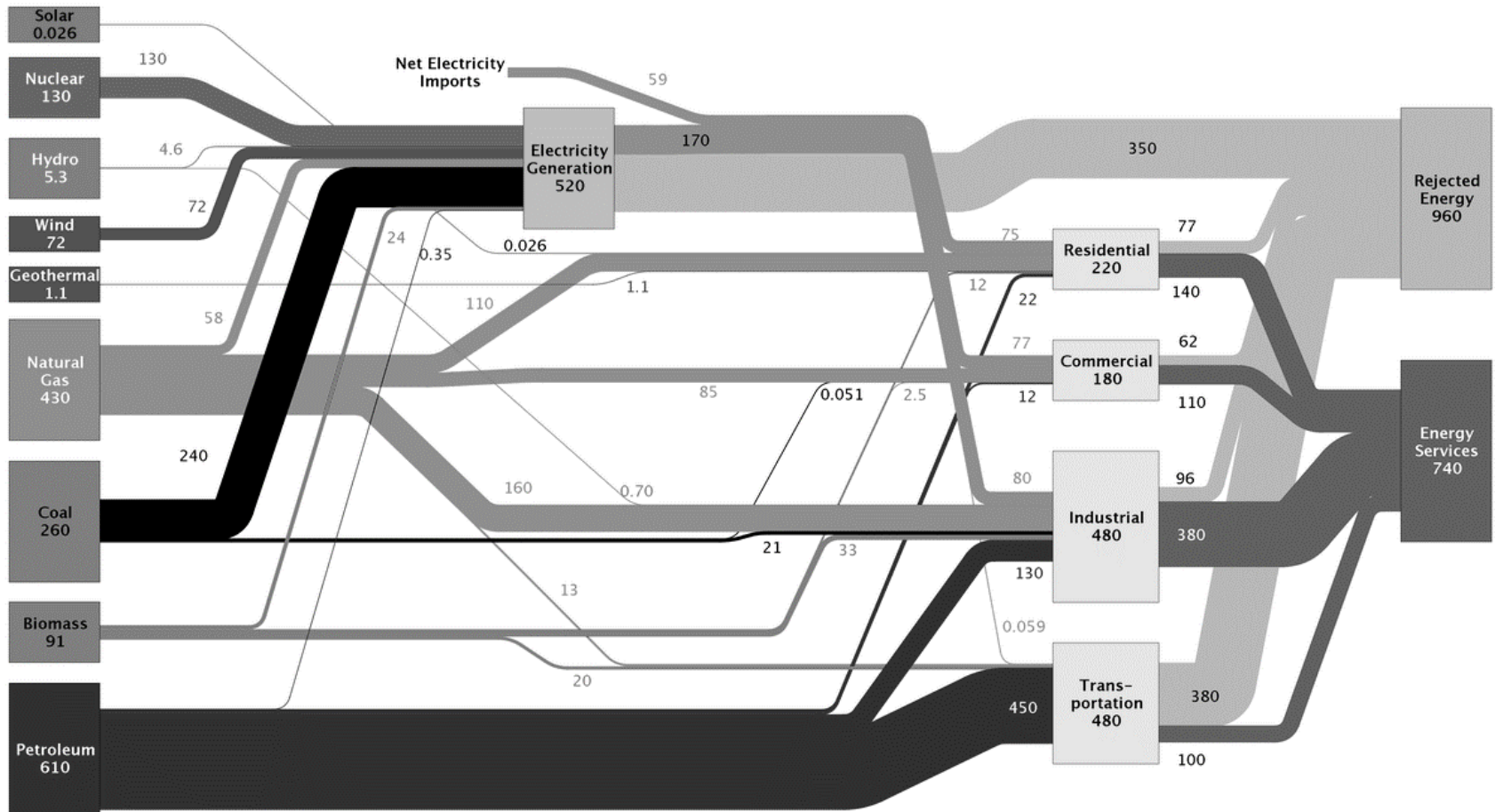


# MINNESOTA'S ENERGY LANDSCAPE

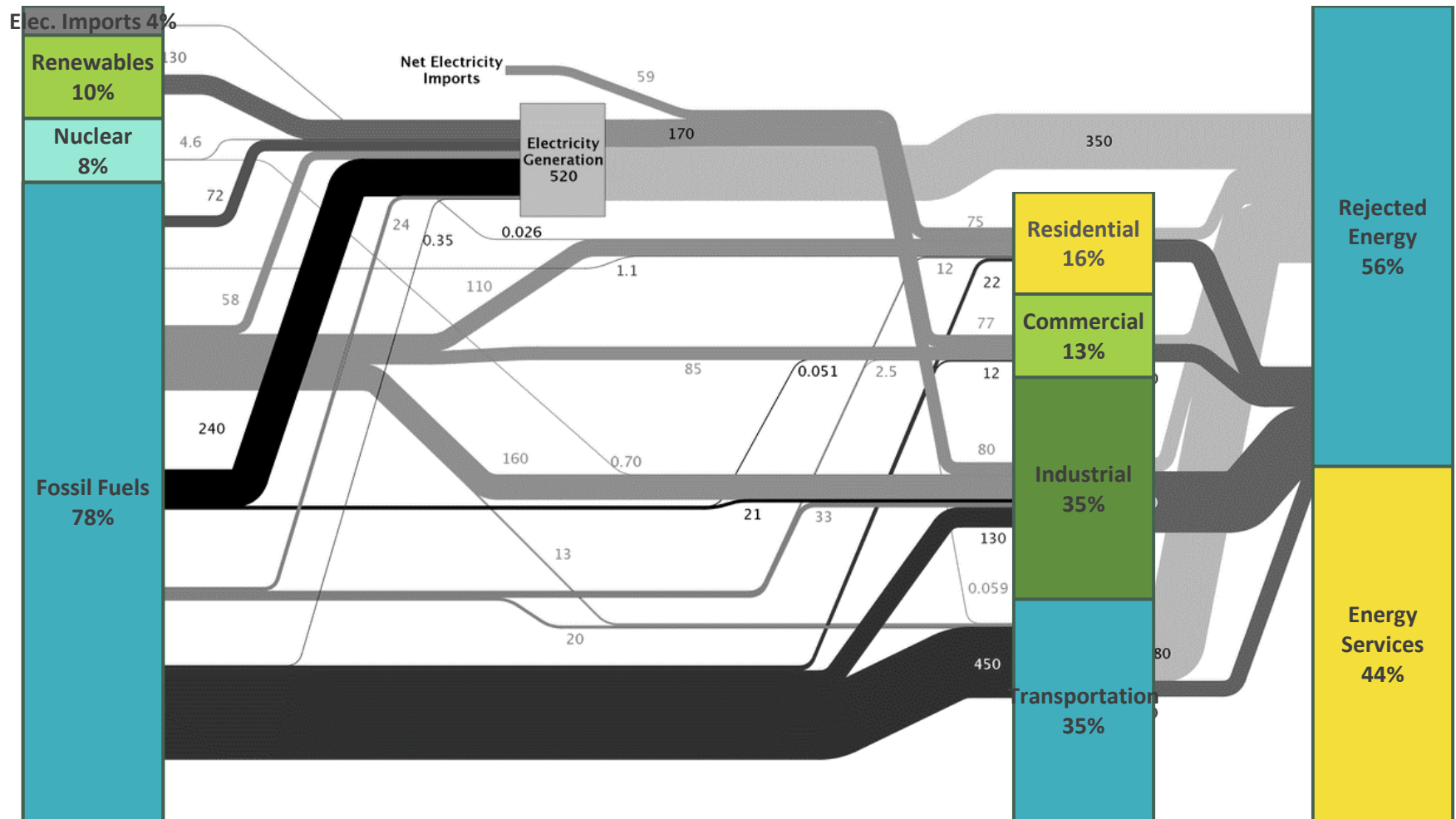
Estimated Minnesota Energy Use In 2012  
~1700 Trillion BTU



Source: Lawrence Livermore National Laboratory. "Estimated Minnesota Energy Use in 2012." <https://flowcharts.llnl.gov/commodities/energy>

# MINNESOTA'S ENERGY LANDSCAPE

**Estimated Minnesota Energy Use In 2012**  
~1700 Trillion BTU



Source: Lawrence Livermore National Laboratory. "Estimated Minnesota Energy Use in 2012." <https://flowcharts.llnl.gov/commodities/energy>

## **MINNESOTA'S ENERGY POLICIES**

### **ENERGY EFFICIENCY**

- Conservation policy
- Building energy codes/standards

### **RENEWABLE ENERGY**

- Renewable energy goal
- Renewable electricity standard
- Solar electricity goal and standard
- Renewable fuel standards

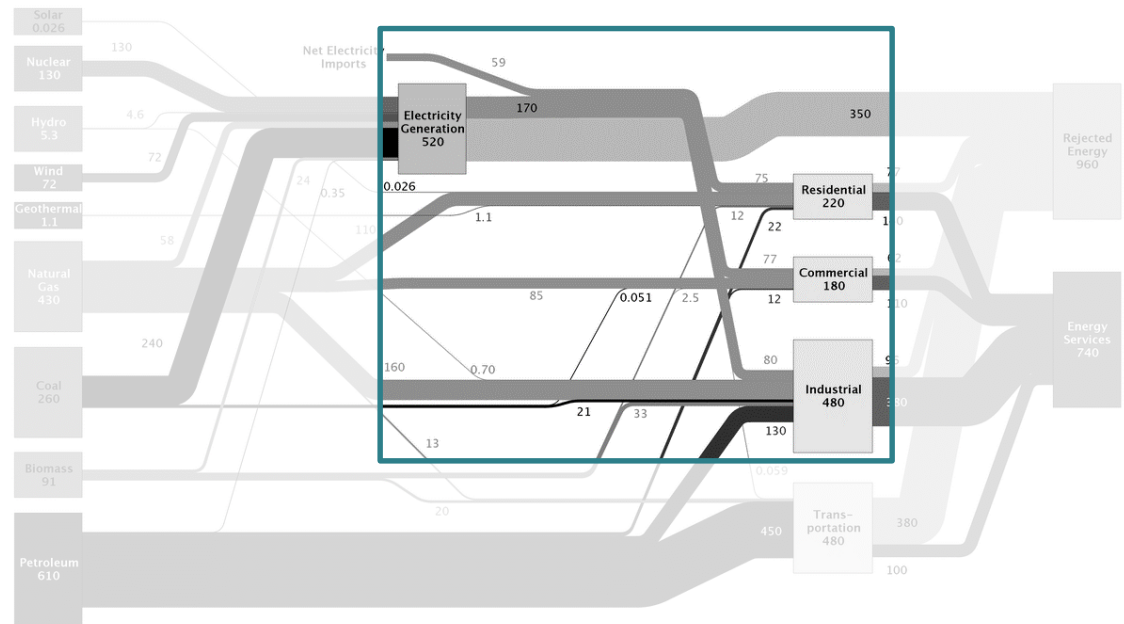
### **CLIMATE**

- Fossil fuel reduction goal
- Greenhouse gas emissions goal

## ENERGY EFFICIENCY

### POLICY

- Energy Conservation Improvement: Annually conserve 1.5% of retail electricity and 1% of natural gas sales ([M.S. 216B.241](#))



Source: Lawrence Livermore National Laboratory. "Estimated Minnesota Energy Use in 2012."

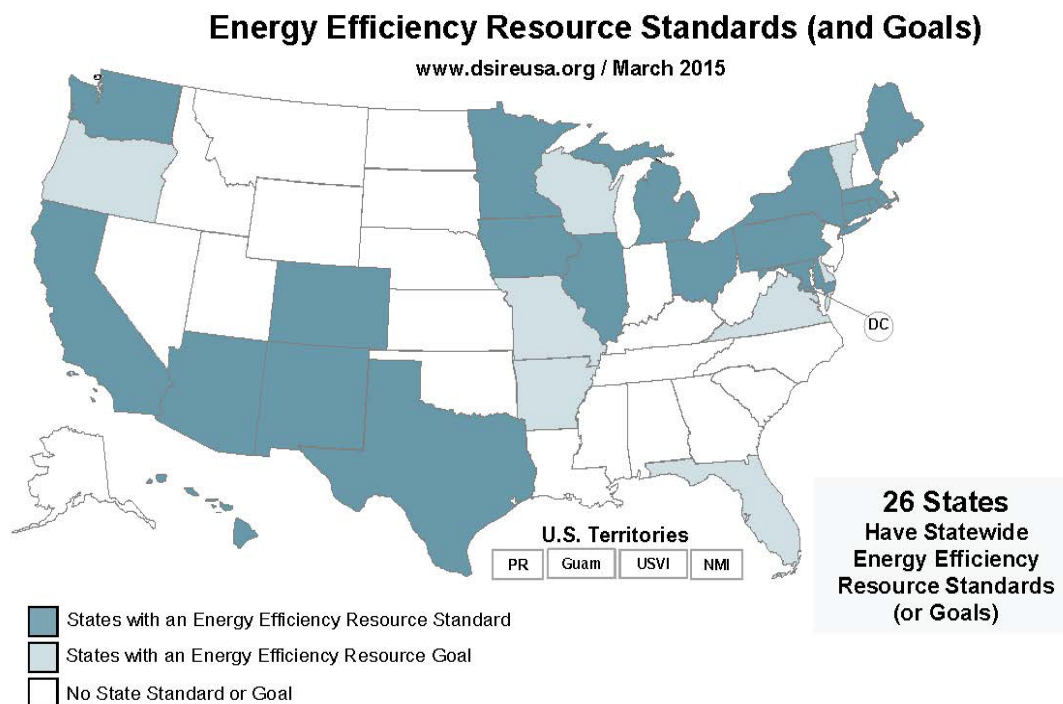
<https://flowcharts.llnl.gov/commodities/energy>

## ENERGY EFFICIENCY

Annually conserve 1.5% of retail electricity and 1% of natural gas sales

## POLICY COMPARISON TO OTHER STATES

- 26 states have electricity energy efficiency resource standards, ranging from 0.2% - 2.6% incremental savings
- 15 states have natural gas policies, ranging from 0.2% - 1.2% incremental savings



Source: U. S. Department of Energy and N.C. Energy Technology Center at N.C. State University. DSIRE. "Energy Efficiency Resource Standards." <http://www.dsireusa.org/resources/detailed-summary-maps/energy-efficiency-resource-standards/>

## ENERGY EFFICIENCY

Annually conserve 1.5% of retail electricity and 1% of natural gas sales

## PROGRAMS AND RESOURCES

- Conservation Improvement Programs (CIPs): utility programs that incentivize energy efficient products and practices.

