potential for efficiency measures in industrial fan systems in South Dakota by system size (GWh/yr)

Table 20. Sensitivity analyses for the cost-effective electricity saving potentials in the industrial fan systems with different discount rates

Table 21. Sensitivity analyses for the cost-effective electricity saving potentials in the industrial fan system with different electricity price

Table 22. Total annual technical energy saving and CO₂ emissions reduction potential in industrial fan systems in the studied states

Table 23. Policies driving customer-funded energy-efficiency programs

Related Reports from Global Efficiency Intelligence, LLC.

- Energy-Efficiency Potential in Industrial **Fan** systems in the U.S. States listed below (separate report for each region)
- Energy-Efficiency Potential in Industrial **Pump** Systems in the U.S. States listed below (separate report for each region)
- Energy-Efficiency Potential in Industrial **Compressed Air** Systems in the U.S. States listed below (separate report for each region)

No.	Regions/ States	No.	Regions/ States
	Northeast Region		South Atlantic Region
1	Massachusetts	20	Florida
2	New Hampshire	21	Georgia
3	New Jersey	22	North Carolina
4	New York	23	South Carolina
	East North Central Region		Virginia
5	Illinois		East South Central Region
6	Indiana	24	Alabama
7	Michigan	25	Kentucky
8	Ohio	26	Tennessee
9	Wisconsin		West South Central Region
	West North Central Region	27	Arkansas
10	Iowa	28	Louisiana
11	Kansas	29	Oklahoma
12	Missouri	30	Texas
13	Nebraska		
14	South Dakota		
15	West Region		
16	Arizona		
17	California		
18	Montana		
19	Washington		

[Download the full report from this link](#)