

# Minnesota Electricity Tax Swap

The 6.875% state sales tax in Minnesota seems to apply to some residential and almost all commercial sales of electricity. This document looks at replacing that sales tax on electricity with a carbon tax on electricity so as to give utilities an incentive to move away from fossil fuels while cushioning the price impact on consumers.

## State sales tax on electricity

The short version:

- Residential electricity is subject to the sales tax except that residences that are primarily heated with electricity are exempt during the six heating months of Nov - Apr; EIA estimates that 17.3% of households use electric heat, and a decent ballpark is that 75% of the electricity used by those households is exempt.
- Commercial electricity is subject to the sales tax except for governments, data centers, and some charities and tribes.
- Industrial electricity is most exempt from sales tax: for example, electricity used to power a press is exempt, but electricity used to light the workspace is not.
- MN DOR data (on sales taxes from electric power generation, transmission, and distribution) is that sales taxes on electricity total about \$317m. Our estimate (below) is roughly in line with that.

For the longer version (which you should probably ignore!), some relevant definitions are in [297A.61](#). Even more helpful are some [sales tax fact sheets](#):

- [Fact Sheet 157 \(Residential Utilities\)](#) says that sales of electricity to residential customers is *exempt from sales tax from November through April if used as their primary source of heat*. (Ditto for natural gas.) It says: “When the primary source of residential heat is either natural gas or electricity, and there is only one meter for that utility, then all gas or electricity measured through that meter is not taxable during the winter heating months.” It also has exemptions for certain tribal members and entities.
- [Fact Sheet 129 \(Utilities Used in Production\)](#) says that electricity used “in agricultural or industrial production is exempt... if it is necessary to produce a particular product [and] is in excess of the average climate control or lighting for the production area.”
- There’s also a [Tax Expenditures](#) document that notes that exemptions include local governments, “utility services to charitable, religious, or educational organizations”, and electricity used in data centers.

How important is the 6-month residential exemption for electric-heat households? Well, [EIA data](#) (click on “Consumption and Expenditures” and then scroll down to the bottom) shows that 17.3% of Minnesota households use electricity for home heating. (That compares with 39.5% of all U.S. households; EIA also shows that space heating--not including A/C--accounts for [14.8% of residential electricity consumption](#) and [43% of total home energy consumption](#) in the U.S.).

Also, the Overview section below links to annual utility reports that list customers and MWh served for all residential customers and for residential customers with electric heat, so it's possible to calculate MWh / customer for these two classes and then get a ratio:

- Xcel: it's 7.3 for all and 11.5 for the 3% (36k) with electric heat, so 60% more.
- Arrowhead: 12.0 for all and 16.4 for the 31% (1.2k) with electric heat, so 64% more.
- Stearns: 12.3 for all and 23.8 for the 21% (4.4k) with electric heat, so 158% more.
- Lake Region: 11.7 for all and 16.5 for the 35% (6.7k) with electric heat, so 81% more.
- MN Valley: 12.0 for all and 22.5 for the 13% (5.2k) with electric heat, so 116% more.
- Crow Wing: it's 9.4 for all and 14.4 for the 22% (9.2k) with electric heat, so 80% more.

So let's estimate that homes in Minnesota that use electricity for home heating (17.3% of MN households) use *twice* as much electricity as other homes, with half of that electricity going to home heating and the other half going to refrigeration, lighting, etc. that is spread out evenly over the year. *All* of their electricity is exempt from sales tax during the 6 heating months, so overall 75% of their electricity is exempt from sales tax. So this ballpark means that 34.6% (twice 17.3%) of residential electricity consumption is for electric-heat households, of which only 25% is subject to sales tax, and that the remaining 65.4% of residential electricity consumption is from non-electric- heat households and is 100% subject to sales tax, meaning that the percentage of total residential electricity consumption that is subject to sales tax is 74.05% ( $=34.6\% \times 25\% + 65.4\% \times 100\%$ ). *This ballpark may or not be great, but it was estimated independently of the revenue estimate below, which is pretty close!*

Here's a revenue estimate based on 2019 EIA data on state electricity [sales](#) and [revenue](#).