RESIDENTIAL	COMMERCIAL AND INDUSTRIAL
Energy audit	Building recommissioning
Energy-efficient construction guidelines	Manufacturing process improvements that reduce energy intensity and improve productivity
Rebates: <ul style="list-style-type: none"><li>• High-efficiency heating, cooling, and water heating appliances</li><li>• Low-flow showerheads</li><li>• Compact fluorescent lighting</li></ul>	Rebates: <ul style="list-style-type: none"><li>• High efficiency boilers, chillers, and rooftop units</li><li>• High efficiency lighting and lighting control systems</li><li>• High efficiency motors and drives</li></ul>

Source: Minnesota Department of Commerce, Department of Energy Resources. "Conservation Improvement Programs."  
<http://mn.gov/commerce/energy/utilities/conservation/index.jsp>

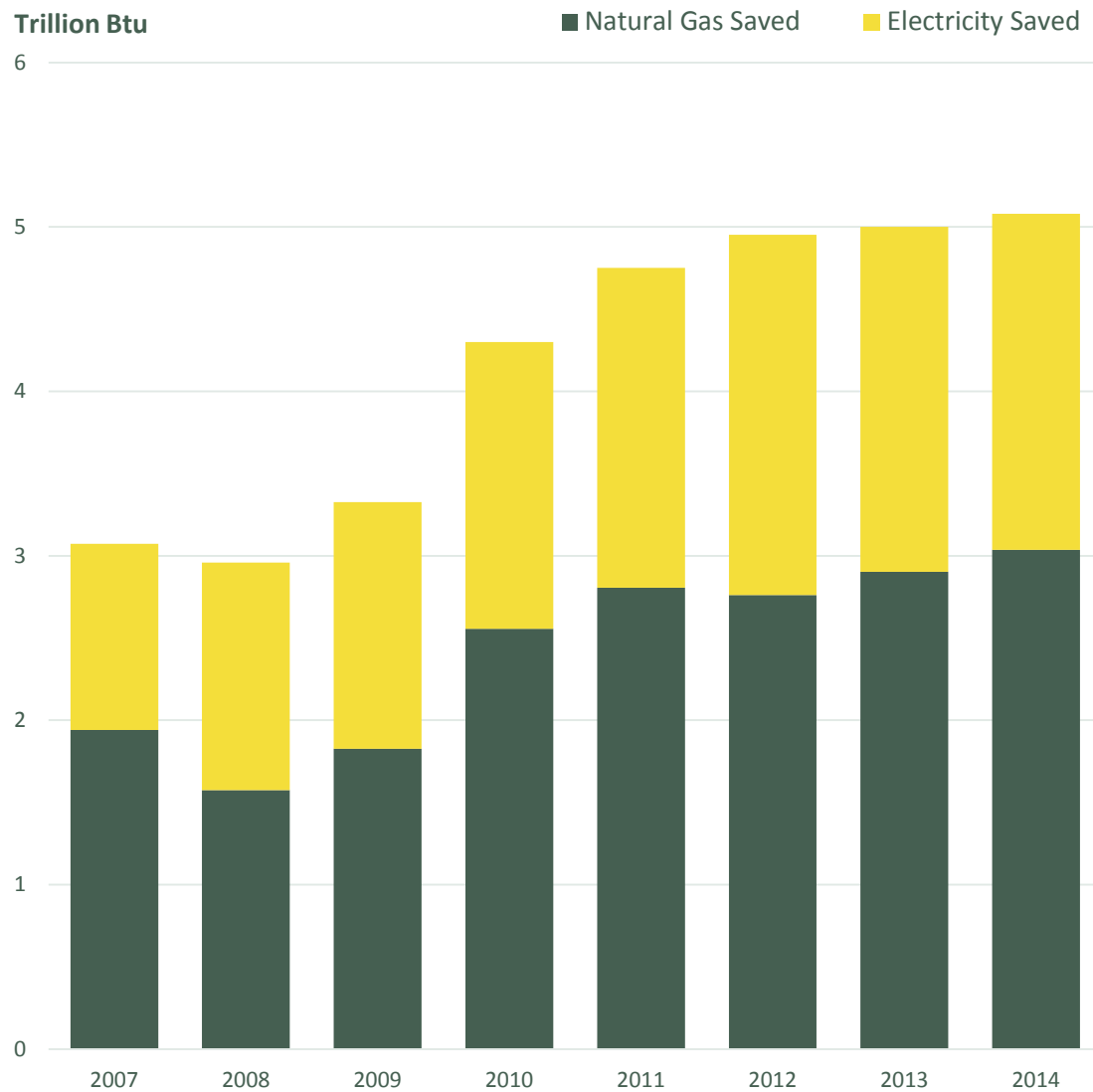
- The Conservation Applied Research and Development (CARD) Grant Program: identifies new technologies or strategies to maximize energy savings



## ENERGY EFFICIENCY

Annually conserve 1.5% of retail electricity and 1% of natural gas sales

## OUTCOMES | ENERGY SAVED THROUGH CIP

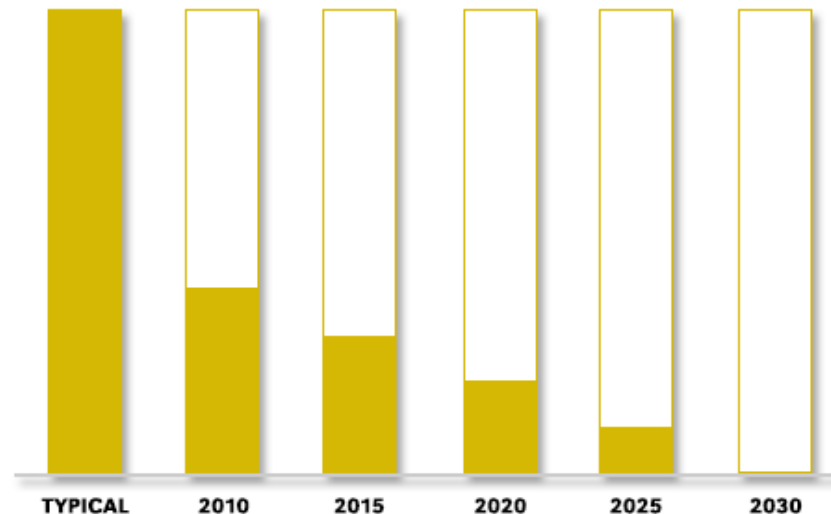


Source: Minnesota Department of Commerce. "A Report on the Impacts of the 2010-2014 Shared Savings Demand-Side Management (DSM) Financial Incentive on Investor-Owned Utility Conservation Achievements and Customer Costs." Docket No. E.G999/CI-08-133. <https://www.edockets.state.mn.us/Efiling/edockets/searchDocuments.do?method=showPoup&documentId={9DF59F7B-19D8-4230-8475-4A14EE738326}&documentTitle=20157-112050-01>

## ENERGY EFFICIENCY

### POLICY

- The Minnesota Sustainable Building 2030 (SB 2030) Program sets aggressive energy targets for new and renovated buildings. It is required for all state-bonded buildings that receive General Obligation (GO) bonds ([M.S. 216B.241](#)).



### SB 2030 Energy Standard

Building Energy Consumption from Carbon Producing Fuel

Source: Minnesota B3. "SB 2030 Energy Standard." <http://www.b3mn.org/2030energystandard/>

### OUTCOMES

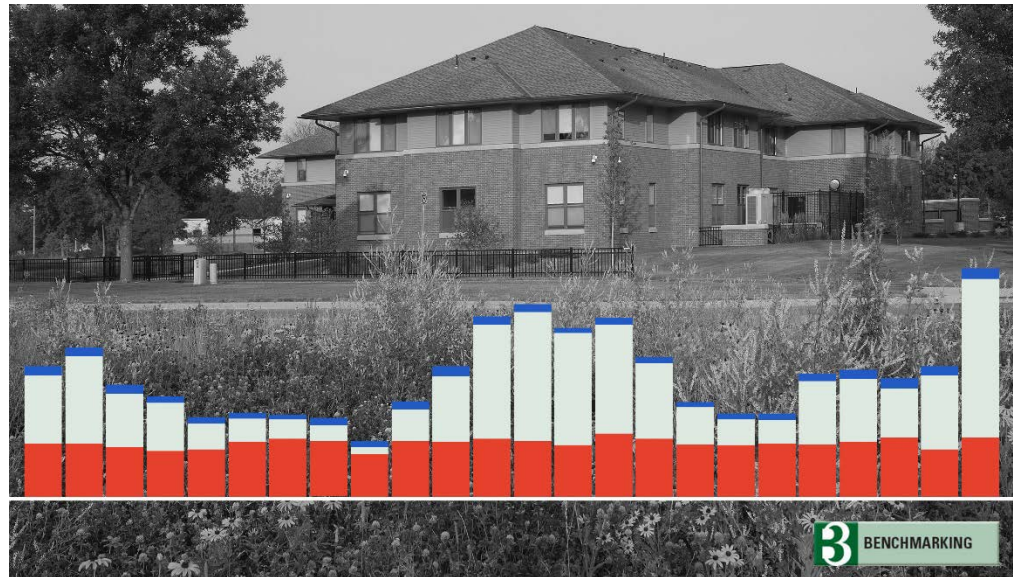
- SB 2030 has resulted in savings of 327 billion Btus and \$5.24 million per year



## ENERGY EFFICIENCY

### POLICY

- Energy Standards for Public Buildings: 20% reduction in energy use in state-owned buildings ([Executive Order 11-12](#)). Each state agency must track energy use in B3 Benchmarking, set site-specific energy goals, and report progress annually.



Source: LHB. For more information, visit: <https://mn.b3benchmarking.com/>

### OUTCOMES

- B3 Benchmarking tracks energy use in 7,890 buildings and has identified easily achievable savings of over 3 million MMBtu annually.

## PROGRAMS AND RESOURCES

### ENERGY EFFICIENCY

- Clean Energy Resource Teams (CERTs): a statewide partnership that supports individuals and communities in pursuing community-based clean energy projects
- Minnesota GreenStep Cities: a voluntary challenge, assistance and recognition program that helps cities achieve their sustainability and quality-of-life goals



Source: MPCA. Minnesota GreenStep Cities. For more information, visit: <http://greenstep.pca.state.mn.us/>

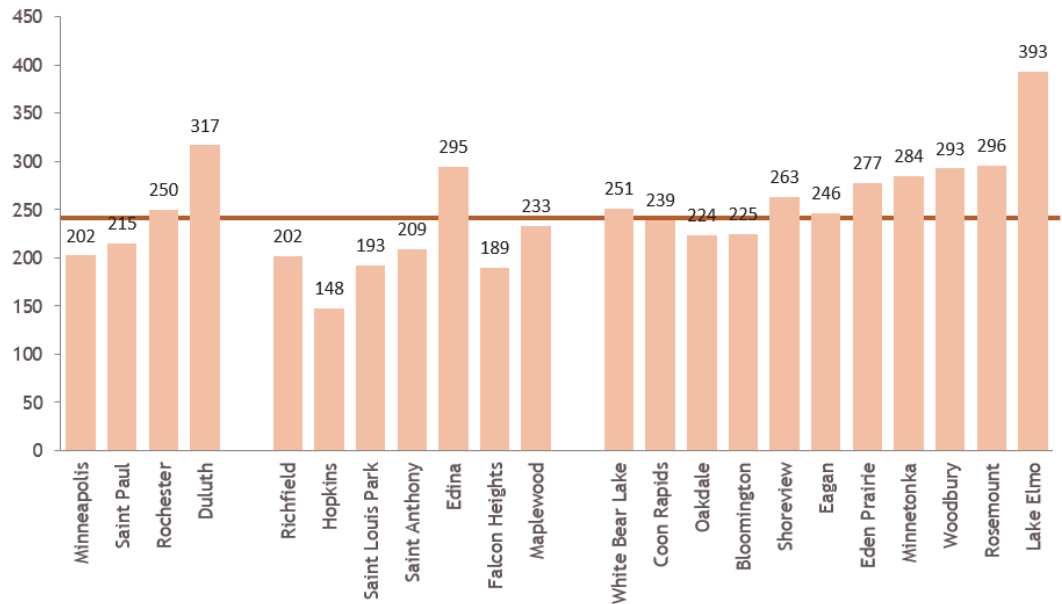
## PROGRAMS AND RESOURCES

### ENERGY EFFICIENCY

- Regional Indicators Initiative: a program that tracks annual performance metrics for Minnesota cities

#### RESIDENTIAL ENERGY USE

KBTU/HOUSEHOLD/DAY - 2012



Source: LHB. Regional Indicators Initiative. "Residential Energy Use." For more information, visit:  
<http://www.regionalindicatorsmn.com/>

## OUTCOMES | TOTAL ENERGY USE

### ENERGY EFFICIENCY

- 1.8% reduction from 2007

Trillion Btu

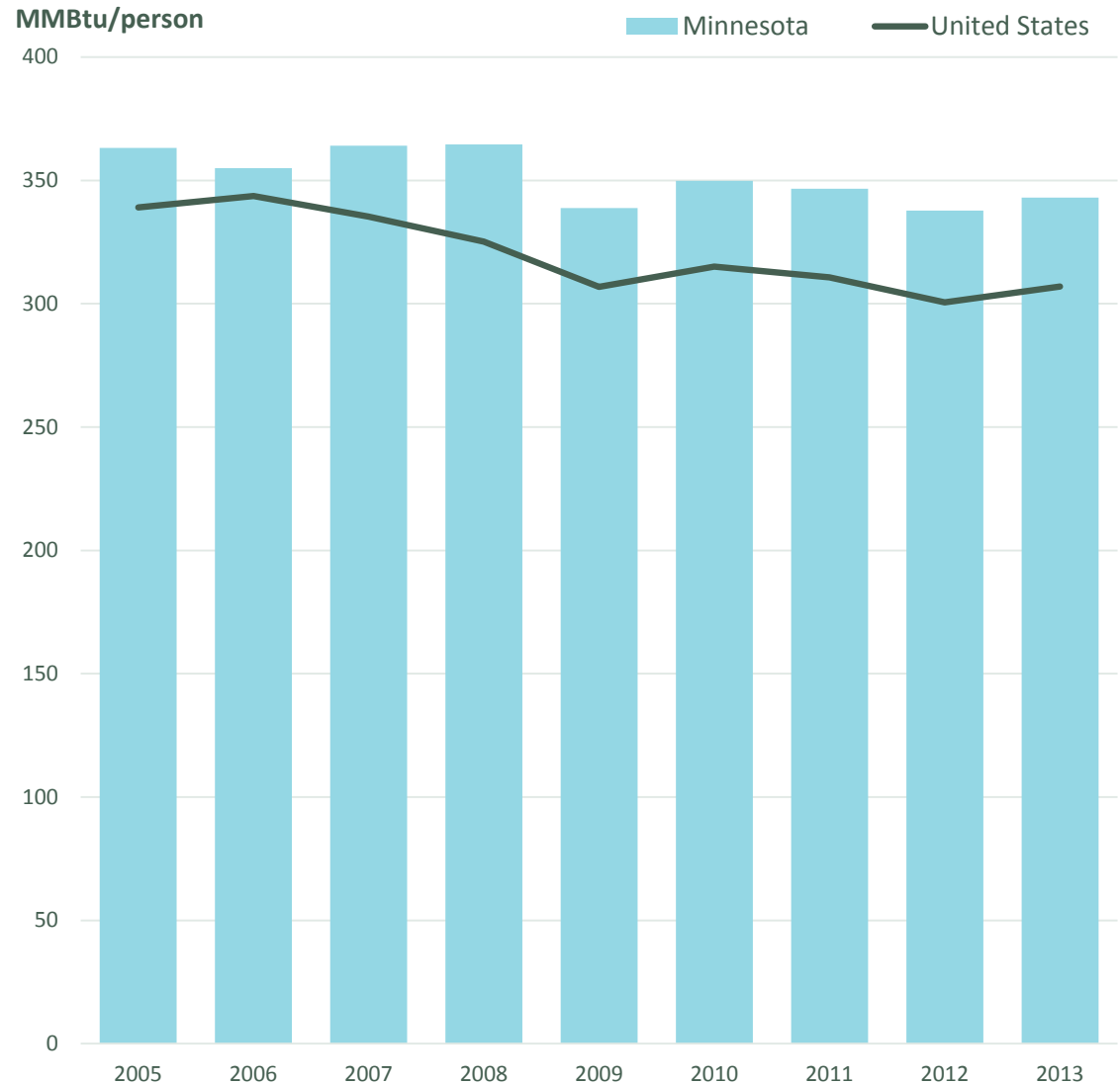


Source: U.S. Energy Information Administration. "Table CT3. Total End-Use Energy Consumption Estimates, 1960-2012, Minnesota". [http://www.eia.gov/state/seds/data.cfm?incfile=/state/seds/sep\\_use/tx/use\\_tx\\_MN.html&sid=MN](http://www.eia.gov/state/seds/data.cfm?incfile=/state/seds/sep_use/tx/use_tx_MN.html&sid=MN)

