COMMON SENSE INSTITUTE

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IOWA ENERGY COMPETITIVENESS INDEX

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ABOUT THE AUTHORS

Steven L. Byers, Ph.D. is the Common Sense Institute Chief Economist. Steven spent three years working for the Coalition for a Prosperous America, a nonprofit organization. Steven's experience as an economist spans twenty-three years, including work at federal regulatory agencies (SEC, CFTC, PCAOB) and quantitative economic analysis supporting international trade litigation cases brought before the U.S. International Trade Commission. His Ph.D. dissertation topic was based on a computable general equilibrium model (CGE) he developed to evaluate the economic impact of regional tax incentives in a small city (Fort Collins, CO).

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ABOUT COMMON SENSE INSTITUTE

Common Sense Institute is a non-partisan research organization dedicated to the protection and promotion of Iowa's economy. CSI is at the forefront of important discussions concerning the future of free enterprise and aims to have an impact on the issues that matter most to Iowans. CSI's mission is to examine the fiscal impacts of policies, initiatives, and proposed laws so that Iowans are educated and informed on issues impacting their lives. CSI employs rigorous research techniques and dynamic modeling to evaluate the potential impact of these measures on the economy and individual opportunity.

TEAMS & FELLOWS STATEMENT

Common Sense Institute is committed to independent, in-depth research that examines the impacts of policies, initiatives, and proposed laws so that Iowans are educated and informed on issues impacting their lives. Common Sense Institute's commitment to institutional independence is rooted in the individual independence of our researchers, economists, and fellows. At the core of CSI's mission is a belief in the power of the free enterprise system. Our work explores ideas that protect and promote jobs and the economy, and the CSI team and fellows take part in this pursuit with academic freedom. Our team's work is informed by data-driven research and evidence. The views and opinions of fellows do not reflect the institutional views of CSI. Common Sense Institute operates independently of any political party and does not take positions.

INTRODUCTION

For any state's economy to thrive, its businesses and residents must have access to abundant, affordable, reliable, and environmentally sustainable energy. The Common Sense Institute's Energy Competitiveness Index reviews Iowa's performance on metrics that reflect the overall capacity, reliability, and affordability of the state's energy supply and its transition to cleaner energy sources.

KEY FINDINGS

- **From 2011 to 2023, Iowa's Energy Competitiveness Index rank improved from 15th to 4th best in the nation.**
- **Total electric power generation capacity has increased in Iowa since 2011.**
  - Nameplate capacity per 100,000 residents has increased 39.7 percent from 537.83 in 2011 to 751.08 in 2022.
- **Iowa's electric supply has become more reliable since 2011.**
  - Power interruptions without major event days has decreased 57.2%.
  - Power interruptions with major event days has decreased 27.6%.
- **Prices for electricity and natural gas all rose between 2011 and 2023, reducing the state's price competitiveness.** On average—
  - residential electric prices increased 24.6%,
  - commercial electric prices increased 32.2%,
  - industrial electric prices increased 30.9%,
  - residential natural gas prices increased 7.2%,
  - commercial natural gas prices increased 30.5%, and
  - industrial natural gas prices increased 45.8%.
- **From 2011 to 2023, the share of Iowa's electric power generation from clean sources increased from 29.9% to 64.3%.**