Sector	Sales (million MWh)	Utility revenue (\$m)	Avg. price (cents per kWh)	State tax revenue at 6.875% (\$m)	Avg. tax (cents per kWh)
Residential (all)	22.288	\$2,907	13.04		
Elec. heat (17.3%)	3.856	\$503	13.04	\$9*	0.23
Other heat (83.7%)	18.432	\$2,404	13.04	\$165	0.90
Commercial	22.904	\$2,369	10.34	\$163	0.71
Industrial	21.748	\$1,637	7.53	\$11**	0.05
Transportation	0	\$2	N/A	\$0	N/A
<b>Resid. + Commer.</b>	<b>45.192</b>	<b>\$5,276</b>	<b>11.67</b>	<b>\$337</b>	<b>0.75</b>

\* Assumes that 25% of electricity use (the share for the 6 non-heating months) is taxed.

\*\* Assumes that 10% of industrial use (for lighting, space heating, etc.) is taxed.

Note also that [Tax Expenditures](#) says (p114) that the residential heating fuels exemption (which covers all residential sales of fuel oil, coal, wood, steam, hot water, propane gas, and LPG and Nov-April sales of natural gas and electricity as described above) costs the state \$115m in FY2020. Unfortunately there's no breakdown here for electricity alone, but if we just take 17.3% of that as an electricity estimate then we get \$20m as the cost of the electricity tax exemption, which is also roughly in line with the estimates from the table. (The table indicates that residences with electric heat pay \$9m in sales tax, and since we assume they're only paying on 25% of their electricity use then the value of that exemption is \$27m.)

Finally: MN DOR has [2018 sales tax revenue](#) by 4-digit industry code. For code 2211 (Electric Power Generation, Transmission, & Distribution), it lists:

- Gross Sales: \$12,054.3m (perhaps this includes wholesale transactions?)
- Taxable Sales: \$4,441.4m (compares reasonably with \$5,276m in utility revenue above since some portion of industrial sales and residential sales are exempt; more specifically, if 74% of residential electricity is exempt then \$5,276 goes down to \$4,520; if 90% of industrial electricity is exempt then it goes down further to \$3,047.)
- **Total Tax: \$317.0m (this is pretty close to the \$337m in the table above!)** Note that the total tax is composed of \$305.3m in sales tax and \$11.6m in use tax. Note also that the MN DOR numbers account for exemptions for governments, etc.
- Number: 144 (presumably the number of taxpayers, which is in the ballpark of the number of utilities in MN; see Utilities tab [here](#).)

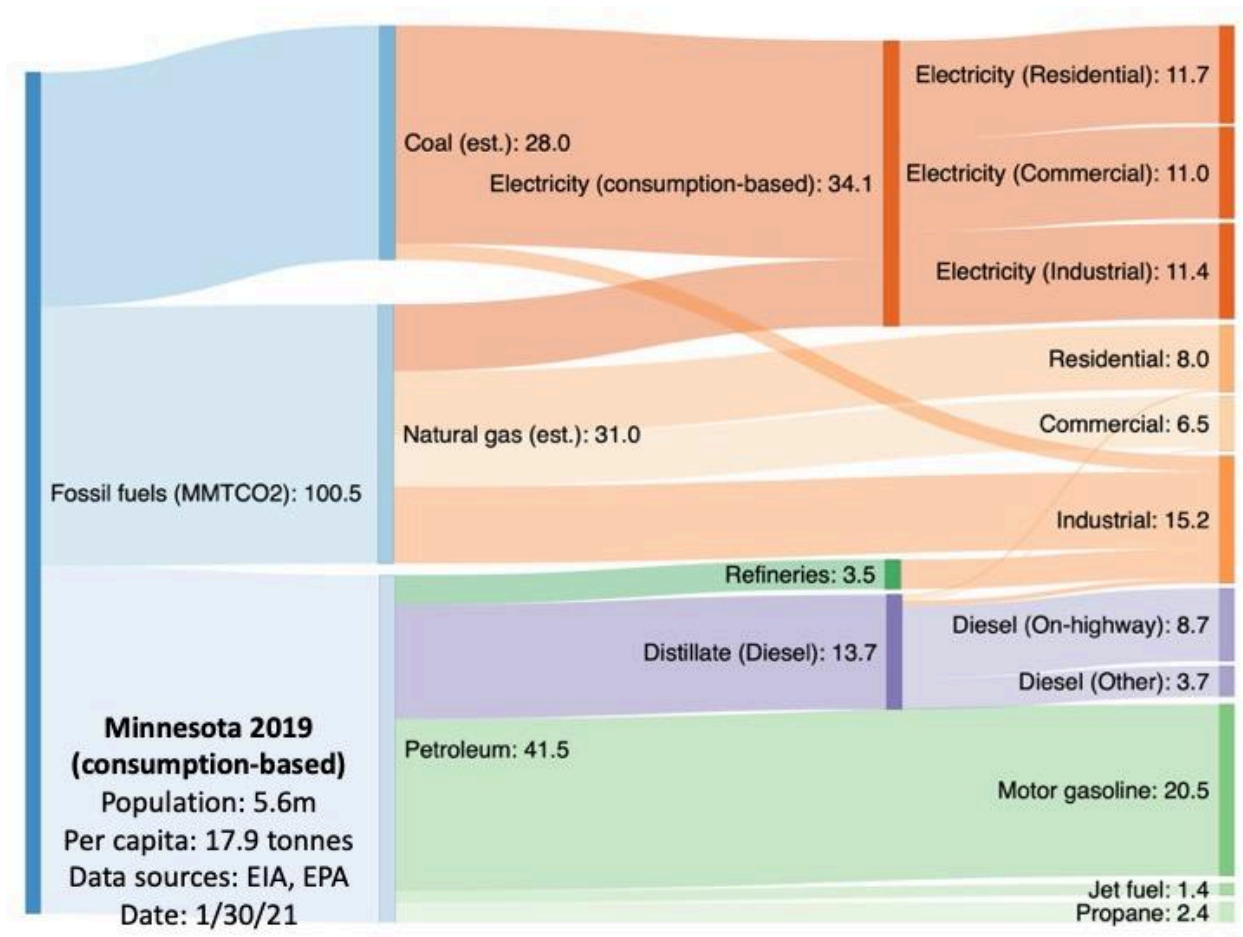
For context, that \$317m [makes up](#) 5.5% of general sales and use tax revenue in Minnesota in Fiscal Year 2018 (\$5.8 billion) and 1.5% of total revenue collection (\$21.5 billion).