## OUTCOMES | TOTAL ENERGY USE PER CAPITA

### ENERGY EFFICIENCY

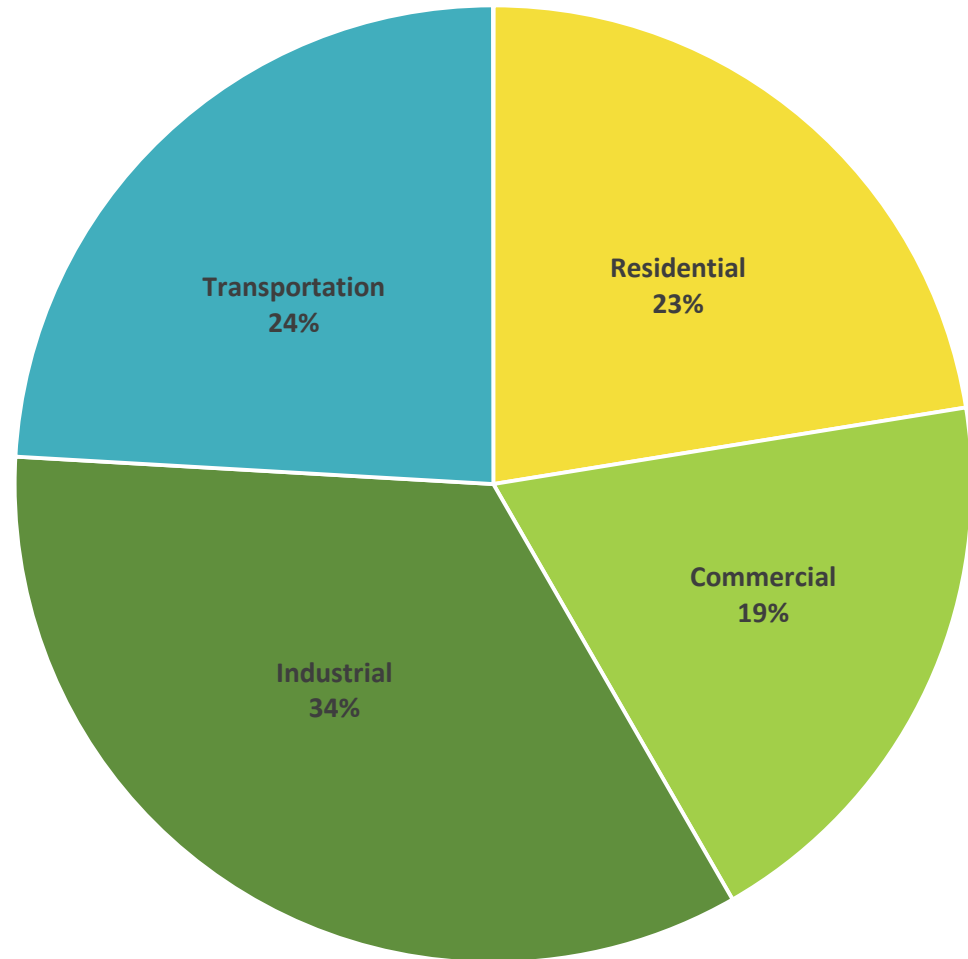
- 5.7% reduction from 2007
- 12% higher than national average



Source: U.S. Energy Information Administration. "Table CT3. Total End-Use Energy Consumption Estimates, 1960-2012, Minnesota". [http://www.eia.gov/state/seds/data.cfm?incfile=/state/seds/sep\\_use/tx/use\\_tx\\_MN.html&sid=MN](http://www.eia.gov/state/seds/data.cfm?incfile=/state/seds/sep_use/tx/use_tx_MN.html&sid=MN)

## OPPORTUNITIES | TOTAL ENERGY USE BY SECTOR (2013)

### ENERGY EFFICIENCY

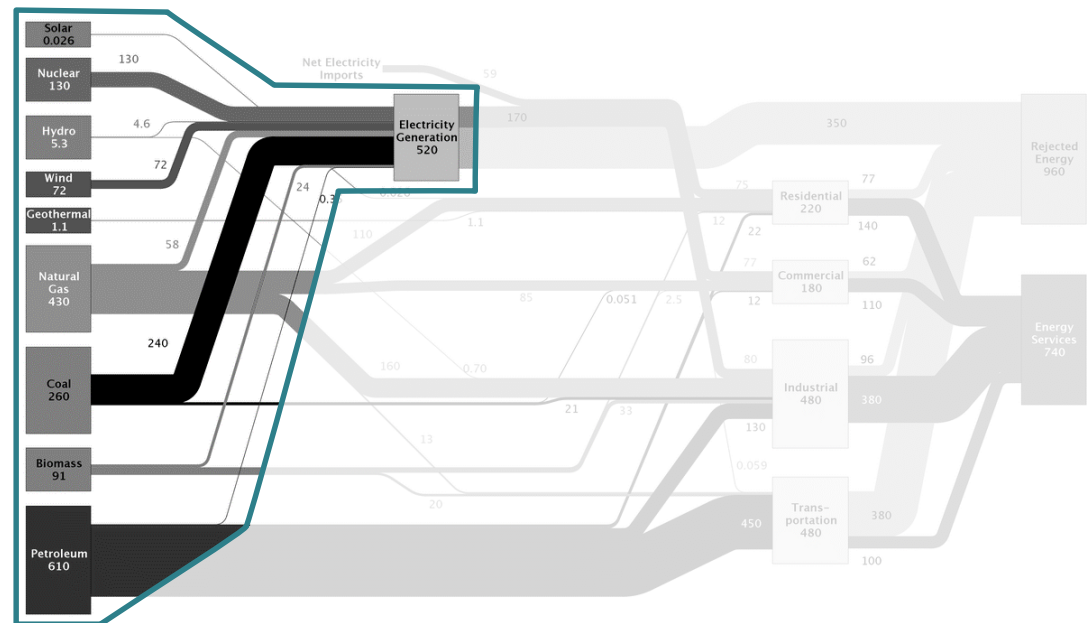


Source: U.S. Energy Information Administration. "Table CT3. Total End-Use Energy Consumption Estimates, 1960-2012, Minnesota". [http://www.eia.gov/state/seds/data.cfm?incfile=/state/seds/sep\\_use/tx/use\\_tx\\_MN.html&sid=MN](http://www.eia.gov/state/seds/data.cfm?incfile=/state/seds/sep_use/tx/use_tx_MN.html&sid=MN)

## RENEWABLE ENERGY

### POLICY

- Renewable Energy Goal: 25% of total energy from renewable sources by 2025 ([M.S. 216C.05 Subd. 2](#))
- Renewable Energy Standard: 25% of electricity from renewable sources by 2025 ([M.S. 216B.1692](#))
- Solar Energy Standard: 1.5% of electricity from solar by 2020 ([M.S. 216B.1692](#))
- Solar Energy Goal: 10% of electricity from solar by 2030 ([M.S. 216B.1692](#))



Source: Lawrence Livermore National Laboratory. "Estimated Minnesota Energy Use in 2012."

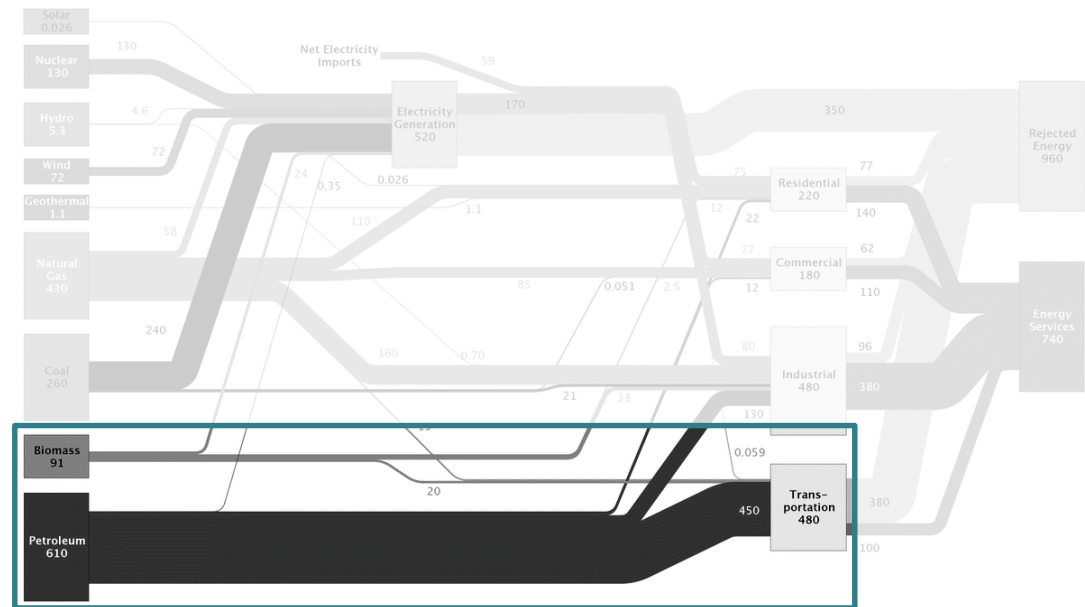
<https://flowcharts.llnl.gov/commodities/energy>



## RENEWABLE ENERGY

### POLICY

- Petroleum Replacement Goal: 30% renewable fuels in total gasoline sold or offered by 2025 ([M.S. 239.7911](#)).
- Biofuel Content Mandate: 10% ethanol or other approved biofuel in all gasoline fuel sold or offered ([M.S. 239.791](#))
- Biodiesel Content Mandate: 20% biodiesel in all diesel fuel sold or offered by 2018 ([M.S. 297.77](#))



Source: Lawrence Livermore National Laboratory. "Estimated Minnesota Energy Use in 2012."

<https://flowcharts.llnl.gov/commodities/energy>

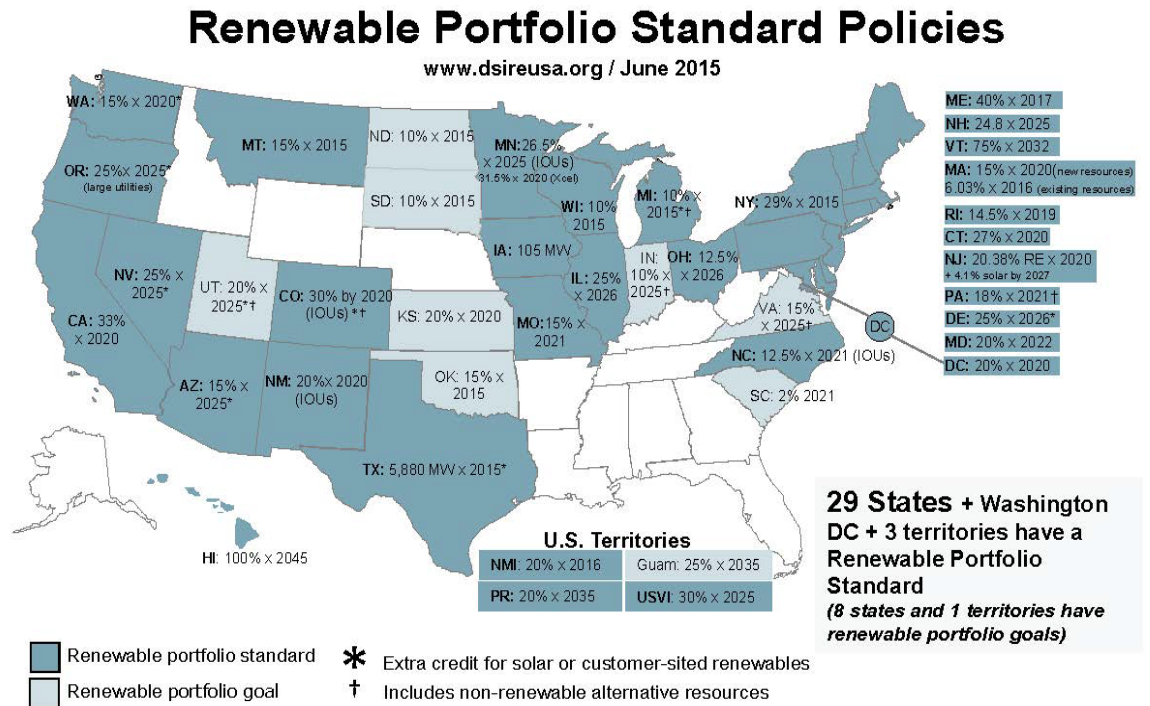


# POLICY COMPARISON TO OTHER STATES

- 29 states have a Renewable Portfolio Standard, ranging from 2%-75%

## RENEWABLE ENERGY

25% of electricity from renewable sources by 2025



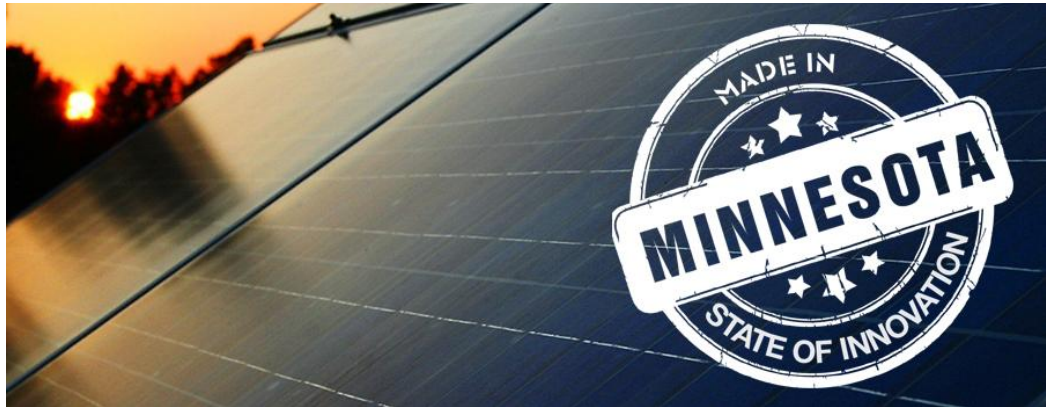
Source: U. S. Department of Energy and N.C. Energy Technology Center at N.C. State University. DSIRE. "Renewable Portfolio Standards." <http://www.dsireusa.org/resources/detailed-summary-maps/>

## RENEWABLE ENERGY

25% of total energy from  
renewable sources by 2025;  
25% of electricity from  
renewable sources by 2025;  
10% of electricity from solar by  
2030

## PROGRAMS AND RESOURCES

- Made in Minnesota Solar Incentive Program: \$15 million per year for incentives for Minnesota-made solar PV and solar thermal ([M.S. 216C.411-.416](#)).