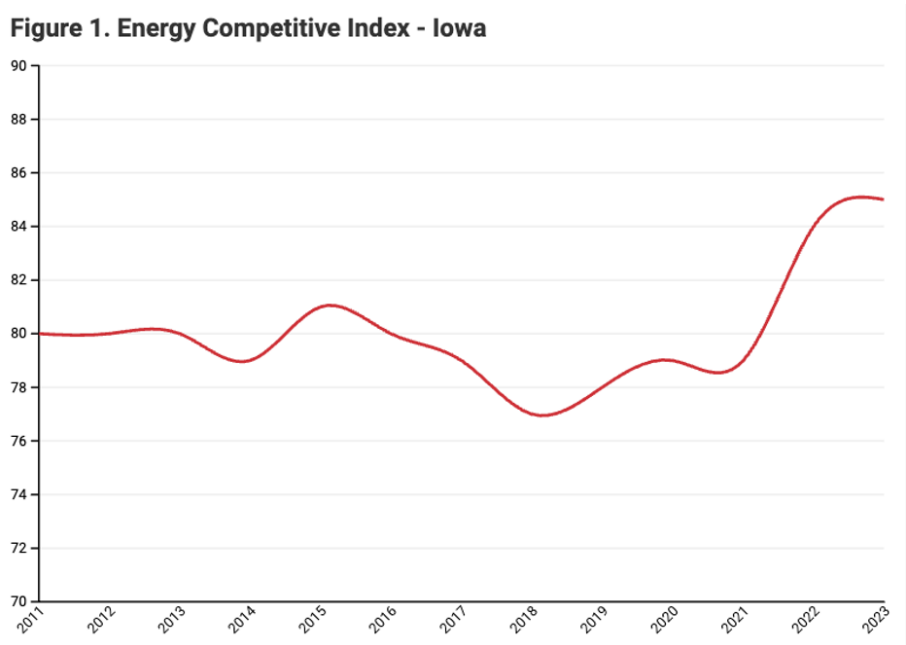
STATE ENERGY COMPETITIVENESS INDEX

The Common Sense Institute issues a Free Enterprise Report annually. The report assesses each state's competitiveness relative to 49 other states and the District of Columbia, and it provides data and analysis on eight policy areas: education, energy, healthcare, housing, infrastructure, public safety, government budget, and taxes and fees. An increase (decrease) in an index indicates increased (decreased) competitiveness relative to the other 49 states and the District of Columbia. For example, if Iowa's performance on a particular metric improves but other states improve by more, Iowa's competitiveness rank relative to all states will decline.

To gauge Iowa's energy competitiveness relative to other states, CSI produces a State Energy Competitiveness Index for all 50 states and the District of Columbia consisting of 10 metrics related to supply, reliability, and affordability:

1. nameplate capacity (megawatts) per 100,00 residents,
2. electricity reliability CAIDI (minutes of interruption) without major event day (MED),
3. electricity reliability CAIDI (minutes of interruption) with major event day (MED),
4. residential electricity price (cents per kWh),
5. commercial electricity price (cents per kWh),
6. industrial electricity price (cents per kWh),
7. residential natural gas price,
8. commercial natural gas price,
9. industrial natural gas price, and
10. share of electricity produced from clean energy.

FIGURE 1.



The index ranks Iowa relative to all fifty states and the District of Columbia by each metric. It then equally weights and sums each ranked metric, which it then ranks again to produce an aggregate measure of state energy competitiveness as shown in **figure 1**. Iowa's Energy Competitiveness Index was 80 in 2011 and then increased to 85 in 2023. It dipped as low as 77 in 2018. An increase in the Energy Competitiveness Index is a positive qualitative change – i.e., the state is more competitive as the index approaches one hundred. Based on its index score, Iowa has ranked as low as 20th most competitive in 2018 to as high as 4th in 2023.

Of the 10 metrics that comprise the energy competitiveness index, three relate to supply or availability of energy, six relate to cost, and one reflects energy sources supplying the grid. The index is based on grid energy, not off-grid energy such as home solar or fuels used to power vehicles or other machinery without use of the electrical grid. Iowa rose in the index despite a drop in index scores under four metrics:

- Commercial electricity price
- Industrial electricity price
- Commercial natural gas price
- Industrial natural gas price

Iowa's score and rank increase from 2011 to 2023 resulted from a combination of improvements in the state and declines in other states. In Iowa, increases occurred in six metrics:

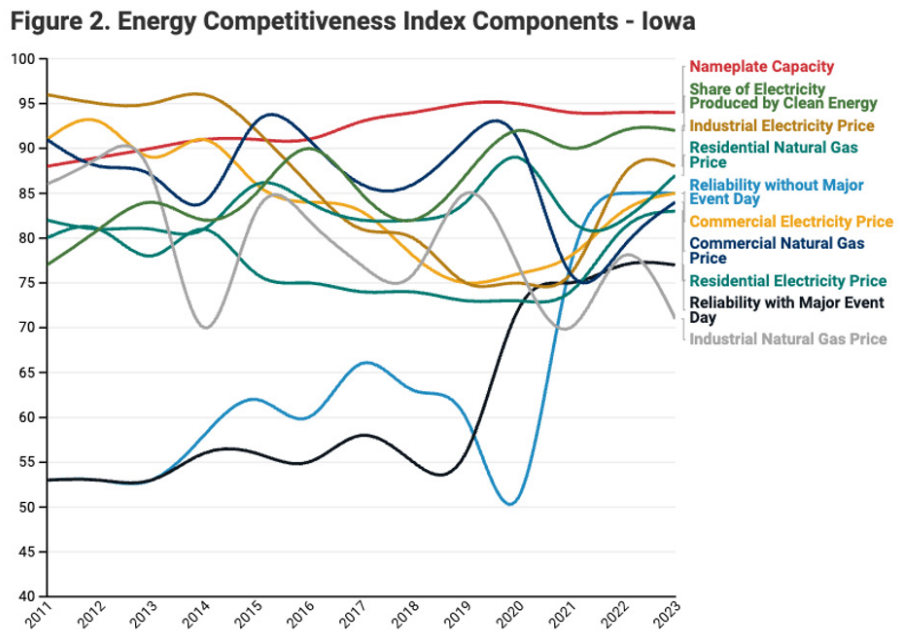
- Nameplate capacity
- Reliability without major event day
- Reliability with major event day
- Residential electricity price
- Residential natural gas price
- Share of electricity produced by clean energy

Figure 2 shows the change in Iowa's index score over time for the ten components included in the Energy Competitiveness Index.

A change in an index score does not necessarily signal an improvement or decline in its performance. Rather, it indicates a change in competitiveness relative to other states. The following sections of this report take a closer look at each of the 10 metrics employed to develop CSI's Energy Competitiveness Index. They describe Iowa's relative competitiveness based on an index score but also show its change in absolute performance.

Comparing relative and absolute performance reveals whether a change in Iowa's index score resulted from a change in its performance, other states' performances, or both.

FIGURE 2.