#### Questions and comments:

- Can we get MN DOR to break down the revenue from this portion of the sales tax: residential, commercial, etc.?
- Any other exemptions?
- Does this money go into the General Fund or ??
- There's also local sales tax, so we need to think about whether we should aim to eliminate state *and* local sales taxes on electricity, or only the state sales tax (is that possible?), or lower the state rate to something very close to zero (e.g., 0.1%) so that the state tax stays on the books and consequently doesn't interfere with the local tax.
- [CEX data](#) shows that electricity taxes are even more regressive than grocery taxes.
- What to do about long-run revenue stability issues? One short- / mid-term option is to raise the carbon tax rate over time, which can postpone but not eliminate revenue stability issues. In a long run scenario where CO2 emissions are zero, perhaps the only two options are to (1) reinstate the sales tax in (say) 2040, or (2) leave the revenue drop because taxes on electricity are very regressive.

## Fossil CO2 in Minnesota

The Sankey diagram below for fossil CO2 in Minnesota is based mostly on [EIA data](#) for 2019, plus the sources listed below that show a statewide emissions intensity of 0.50 MTCO2/MWh. Note that this electricity CO2 estimate here is based on the carbon content of electricity *consumed* in the state. An estimate based on the carbon content of electricity *generated* in the state would be lower because the state imports about 10% of its electricity.



CO2 emissions from the residential and commercial sectors total 22.7 MMTCO2. (Note: This is a bit lower than estimates from the state's [GHG emissions data for 2016](#).) So if you wanted to generate the same \$317m in revenue that the sales tax on electricity currently generates then you'd need a carbon tax of about \$14 per ton CO2.

Alternatively: If you want to exempt residences with electric heat from the carbon tax but still give them the sales tax break (because they're mostly exempt from the sales tax as-is, and because that would be an incentive to "electrify everything") then CO2 emissions from R+C would total about 20.8 MMTCO2. (The table above shows that residences with electric heat use

3.856m MWh of power, so at a carbon intensity of 0.5 that's 1.9 MMTCO<sub>2</sub>.) So if you want to generate \$317m in revenue then you'd need a carbon tax of about \$15 per ton CO<sub>2</sub>.

Alternatively: Since residences with electric heat only pay (about) 25% of the sales tax, perhaps it makes sense to have them pay 25% of the carbon tax. Then CO<sub>2</sub> emissions total 20.7 + 0.25\*1.9 = 21.2 MMTCO<sub>2</sub>, and if you wanted to generate \$317m in revenue then you'd need a carbon tax of \$14.95. **Let's call it \$15 and go with this approach for now.**

Bottom line: a carbon tax of about \$15 on residential and commercial electricity would have generated about the same in revenue (\$317m) as the existing sales tax on those sectors. But a carbon tax (unlike a sales tax) will give utilities a financial incentive to reduce emissions!