Source: Minnesota Solar Energy Industries Association. "Made in Minnesota Solar Incentive Program for PV & Thermal."  
<http://www.mnseia.org/programs/made-in-minnesota>

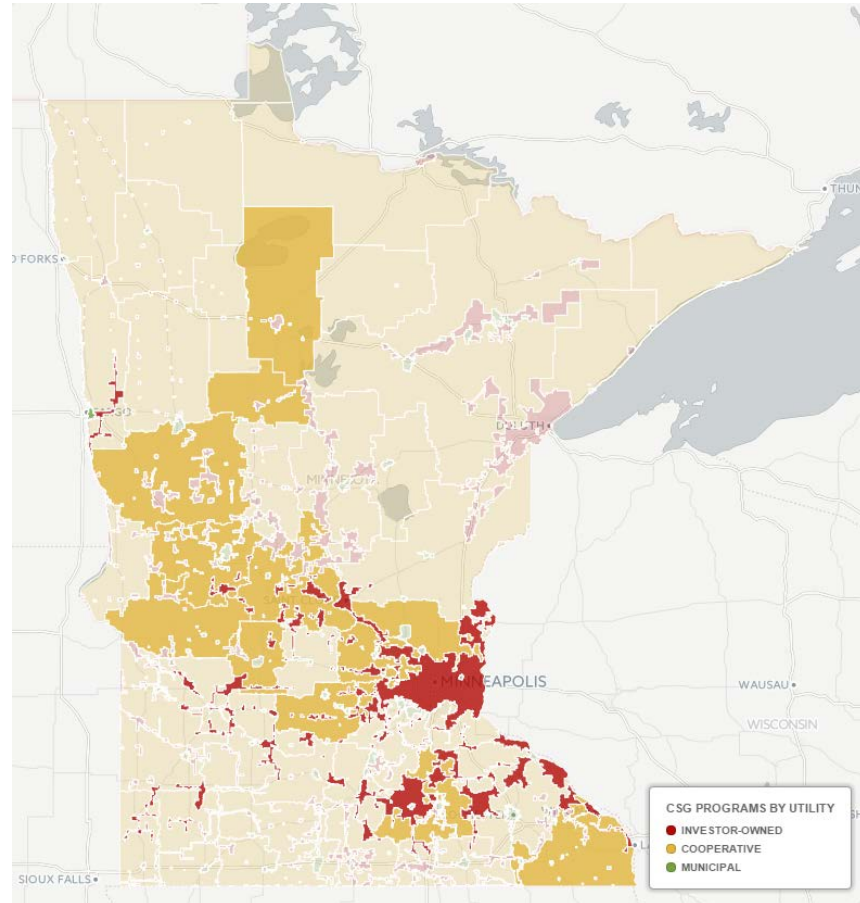
- Renewable Energy Production Incentive: up to \$10.9 million per year for performance-based incentives for wind, hydroelectric, and on-farm biogas facilities ([M.S. 216C.41](#))
- Solar Production Based Incentive (Xcel Energy): \$5 million per year for performance-based incentives for solar installations

## RENEWABLE ENERGY

25% of total energy from  
renewable sources by 2025;  
25% of electricity from  
renewable sources by 2025;  
10% of electricity from solar by  
2030

## PROGRAMS AND RESOURCES

- Community Solar Gardens: programs offered by utilities for customers to subscribe to a community solar installations ([M.S. 216B.1641](#)).



Utilities that offer community solar programs. Source: Clean Energy Resource Teams. "Community Solar Gardens."  
<http://www.cleanenergyresourceteams.org/solargardens#current>

## RENEWABLE ENERGY

25% of total energy from  
renewable sources by 2025;  
25% of electricity from  
renewable sources by 2025;  
10% of electricity from solar by  
2030

## PROGRAMS AND RESOURCES

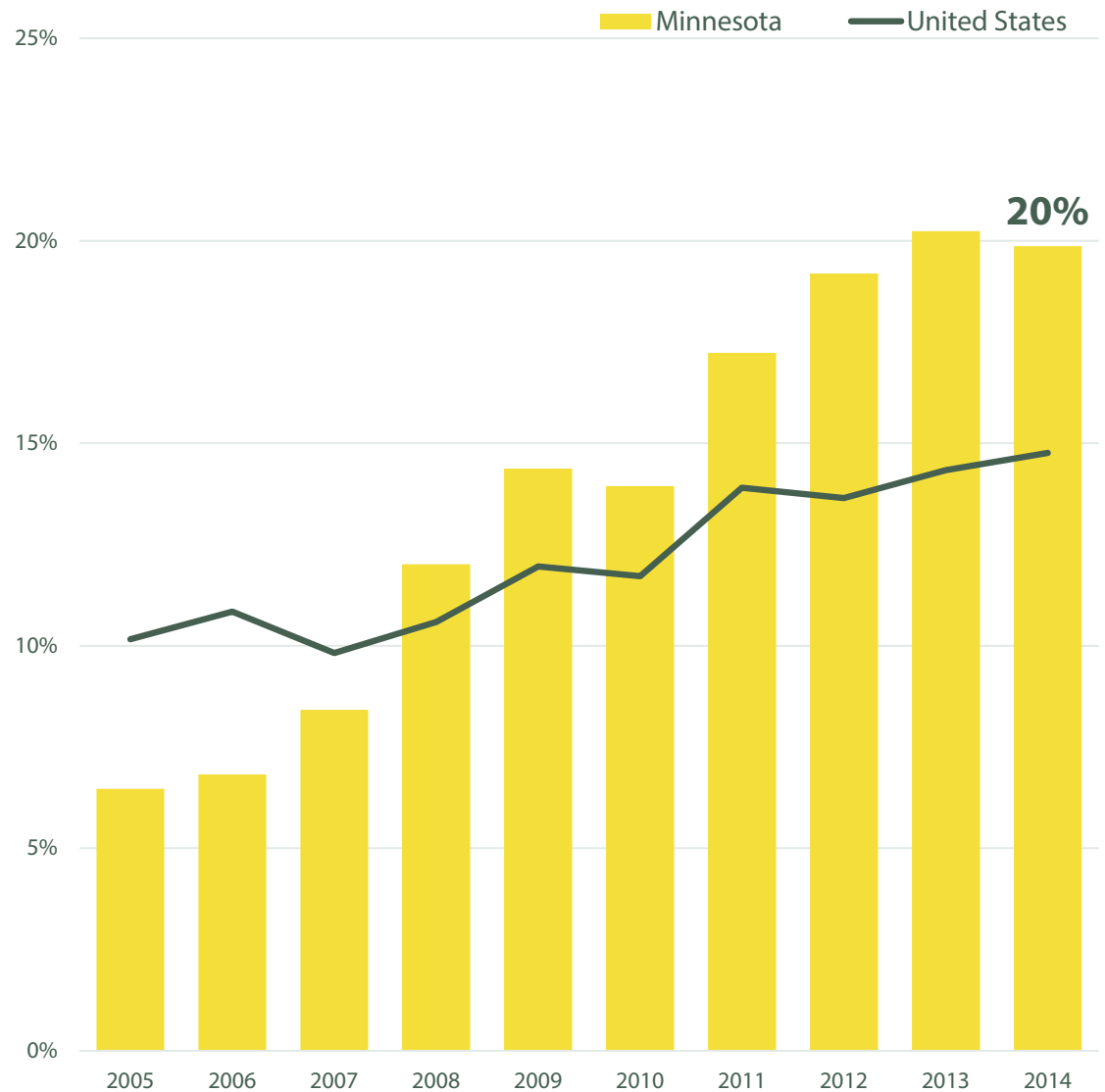
- Renewable Energy Equipment Grant Program: \$150,000 per year for grants to low-income Minnesota households ([Laws of MN 2015 1st Spec. Session](#), Ch 1, art 1. sec 8, subd 7).
- Property-Assessed Clean Energy (PACE): energy efficiency and renewable energy financing program for home and business owners
- Net energy metering: credits solar PV system owners for the electricity they add to the grid ([M.S. 216B.164](#)).
- Value of Solar Tariff: an alternative to net metering that credits grid-tied solar PV system owners for the value they provide to the utility, its customers, and society ([M.S. 216B.164, Subd. 10](#)).



## OUTCOMES | RENEWABLE % OF ELECTRICITY GENERATION

### RENEWABLE ENERGY

25% of electricity from  
renewable sources by 2025



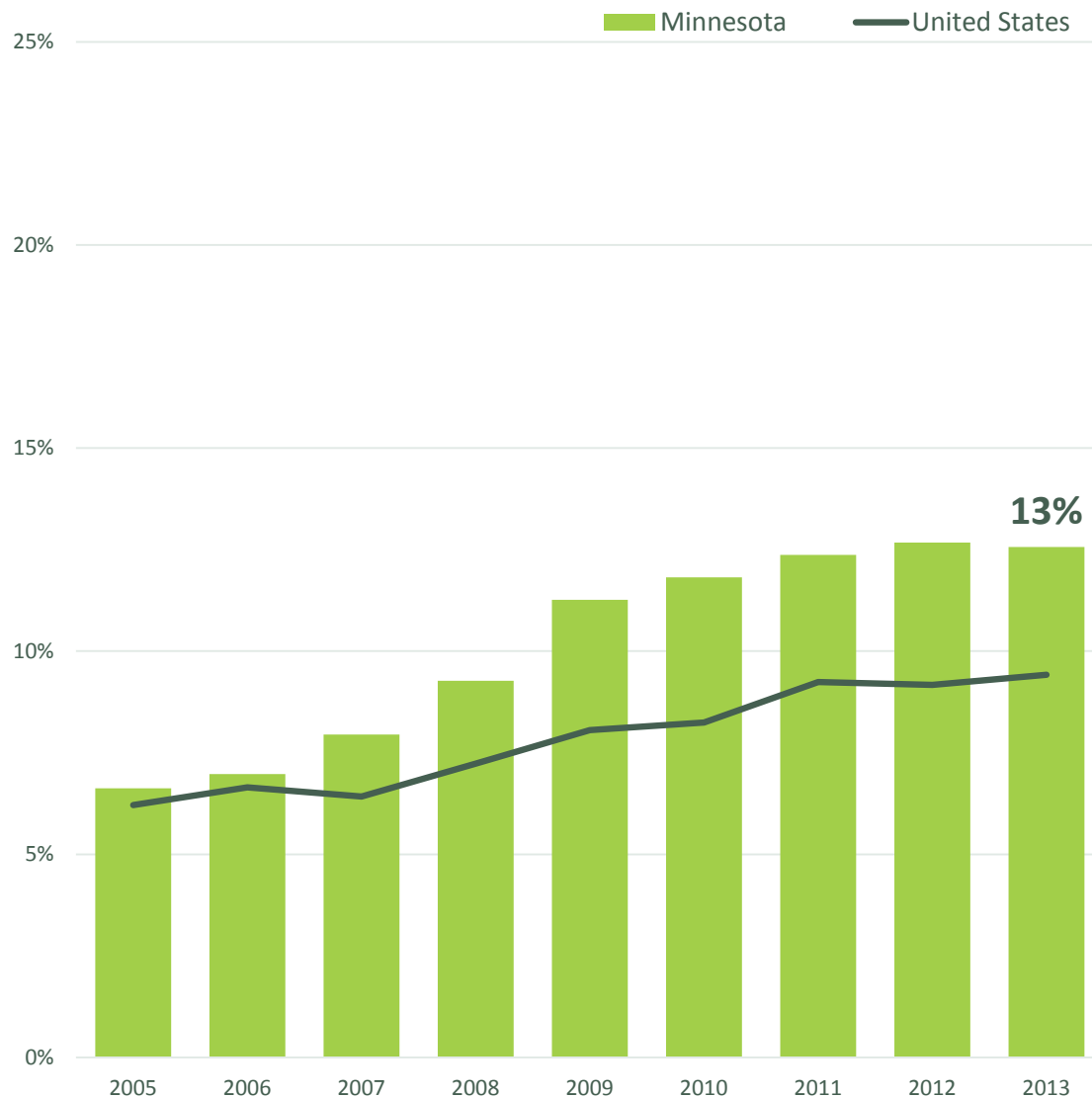
Source: U.S. Energy Information Administration. "Net Generation by State by Type of Producer by Energy Source." <http://www.eia.gov/electricity/data/state/>