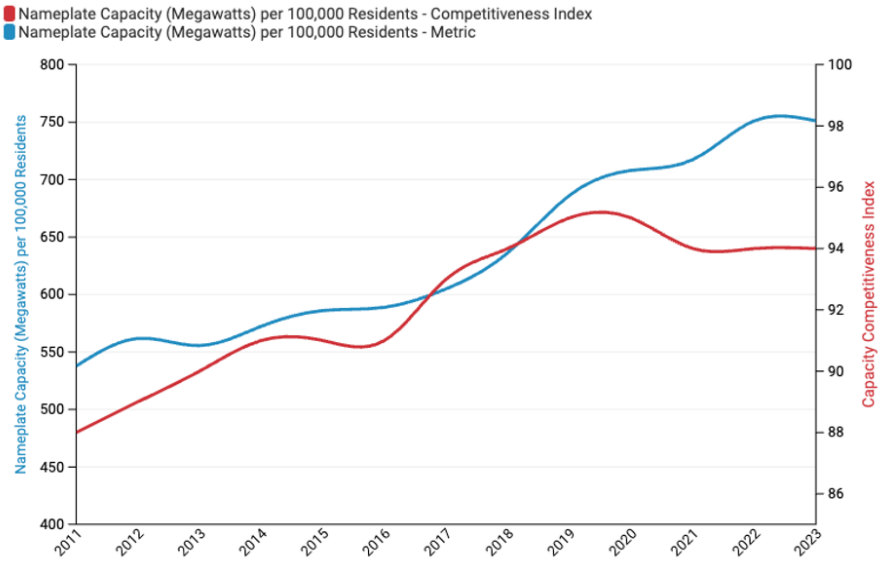
NAMEPLATE CAPACITY

Nameplate capacity is the maximum amount of electricity that can be generated—typically expressed in megawatts (MW)—without exceeding design thermal limits.[i] Common Sense Institute divides the nameplate capacity for a state by the state's population times 100,000 to get nameplate capacity per 100,000 residents. This enables an apples-to-apples comparison across states. The higher the nameplate capacity per 100,000 residents, the more competitive the state. This metric signals the state's ability to provide for the energy demands of its residents and businesses regardless of grid demand at any given time. **Figure 3** charts the nameplate capacity on the left axis with CSI's energy competitiveness index score on the right axis.

Over the timeframe surveyed, Iowa steadily increased its grid capacity.[ii] Nameplate capacity per 100,000 residents increased from 537.83 in 2011 to 751.08 in 2023. Meanwhile, other states either decreased their capacity or increased it less rapidly. The state consequently saw a steady increase in its index score, which rose from 88 in 2011 to 94 in 2023—a rank increase from 12th to 6th best.

FIGURE 3.

Figure 3. Nameplate Capacity per 100,000 Residents - Iowa
Competitiveness Index and Metric



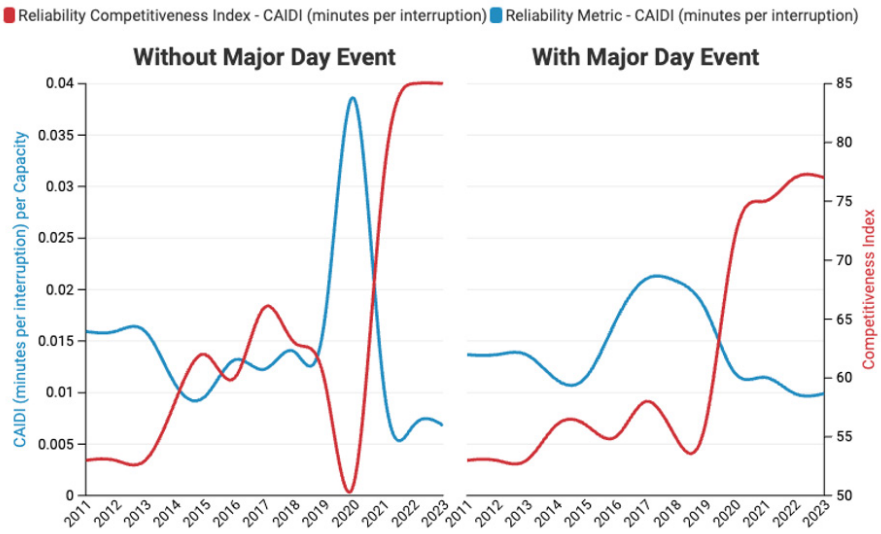
ELECTRICITY RELIABILITY

The two metrics in this section reflect the electric grid's ability to deliver electricity continuously with and without the presence of "major events" that adversely affect energy providers. To score reliability, the CSI Energy Competitiveness Index uses the Customer Average Interruption Duration Index (CAIDI) with and without Major Event Days (MED).[iii] The CAIDI index indicates the number of minutes it takes to restore non-momentary electric interruptions. The CSI Energy Competitiveness Index metric "Electricity Reliability with Major Event Day" reflects the number of minutes it takes to restore non-momentary electric interruptions when there are catastrophic events that exceed reasonable design or operational limits of an electric power system. "Electricity Reliability with Major Event Day" reflects the same, but without catastrophic events present.