## Electricity (Summary)

The table below summarizes the Minnesota electricity sector, with columns as follows:

1. **Name of the utility** (or utilities, e.g., Great River members).
2. **% share of MWhs** sold to the residential and commercial sectors.
3. **Carbon intensity** (MTCO<sub>2</sub>/MWh), e.g., coal-fired power is roughly 1.0. *This amount is also the cents/kWh impact of a \$10 carbon tax* (e.g., about 1 cent/kWh for coal).
4. **Estimated savings (or costs) from a revenue-neutral tax swap**, in cents per kWh. This estimates the combined impact of eliminating the state sales tax (an average savings of 0.75 cents per kWh) and replacing it with a \$15 carbon tax (an average cost of 0.75 cents per kWh). Customers of utilities with a carbon intensity that is *lower* than the statewide average will end up paying a bit less; customers of utilities with a carbon intensity that is *higher* than the statewide average will end up paying a bit more.

Name	% of sales (R+C)	MTCO <sub>2</sub> /MWh	Net savings (+) or cost (-) from tax swap, cents/kWh
<b>Statewide average</b>	<b>100%</b>	<b>0.50 (?)</b>	<b>0</b>
Northern States Power (Xcel)	47.6%	0.36	+ 0.21
Minnesota Power (ALLETE)	6.5%	0.63	- 0.20
Otter Tail Power	3.6%	0.79	- 0.44
Great River Energy members	24.5%	0.62 (?)	- 0.18
SMMPA members	4.3%	0.75 (?)	- 0.38
MRES members	3.3%	0.40 (?)	+ 0.15
Minnkota members	2.9%	0.70 (?)	- 0.30

MMPA members	2.2%	0.50 (?)	0
Other	5.0%	0.70 (??)	- 0.30

## Electricity (Gory details)

The Utilities tab [here](#) has EIA data on electricity providers in Minnesota. Here is more information about these providers, including an estimate of their % share of MWh sold to the residential and commercial sectors and an estimate of their carbon intensity (with coal-fired power and gas-fired power being [roughly](#) 1.0 and 0.5 MTCO<sub>2</sub>/MWh, respectively):

### 58% of electricity sales: IOUs (Investor Owned Utilities)

47.6%: **Northern States Power Co.**, a division of **Xcel Energy**

Their [EEI spreadsheet](#) says that their emissions intensity is 0.36 MTCO<sub>2</sub>/MWh. See more info in the South Dakota document.

6.5%: **Minnesota Power**, a division of **ALLETE**

Their [EEI template](#) says that their emissions intensity is 0.63 MTCO<sub>2</sub>/MWh. Note that we're assuming that their customer base includes a number of municipal utilities (e.g., Grand Rapids Public Utilities) that apparently get most if not all their power from MN Power. Here's their [IRP](#).

3.6%: **Otter Tail Power Co.**

Their [EEI template](#) says that their emissions intensity is 0.79 MTCO<sub>2</sub> / MWh. See more info in the South Dakota document.

### 42% of electricity sales: Coops, municipal utilities, etc.

24.5%: **Great River Energy** members

Members include [28 coops](#) such as Connexus Energy and Dakota Electric Association. Note that some of their members are also members of Basin and/or East River; more about those in the South Dakota document. Great River's [webpage](#) says they're currently 1% natural gas, 18% market (assumed to be natural gas), and 52% coal, for an emissions intensity of about  $0.1 \times 0.5 + 0.18 \times 0.5 + 0.52 \times 1 = 0.62$ . They also have [plans](#) to retire a big coal plant in 2022 and add wind plus a battery demonstration system, claiming that their future "power supply resources will be



more than 95% carbon dioxide-free, virtually eliminating carbon risk.” (This may or may not be true, depending on how dependent they are on market purchases.)