## RENEWABLE ENERGY

25% of total energy from  
renewable sources by 2025

## OUTCOMES | RENEWABLE % OF ENERGY SUPPLY

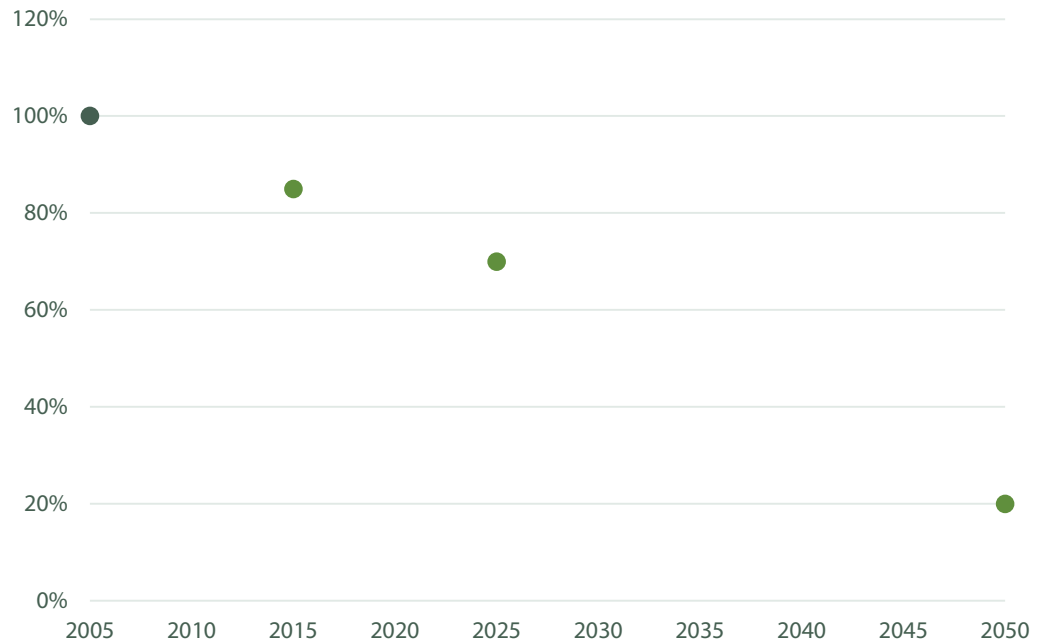


Source: U.S. Energy Information Administration. "Table CT3. Total End-Use Energy Consumption Estimates, 1960-2012, Minnesota". [http://www.eia.gov/state/seds/data.cfm?incfile=/state/seds/sep\\_use/tx/use\\_tx\\_MN.html&sid=MN](http://www.eia.gov/state/seds/data.cfm?incfile=/state/seds/sep_use/tx/use_tx_MN.html&sid=MN)

## CLIMATE

### POLICY

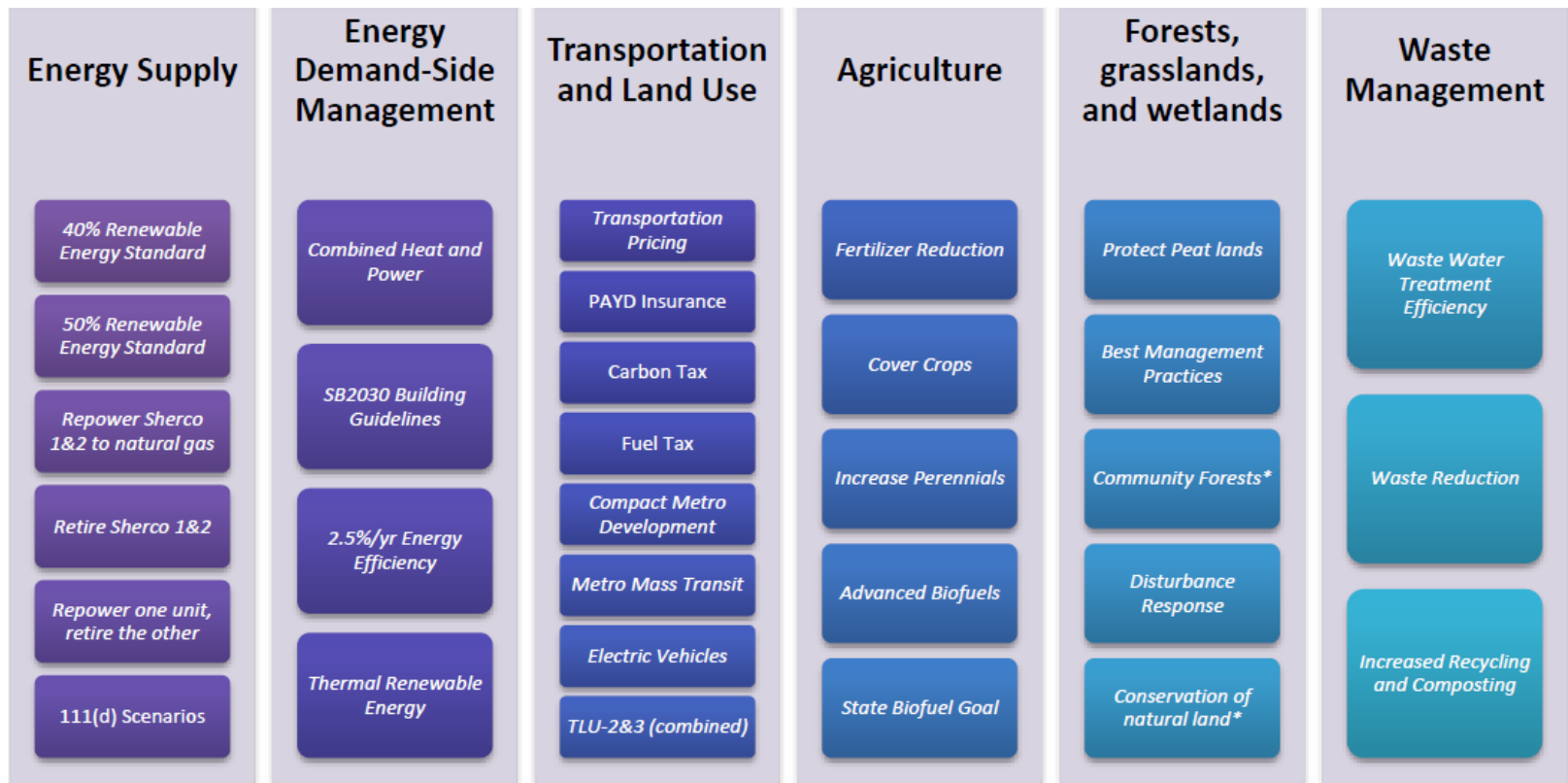
- Reduce per capita fossil fuel use for energy by 15% by 2015 ([M.S. 216C.05 Subd. 2](#))
- Reduce greenhouse gas emissions across all sectors producing those emissions to at a level at least:
  - 15% below 2005 levels by 2015;
  - 30% percent below 2005 levels by 2025; and
  - 80% below 2005 levels by 2050. ([M.S. 216H.02](#))



# PROGRAMS AND RESOURCES

## CLIMATE

- Climate Solutions and Economic Opportunities: project that identified and quantified strategies to bend the curve toward the statewide emissions goal



Source: Environmental Quality Board. "Climate Solutions and Economic Opportunities." For more information, visit: <http://www.environmental-initiative.org/our-work/environmental-policy/climate-solutions-economic-opportunities>

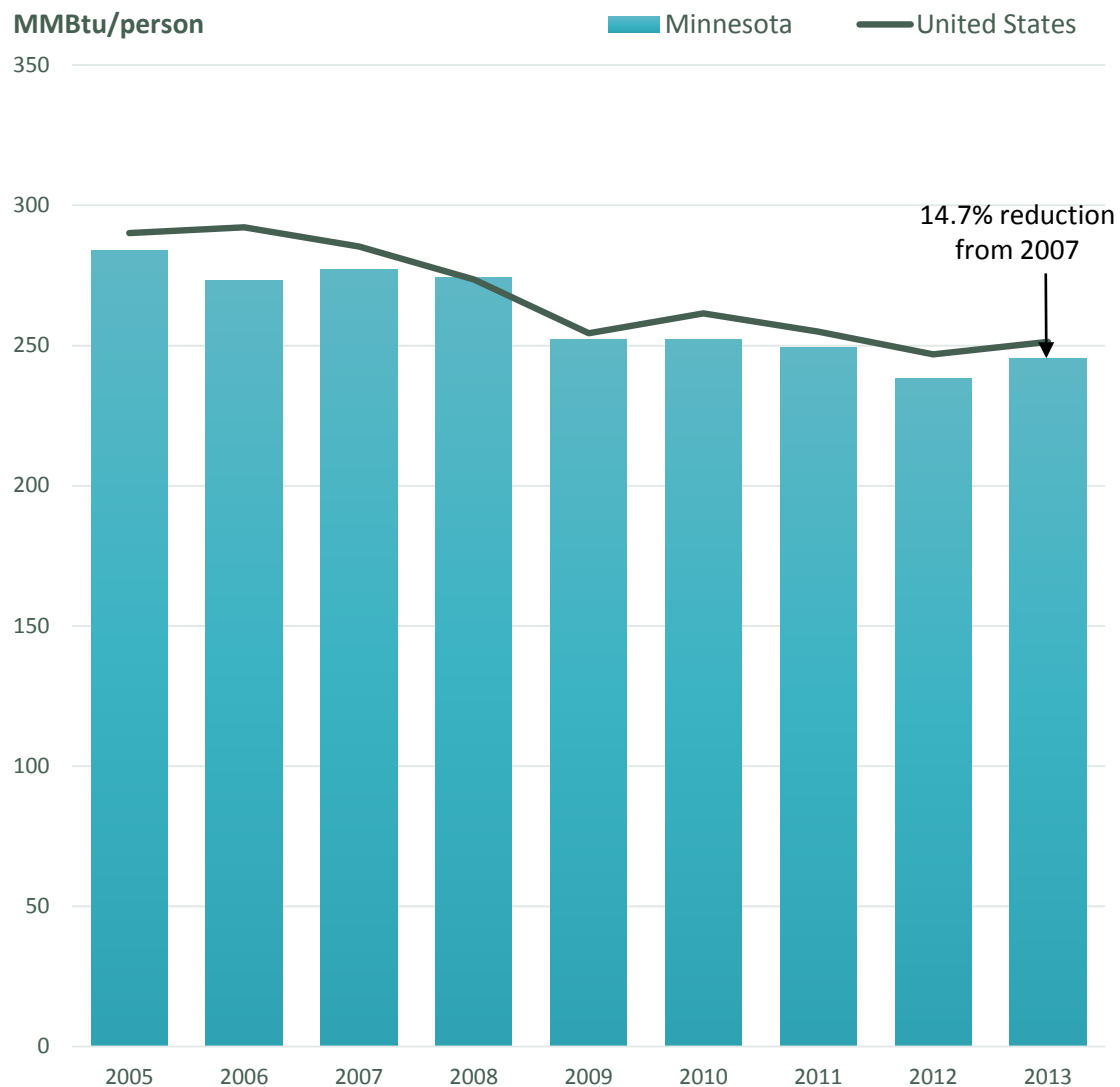




## CLIMATE

Reduce per capita fossil fuel use for energy by 15% by 2015

## OUTCOMES | FOSSIL FUEL USE PER CAPITA



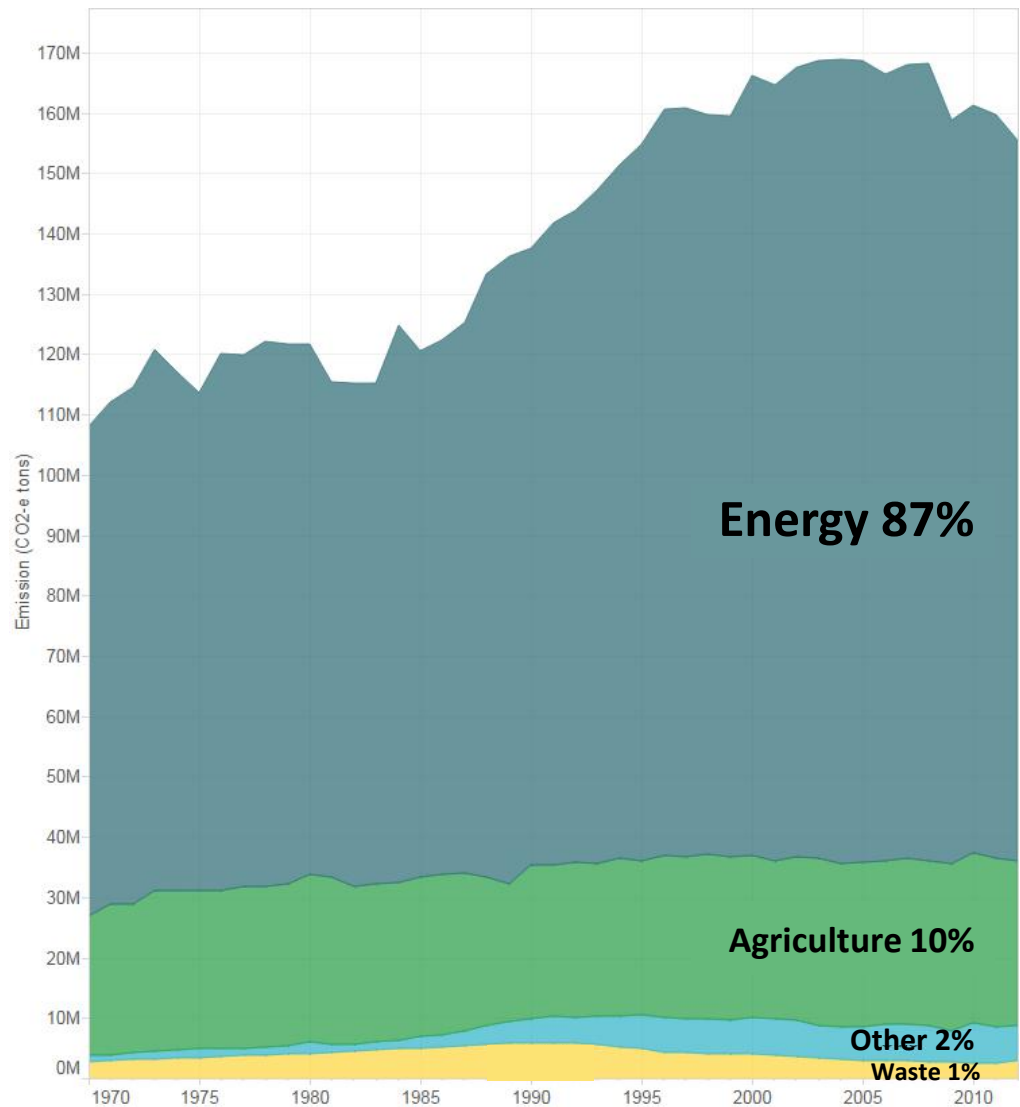
Source: U.S. Energy Information Administration. "Table CT3. Total End-Use Energy Consumption Estimates, 1960-2012, Minnesota". [http://www.eia.gov/state/seds/data.cfm?incfile=/state/seds/sep\\_use/tx/use\\_tx\\_MN.html&sid=MN](http://www.eia.gov/state/seds/data.cfm?incfile=/state/seds/sep_use/tx/use_tx_MN.html&sid=MN)