From 2011 to 2023, Iowa's overall reliability improved during days with and without major events. Figure 4 charts Iowa's CAIDI performance on the left axis with CSI's competitiveness index score on the right axis for each of these two metrics. Together, the reliability metrics have a 20% weighting in CSI's Energy Competitiveness Index.

FIGURE 4.

Figure 4. Electricity Reliability with & without Major Event Day - Iowa
Competitiveness Index and Metric



Iowa rose in the metric index score for reliability without major events from 53 in 2011 and 85 in 2023. This was primarily the result of a 57.2% decrease from 0.0159 minutes per 100,000 residents in 2011 to 0.0068 minutes per 100,000 residents in 2023. Because of improvements in reliability, Iowa's performance relative to other states and the District of Columbia increased. Notably, the amount of power interruptions on days without major events surged to its highest level in 2020 before declining to its lowest level in 2022. This shock caused Iowa's index rank to fall to 3rd worst in the nation in 2020 with an index score of 51. It now stands at 15th best with an index score of 85. The derecho storms that hit Iowa in the summer of 2020 may have caused this surge. While the storms would have counted as a major day event, thousands of Iowans remained without power for over a week after the storm, possibly causing the outages to be included in this data.[iv]

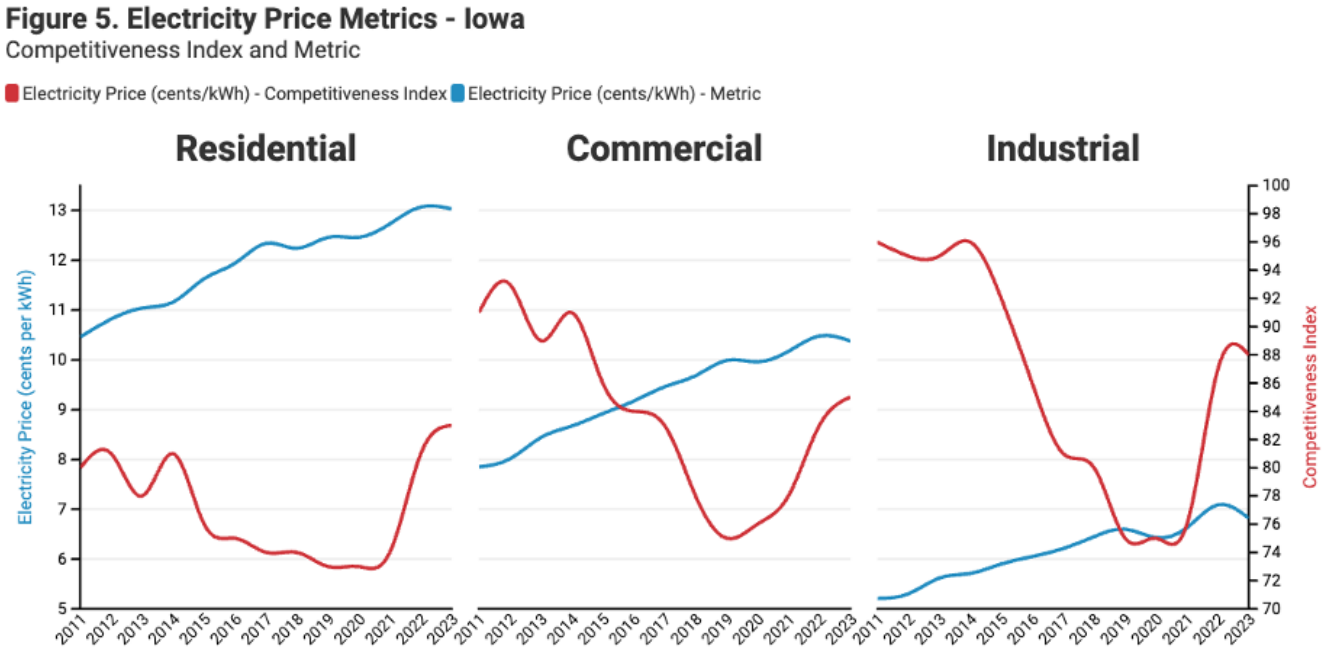
With a decrease in the minutes of interruption per 100,000 residents from 0.0137 in 2011 to 0.0099 in 2023, Iowa's index score for reliability with major events metric increased from 53 in 2011 to 77 in 2023, lifting its rank from 47th to 23rd. Because of the improvement in reliability, Iowa's electricity reliability competitiveness relative to other states and the District of Columbia rose. Interestingly, the number of minutes of interruption increased significantly from 2015 to 2017, yet Iowa's index score improved from 56 to 58 over the same period. This suggests that other states also struggled with reliability during the same years. As Iowa's grid reliability improved from 2018 through 2022, the state's index score rose precipitously from 55 to 77.