#### 4.3%: **SMMPA** members

Southern Minnesota Municipal Power Agency members include 18 municipal utilities, the biggest being Rochester Public Utilities. The SMMPA [webpage](#) indicates that they’re 20% renewable, with the rest mostly being coal from the Sherco 3 power plant, so their emissions intensity is probably about  $0.70 \cdot 1 + 0.10 \cdot 0.5 = 0.75$ . Sherco 3 is owned 41% by SMMPA and 59% by Xcel, and is going to be [retired by 2030](#). SMMPA [plans](#) for “a 90% reduction in CO2 emissions from 2005 levels and 80% carbon-free energy on an annual basis in 2030.” Note also that Rochester Public Utility’s [2019 annual report](#) says that the city council aims for 100% renewable by 2030.

#### 3.3%: **MRES (Missouri River Energy Services)** members

Members include the cities of Moorhead and Willmar. Their [website](#) says that on average their members get 40% of their power from WAPA and there’s a pie chart showing their members’ power supply as 39% hydro, 4% wind, 6% nuclear, 14% coal, 2% natural gas, and 35% market purchases. Assuming that coal and natural gas have emissions intensities of 1 and 0.5, respectively, MRES’s emissions intensity is somewhere between 0.15 (if the market purchases are all renewables) and 0.50 (if the market purchases are all coal). The [SD PUC](#) reports them at 14% coal, 2% gas, and 35% market purchases (assumed to average 0.5, i.e., gas), which works out to a carbon intensity of about  $0.14 \cdot 1 + 0.37 \cdot 0.5 = 0.33$ , so let’s use that number.

#### 2.9%: **Minnkota** members

Members include [11 coops](#) in northwestern Minnesota and in North Dakota. They have an [energy production pie chart](#) showing 67% coal, 19% wind, 11% WAPA, and 3% other, so that’s an emissions intensity of about  $0.67 \cdot 1 + .11 \cdot 0.1 + 0.03 \cdot 0.5 = 0.70$ . Note that Minnkota has a [Joint Agreement](#) with NMPA (see below), but it’s not clear if that covers their power generation.

#### 2.2%: **MMPA** members

Minnesota Municipal Power Agency members include 12 municipal utilities, the biggest being the cities of Chaska and Anoka. Their [webpage](#) has an [IRP](#) and it looks from p28 like they’re pretty close to 100% natural gas, so let’s use an emissions intensity of 0.5. Note that their [sustainability](#) page also mentions that two of their members (East Grand Forks and Olivia) get WAPA power. Also their webpage mentions [annual reporting](#) required by the state.

#### 5.0%: Other

Includes Dairyland Power members (1.4%, guesstimated emissions intensity of about 0.8), MiEnergy Coop and municipalities they serve (0.7%, their power comes from Dairyland [0.8?] and [Alliant](#) [0.56]), East River members (0.7%, emissions intensity of about 0.55 from SD data), NMPA members (0.5%, they have a joint agreement with Minnkota and so may share their 0.7

emissions intensity), Basin members (Minnesota Valley Coop L&P is a Class A member, other coops also appear to be members; their emissions intensity is about 0.7 from SD data), and various small municipalities, some of which are part of [Central Municipal Power Agency/Services](#) (CMPAS).

## Overviews from EIA etc.

[MMUA](#) has a good overview of legislation etc. The state has a collection of [IRPs](#). There are also annual reports filed by many utilities with the state: from [here](#), click on “Electric Utility Annual Reporting”, and then scroll down and click on the Docket Number for the most recent reporting period.

There’s also an [EIA electricity overview](#) (but note that it focuses on the electricity generated in the state rather than the electricity consumed in the state): “Although coal-fired power plants provide the largest share of Minnesota’s electricity net generation, their contribution fell below half for the first time in at least three decades in 2012 and declined to less than one-third in 2019... The state’s two nuclear power plants, located on the Mississippi River in southeastern Minnesota, typically provide about one-fourth of state generation. Almost all the rest of Minnesota’s electricity generation comes from wind, which supplied 19% of the state’s electricity net generation in 2019, and natural gas, which fueled 18%... Most of the electricity generated in Minnesota is produced by electric utilities; however, the amount provided by independent power producers has increased markedly in the past two decades. In 2019, independent power producers accounted for more than one-fifth of Minnesota’s net generation. Most of that electricity was generated using wind energy, and the rest was primarily fueled by solar energy and natural gas... Minnesotans consume more electricity than is generated in the state, and during the past decade they have received as much as one-fifth of the electricity they use each year from other states via the regional grid. Electricity retail sales are nearly equally divided among the residential, industrial, and commercial end-use sectors. Almost one-fifth of Minnesota households use electricity for home heating. Per capita electricity retail sales to the residential sector are lower than in almost two-thirds of the states.”