## OUTCOMES | EMISSIONS BY ACTIVITY

### CLIMATE

Reduce greenhouse gas emissions by 30% by 2025



Source: Minnesota Pollution Control Agency

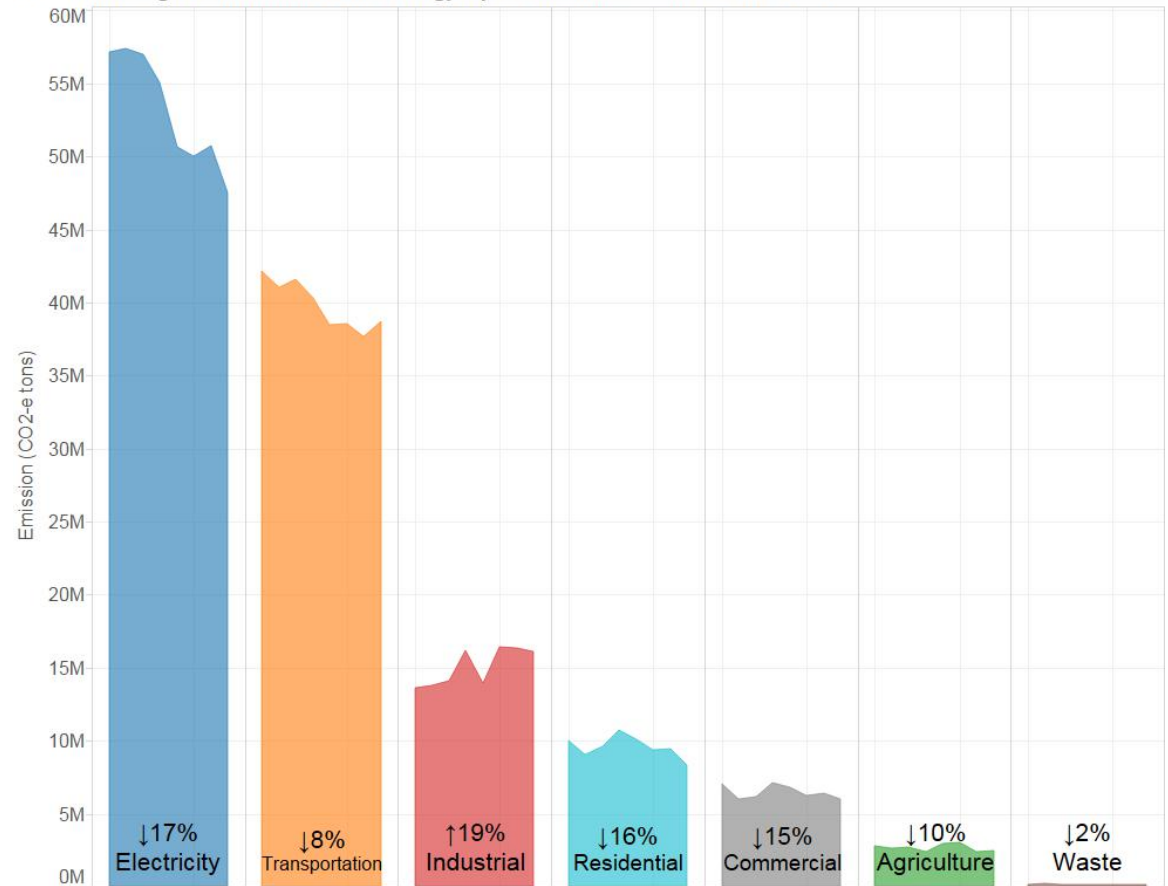


# OUTCOMES | ENERGY EMISSIONS TRENDS BY SECTOR

## CLIMATE

Reduce greenhouse gas emissions by 30% by 2025

Greenhouse gas emissions from energy by economic sectors: 2005-2012



Source: Minnesota Pollution Control Agency

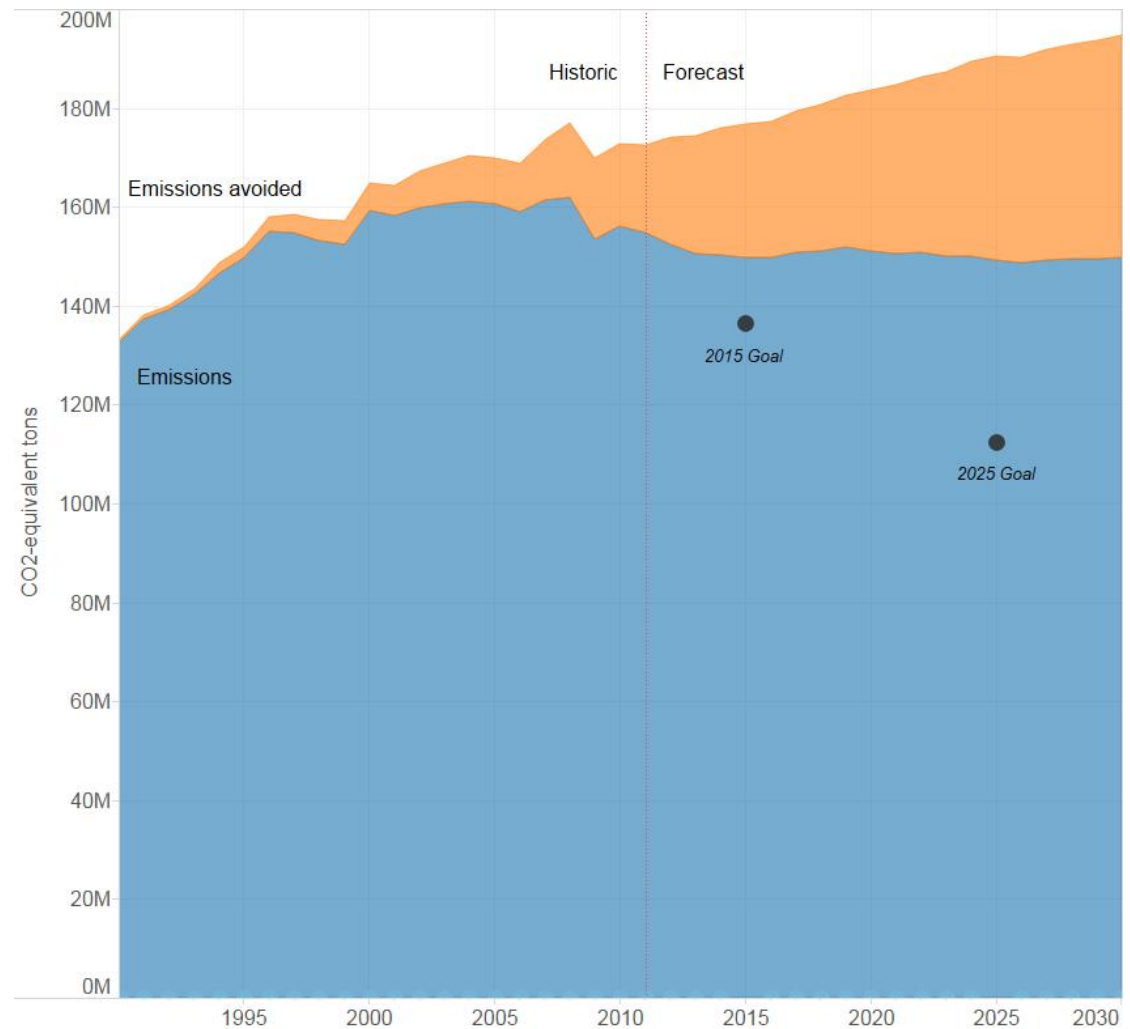
Greenhouse gas emissions from energy have decreased 10% from 2005-2012.



# OUTCOMES | FORECASTED EMISSIONS

## CLIMATE

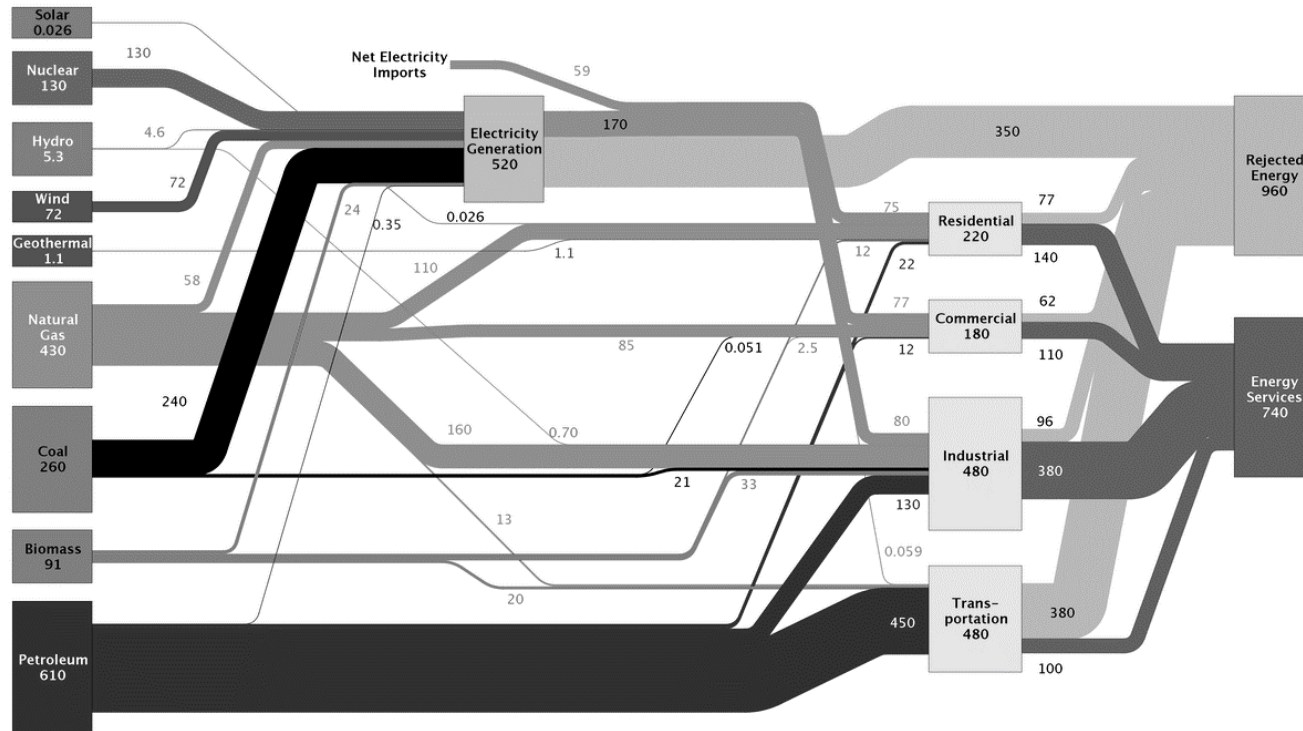
Reduce greenhouse gas emissions by 30% by 2025



Source: Minnesota Pollution Control Agency

# QUESTIONS?

- What else do you need to know in order to identify priority strategies and technologies for Minnesota to focus on over the next ten years?



Source: Lawrence Livermore National Laboratory. "Estimated Minnesota Energy Use in 2012." <https://flowcharts.llnl.gov/commodities/energy>

- Additional questions? Send to [becky.alexander@lhbcorp.com](mailto:becky.alexander@lhbcorp.com)