ELECTRICITY PRICE

Public utilities generally provide energy to homes, commercial buildings, and industry in the form of electricity or natural gas. The next three metrics assign an index score based on the price per kilowatt hour for electricity for residential, commercial, and industrial use. It is agnostic toward the source of power generation, whether coal, wind, natural gas, etc. A lower price yields a higher index score. Together, these three metrics constitute 30% of CSI's Energy Competitiveness Index. **Figure 5** shows the metric data and index score for each of the three electricity price components of the index.

Since 2011, the cost of electricity in Iowa has trended up for residential, commercial, and industrial use. From 2011 through 2020, that generally caused Iowa to become less competitive relative to other states. However, over the past few years Iowa's index score has improved across

FIGURE 5.



all three electricity price components metrics despite energy prices continuing to rise. That suggests energy prices have risen less rapidly in Iowa since 2020 than in other states. Consequently, Iowa's relative electricity price competitiveness has recently increased while its electricity prices have continued to rise. For all three components, prices fell slightly from 2022 to 2023.

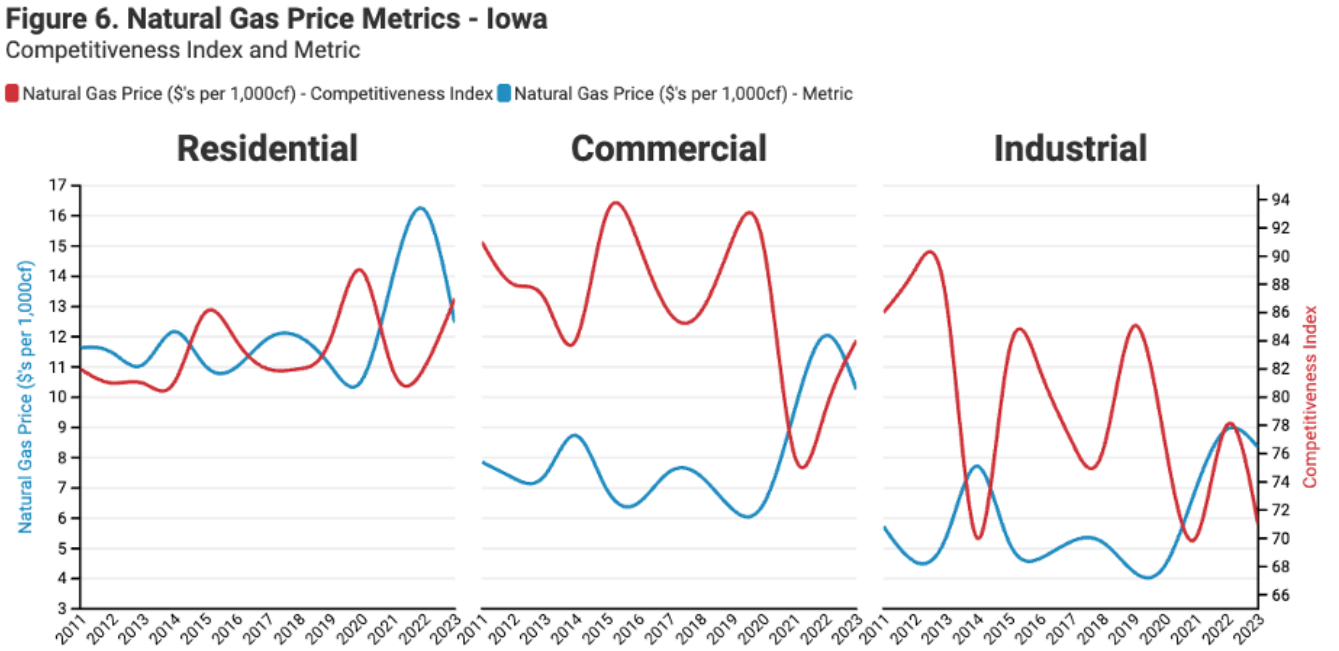
The residential electricity price index score increased from 80 in 2011 to 83 in 2023 with a low of 73 in 2019 and 2020. During that time, the average price of residential electricity increased from 10.46 cents to 13.03 cents per kilowatt hour. With an increase in the average price of commercial electricity from 7.85 cents per kilowatt hour in 2011 to 10.38 cents per kilowatt hour in 2023, the commercial electricity price index score decreased from 91 in 2011 to 85 in 2023. It hit a low score of 75 in 2019 before increasing starting in 2020 as prices continued to rise. Finally, the Iowa's index score for industrial electricity prices fell from 96 in 2011 to 88 in 2023. Over the period, the average price of industrial electricity rose 30.9% with an increase from 5.21 cents per kilowatt hour in 2011 to 6.82 cents per kilowatt hour in 2023. Iowa currently ranks 17th for residential, 15th for commercial, and 12th for industrial electricity prices.

NATURAL GAS PRICE

The previous three component metrics assigned scores based on the price of electric power; the three metrics in this section assign scores based on the price of the other major public energy utility—natural gas. As with the electricity price metrics, this section also breaks them into three separate component metrics: residential, commercial, and industrial. Again, a lower price yields a higher index score, and together, the three metrics constitute 30% of CSI's Energy Competitiveness Index. **Figure 6** shows the metric data and index score for each of the three natural gas price components of the index.

In the case of the electricity price metrics, Iowa's score fell and rose again while prices rose steadily from 2011 to 2023. The index scores for the natural gas price metrics have a more direct inverse relationship to the price. In years where the price of natural gas went up, Iowa's index scores

FIGURE 6.



generally went down, and vice versa. The most notable exception was for industrial natural gas prices from 2021 to 2023. From 2021 to 2022, Iowa's index score rose as the price rose; from 2022 to 2023, its score fell as the price fell. Otherwise, Iowa's index score generally rose in years prices fell and fell in years prices rose.

The residential metric index score increased from 82 in 2011 to 87 in 2023 after a 7.2% increase in the average price of residential natural gas from $11.63 per 1,000 cubic feet in 2011 to $12.47 per 1,000 cubic feet in 2023. While natural gas prices rose slightly over that period, the increase in price relative to some other states was smaller, causing Iowa's residential natural gas competitiveness to increase relative to other states and the District of Columbia. The commercial metric index score decreased from 91 in 2011 to 84 in 2023 after a 27.1% increase in the average price of commercial natural gas from $7.86 per 1,000 cubic feet in 2011 to $10.26 per 1,000 cubic feet in 2023. The industrial metric index score decreased from 86 in 2011 to 71 in 2023 after a 45.8% increase in the average price of industrial natural gas from $ 5.72 1,000 cubic feet in 2011 to $8.34 per 1,000 cubic feet in 2023.