## **APPENDIX**

### **ENERGY EFFICIENCY**

- Energy use by sector
- Vehicle travel per capita

### **RENEWABLE ENERGY**

- Energy by fuel

### **CLIMATE**

- Energy emissions by sector/fuel
- Forecasted emissions by sector

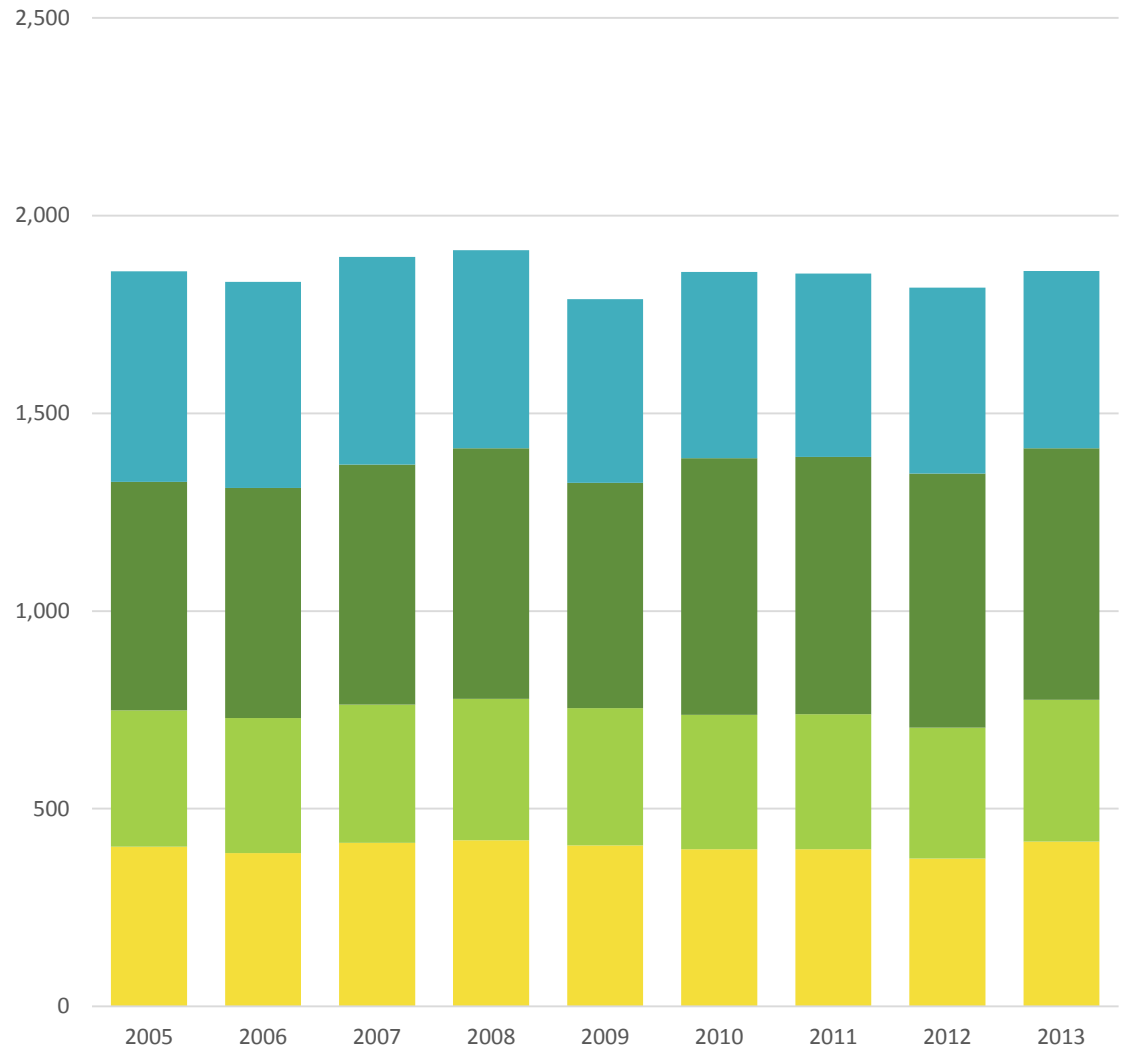
### **ENERGY ECONOMY**

- Energy prices
- Energy cost per gross state product

## ENERGY EFFICIENCY

### TOTAL ENERGY USE BY SECTOR

Trillion Btu

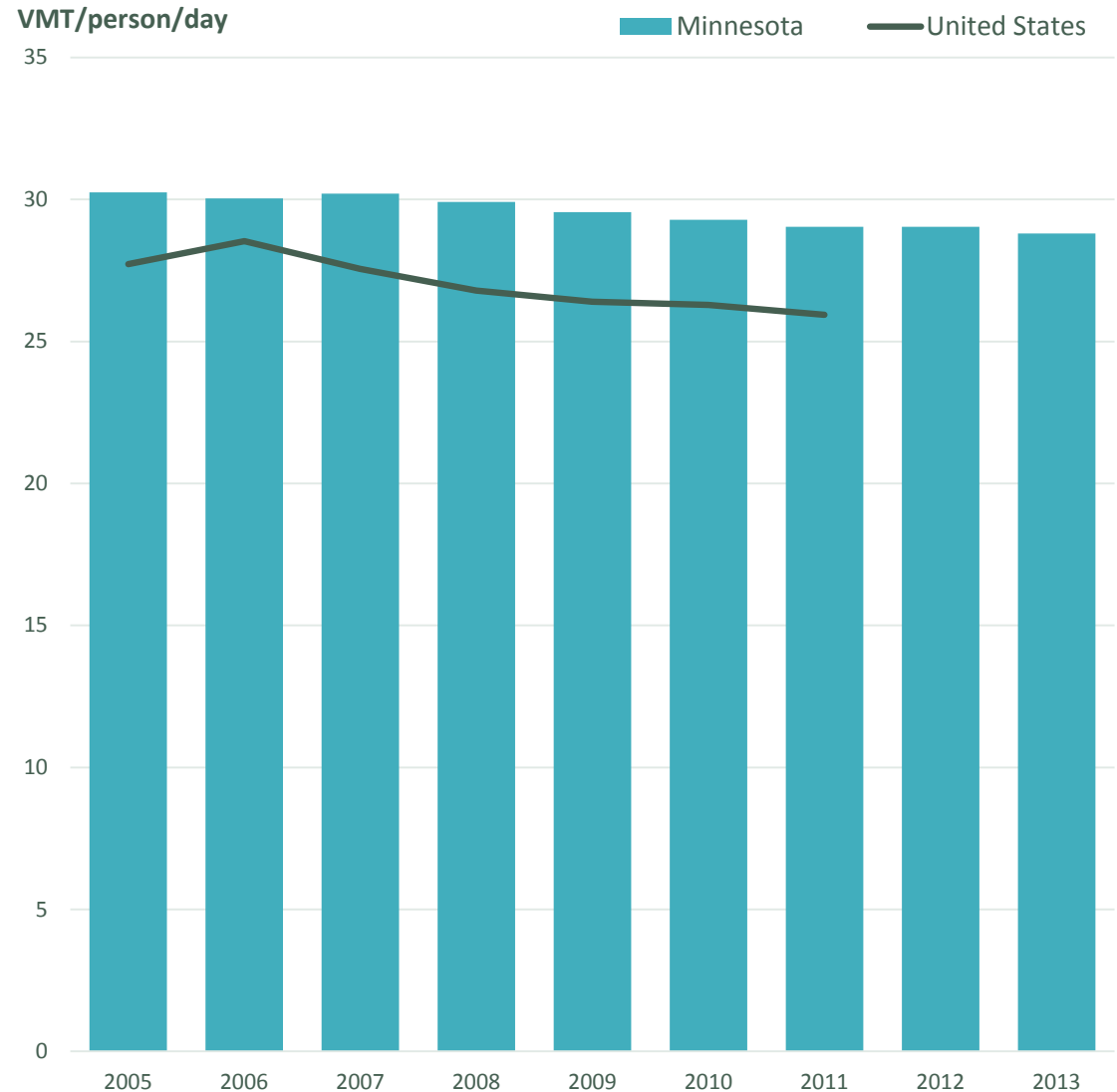


Source: U.S. Energy Information Administration. State Energy Data System. "Tables CT4-CT7, 1960-2013, Minnesota."  
<http://www.eia.gov/state/seds/seds-data-complete.cfm?sid=MN#Consumption>

# VEHICLE TRAVEL PER CAPITA

## ENERGY EFFICIENCY

- 4.7% reduction from 2007
- 12% higher than national average



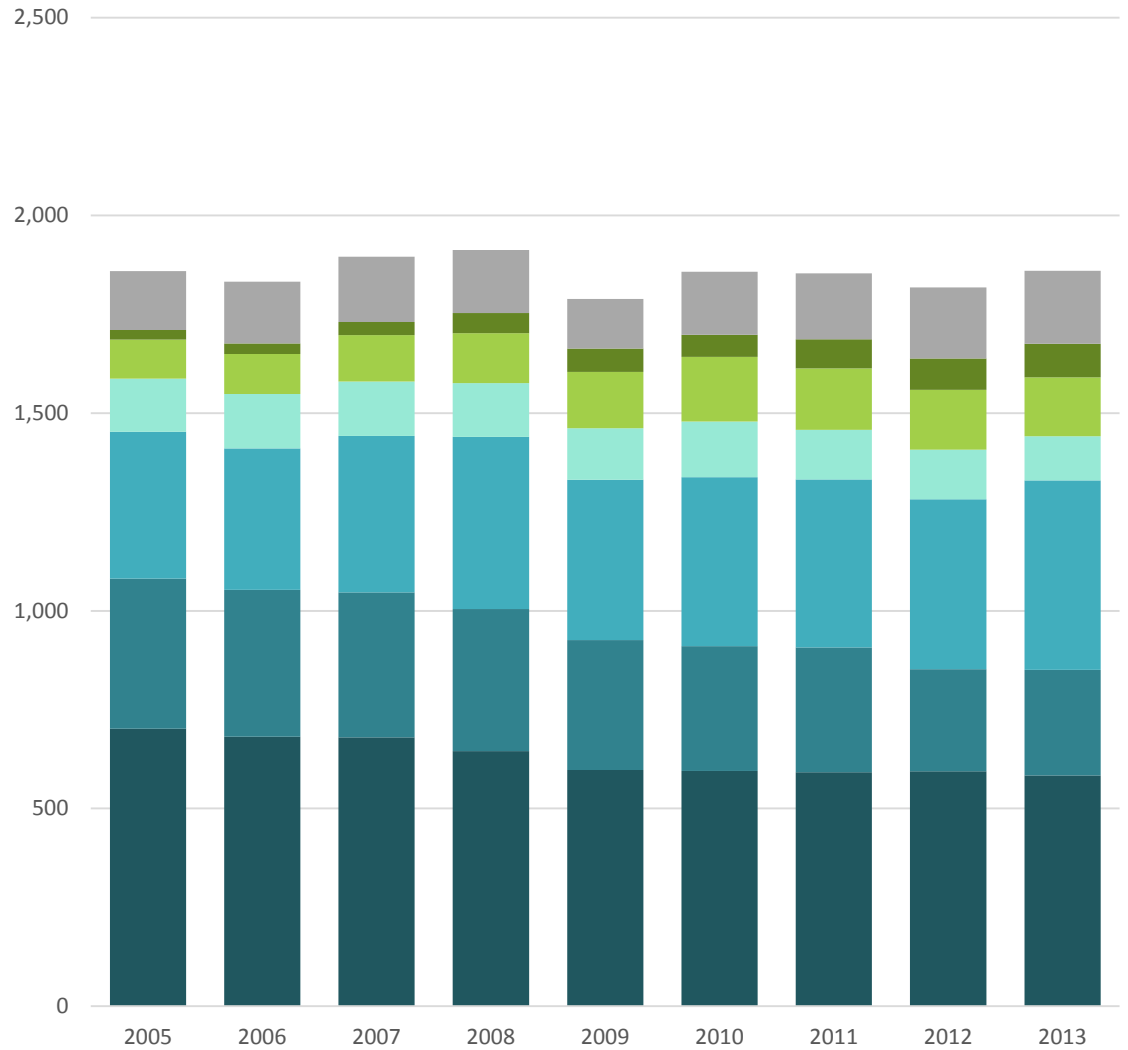
Sources: Minnesota Department of Transportation. "Roadway Data." <http://www.dot.state.mn.us/roadway/data/data-products.html#VMT>. U.S. Department of Transportation, Office of Highway Policy Information. "Vehicle Miles of Travel Highway Statistics Series." <http://www.fhwa.dot.gov/policyinformation/quickfinddata/qftravel.cfm>



## RENEWABLE ENERGY

# TOTAL ENERGY BY SOURCE

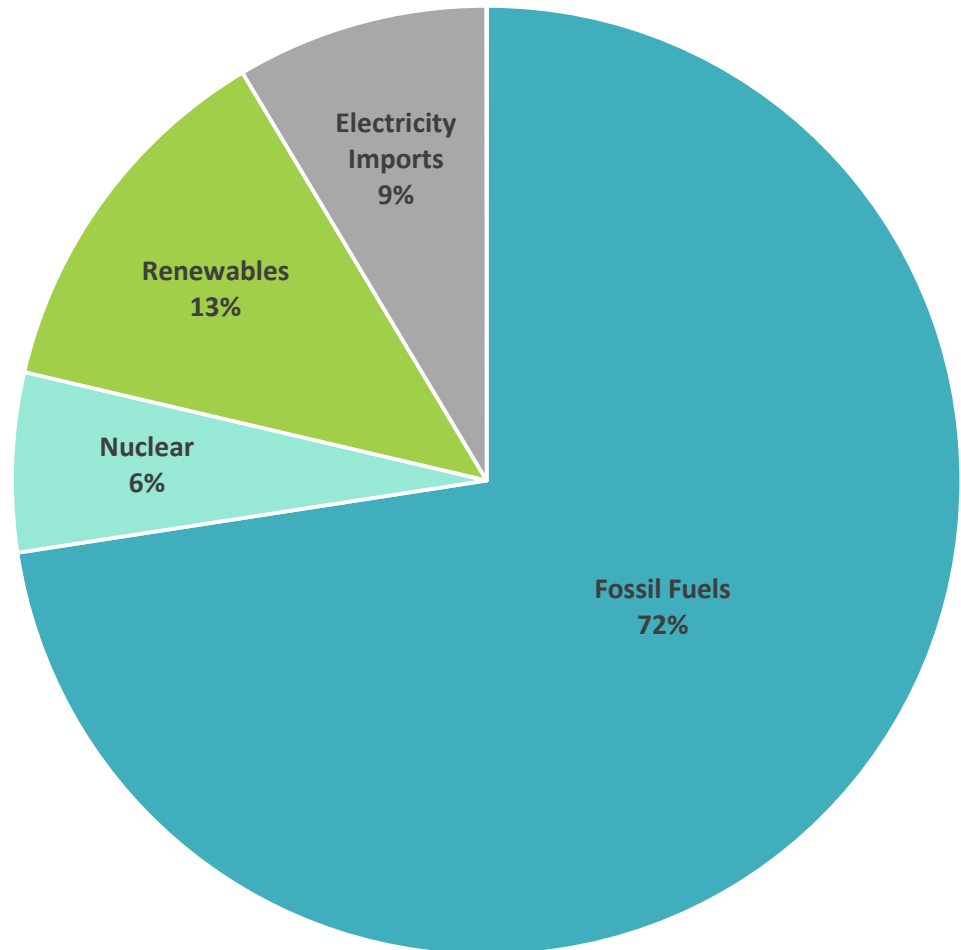
Trillion Btu



Source: U.S. Energy Information Administration. "Table CT1. Total End-Use Energy Consumption Estimates, 1960-2013, Minnesota". [http://www.eia.gov/state/seds/data.cfm?incfile=/state/seds/sep\\_use/total/use\\_tot\\_MN.html&sid=MN](http://www.eia.gov/state/seds/data.cfm?incfile=/state/seds/sep_use/total/use_tot_MN.html&sid=MN)

## ENERGY SOURCES (2013)

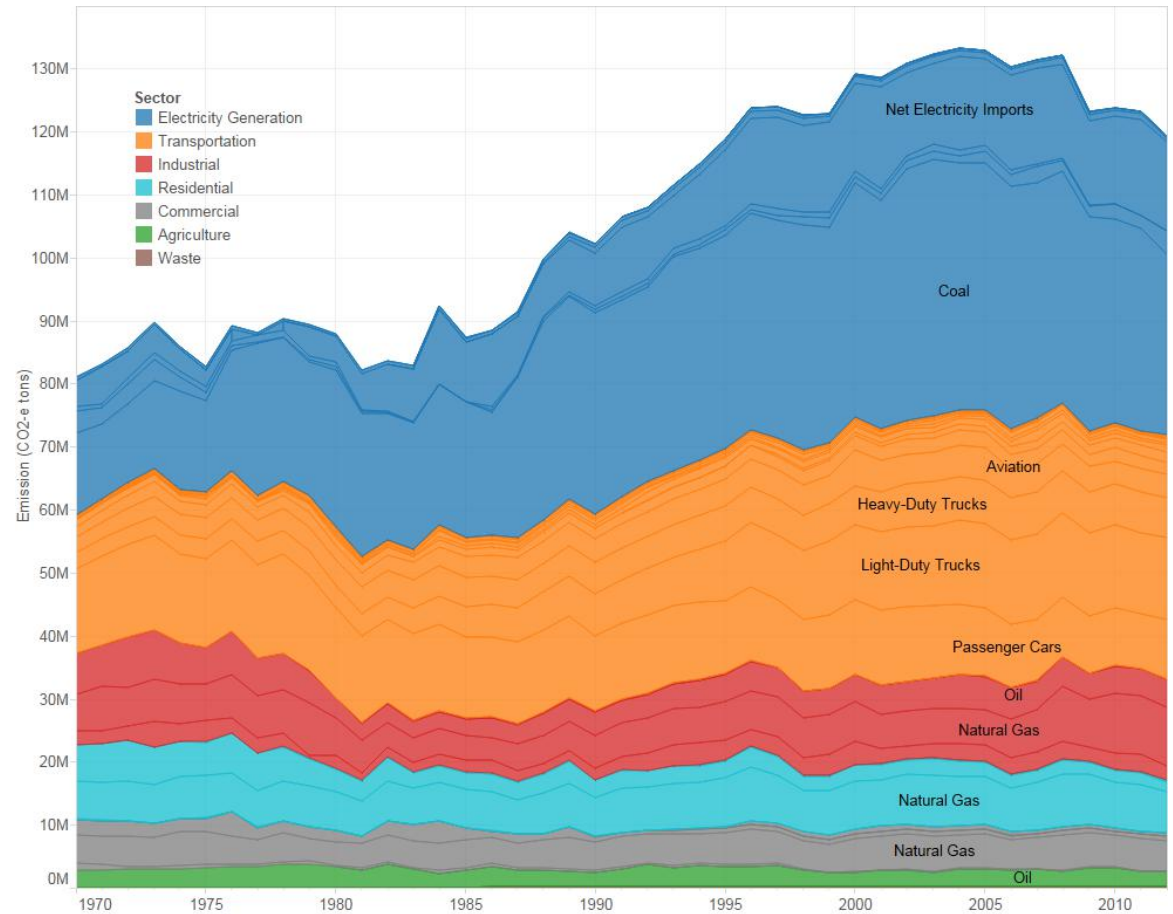
### RENEWABLE ENERGY



Source: U.S. Energy Information Administration. "Table CT1. Total End-Use Energy Consumption Estimates, 1960-2013, Minnesota". [http://www.eia.gov/state/seds/data.cfm?incfile=/state/seds/sep\\_use/total/use\\_tot\\_MNa.html&sid=MN](http://www.eia.gov/state/seds/data.cfm?incfile=/state/seds/sep_use/total/use_tot_MNa.html&sid=MN)

# HISTORIC MINNESOTA ENERGY EMISSIONS

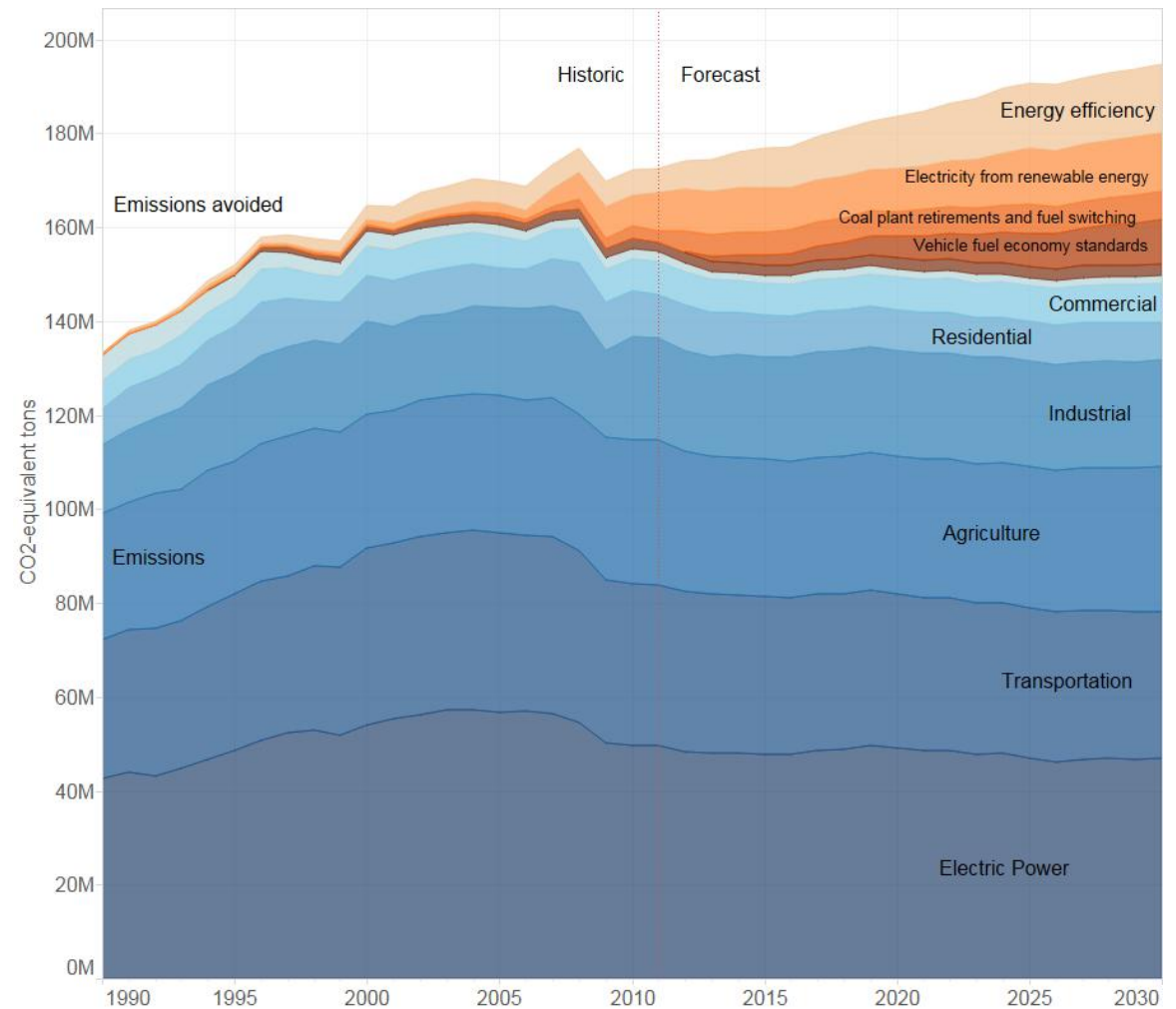
## CLIMATE



Source: Minnesota Pollution Control Agency

# FORECASTED MINNESOTA EMISSIONS

## CLIMATE

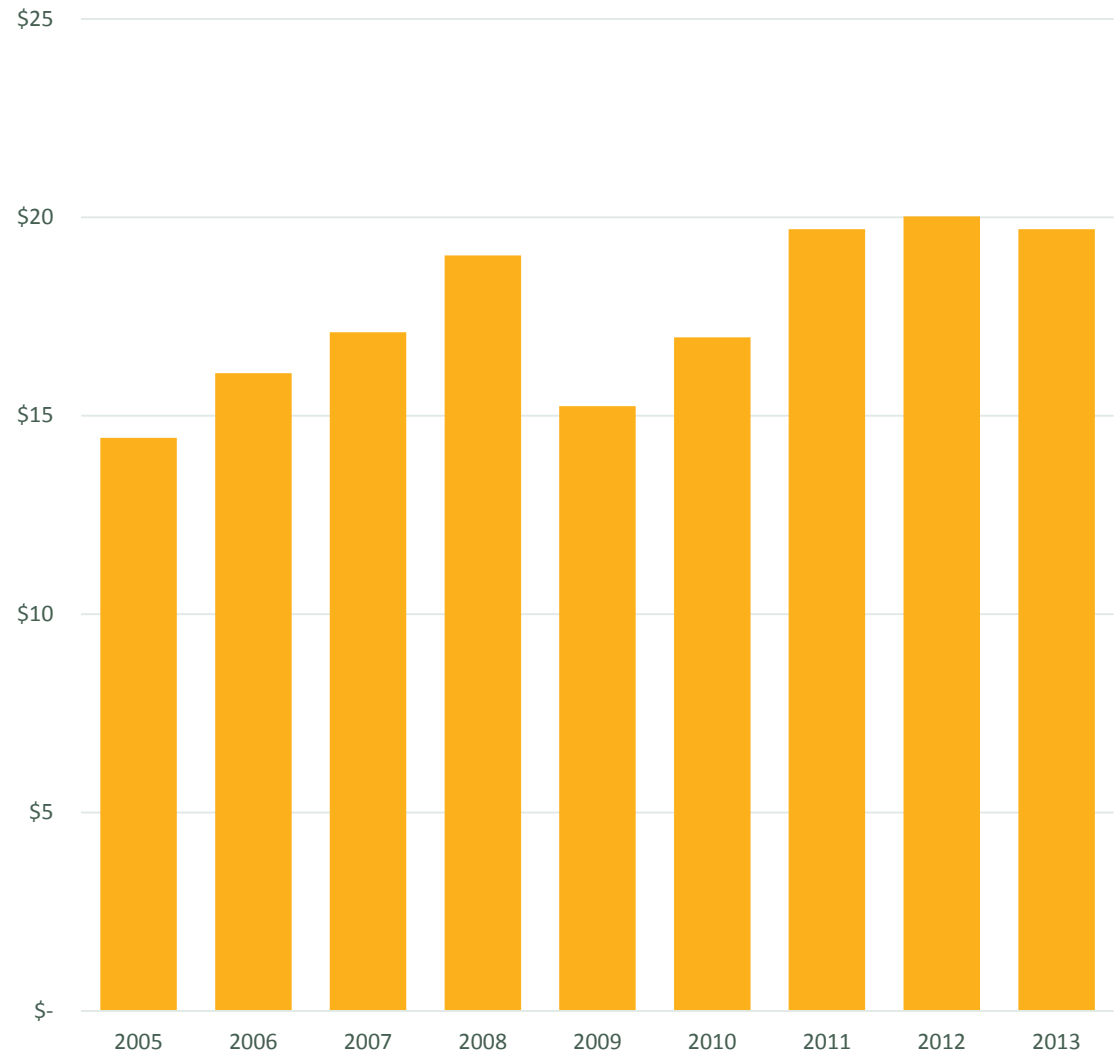


Source: Minnesota Pollution Control Agency

## ENERGY ECONOMY

### PRICE OF ENERGY

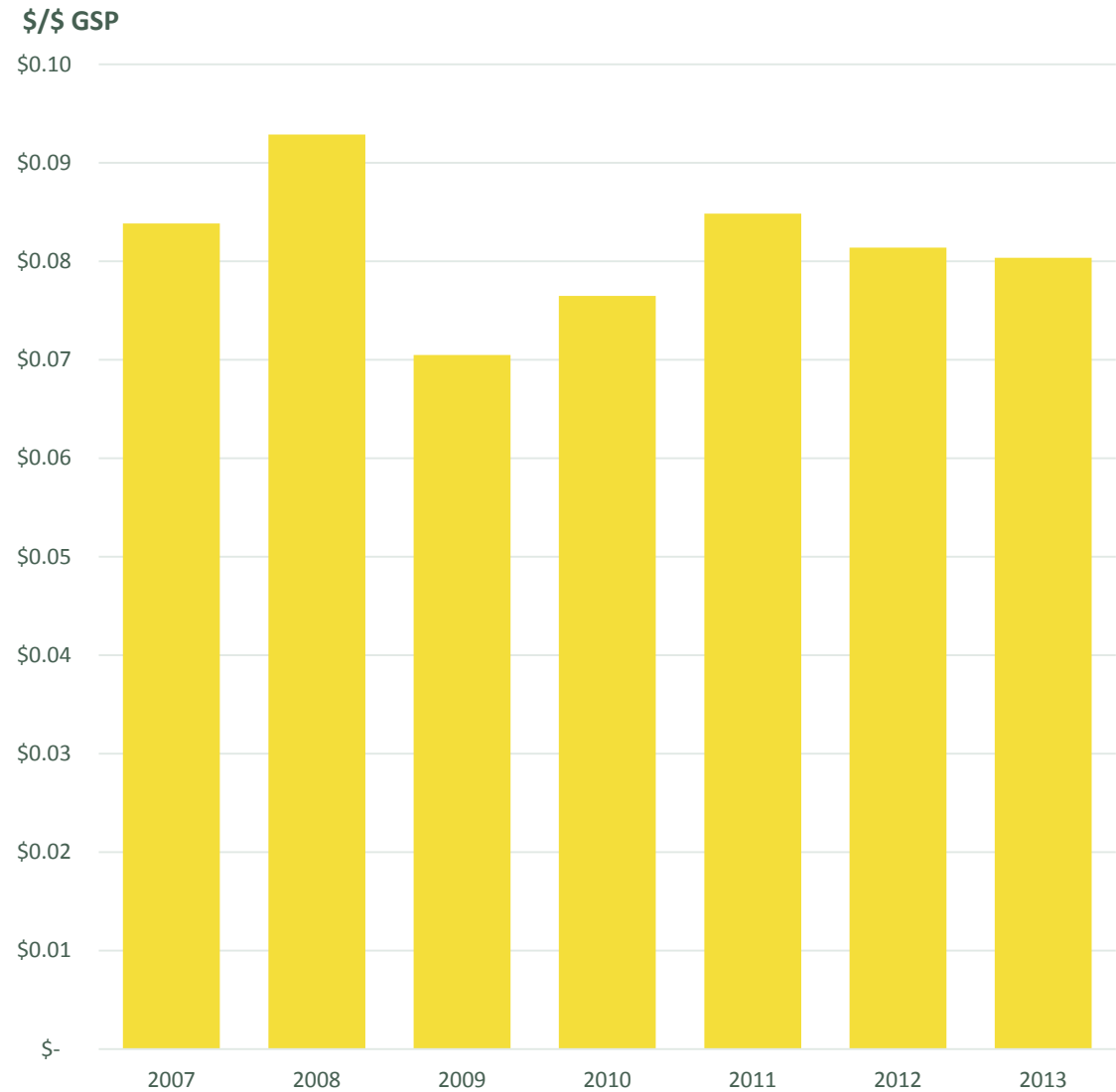
\$/MMBtu



Source: U.S. Energy Information Administration. "Table ET2. Total End-Use Energy Price and Expenditure Estimates, 1960-2013, Minnesota". [http://www.eia.gov/state/seds/data.cfm?incfile=/state/seds/sep\\_prices/tx/pr\\_tx\\_MN.html&sid=MN](http://www.eia.gov/state/seds/data.cfm?incfile=/state/seds/sep_prices/tx/pr_tx_MN.html&sid=MN)

## ENERGY ECONOMY

### ENERGY EXPENDITURES PER GSP



Sources: U.S. Energy Information Administration. "Table ET2. Total End-Use Energy Price and Expenditure Estimates, 1960-2013, Minnesota". [http://www.eia.gov/state/seds/data.cfm?incfile=/state/seds/sep\\_prices/tx/pr\\_tx\\_MN.html&sid=MN](http://www.eia.gov/state/seds/data.cfm?incfile=/state/seds/sep_prices/tx/pr_tx_MN.html&sid=MN).  
Federal Reserve Bank of St. Louis. "Total Gross Domestic Product for Minnesota." <https://research.stlouisfed.org/fred2/graph/?id=MNNGSP>