SHARE OF ELECTRICITY PRODUCED BY CLEAN ENERGY

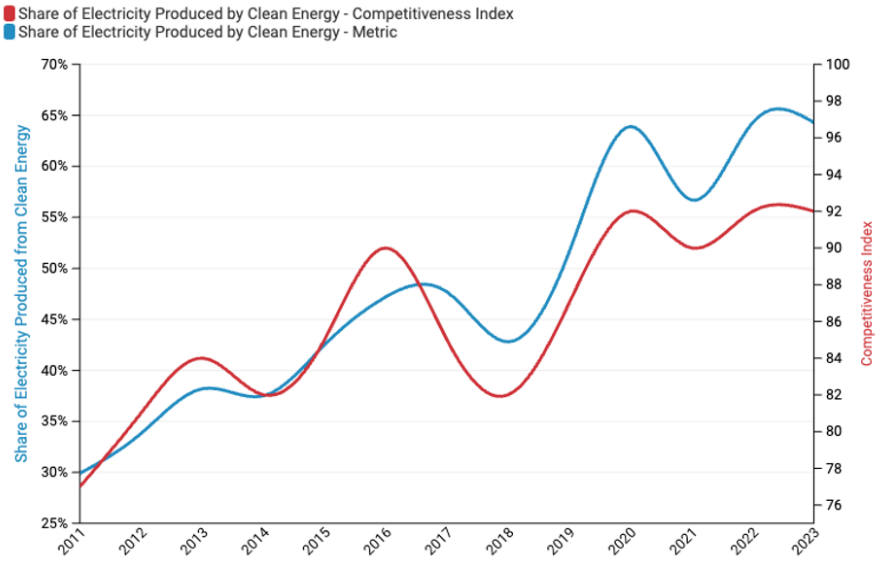
The CSI index classifies nuclear, conventional hydroelectric, pumped hydroelectric, wind, and solar as the clean energy sources for the "clean energy" component metric. Figure 7 shows the metric data and index score for the share of Iowa's electricity produced by clean energy.

This component metric index score has increased steadily from 77 in 2011 to 92 in 2022 as Iowa has generated an increasing amount of its energy from clean sources.[v] From 2011 to 2022, the state increased its use of clean energy sources for electricity generation from 29.9% in 2011 to 64.3% in 2022. Because Iowa has increased its use of clean energy at a faster pace than most other states, its index score has increased and it now ranks 8th in the nation for clean energy use.

Notably, this component metric does not include biomass as a clean energy, but this likely has little impact on Iowa's score. About 5% of all U.S. energy consumption in 2022 came from biomass.[vi] In 2020, only 1.4% of all electricity generated in the United States came from biomass, and only a small fraction of that is derived from corn, according to the EPA.[vii] Very little of that biomass electric energy in the United States is derived from corn. Rather, ethanol derived from corn is the main biomass input for ethanol fuel used in vehicles. The CSI Energy Competitiveness Index focuses on energy from public utilities, not for use in vehicles.

FIGURE 7.

Figure 7. Share of Electricity Produced from Clean Energy - Iowa
Competitiveness Index and Metric



CONCLUSION

Iowa's overall energy competitiveness has improved significantly since 2011. Electric energy generation capacity has increased both in absolute terms and relative to other states. Its grid has become more reliable. And while the state has followed the national trend of rising energy prices, its relative price competitiveness has not changed significantly. In fact, residential electric and natural gas prices have become slightly more competitive. Meanwhile, Iowa has become one of the nation's leaders in clean energy thanks primarily to wind power generation. According to the U.S. Energy Information Administration, 62% of the state's total electricity generation came from wind in 2022, making it the leader in wind as a share of total electric power generation. It lags only Texas in total wind generation. Iowa's rank of 8th in the nation for clean energy is based on an increase in electricity produced by clean energy from 29.9% in 2011 to 64.3% today.

Based on CSI's Energy Competitiveness Index, the state's rank relative to 49 other states and the District of Columbia has risen from 15th to 4th from 2011 to 2023. Iowa's economy and inhabitants depend on energy that is affordable, abundant, reliable, and clean. The state's high energy competitiveness is a boon to the state's businesses and residents.

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