

The Upper Midwest: Reading a Regional Energy System

How It Works or Fails · The Upper Midwest · Grades 11–12 / First-Year College

Name _____ Date _____ Class _____

How to use this sheet. A ride-alongside worksheet: keep the interactive Upper Midwest & Great Plains map open beside you (ND, SD, MN, IA, NE, KS, MO).

The map	Open the Upper Midwest & Great Plains Fuel Flow Map full-screen — the ‘Breadbasket & Bakken’ energy flows across ND, SD, MN, IA, NE, KS and MO.
Lens row	Sweep the views — Bakken crude, ethanol / biofuel, wind, coal, natural gas, hydro, electricity. This region grows fuel and drills fuel.
State filter	Switch between North Dakota, Iowa, Kansas, Minnesota, and Missouri to isolate one piece of the system.
Emissions	The button opens the emissions app — AIR QUALITY / GHG / SINKS, on EPA/EIA data. Note agriculture and ethanol, not just power and coal.
Vulnerability	Press VULNERABILITY and open a card.
Scenarios	The story-row buttons run a real event — a Bakken takeaway cut, an Enbridge Line 5 shutdown, a Midcontinent freeze — on today’s infrastructure and move the supply×demand (CURVES) window.

Part 1 · The mix — grows fuel and drills fuel

Sweep the views, then use the state filter. This region both grows fuel (ethanol from corn) and drills fuel (Bakken crude), and generates world-class wind.

1.1 On the ETHANOL lens, press CURVES and hover the blend-wall window. Read the production line against the dashed wall: in roughly what year does production cross it, and where does the extra go after that?

1.2 On the WIND lens, read the 24-hour window: at what hour is wind strongest, and at what hour is demand highest? Then press CURVES and scrub the year — in which months does wind generation of power exceed demand for power?

1.3 On the CRUDE lens, press CURVES and read the REAL MARKET PATH window. Compare what this region produces with what its refineries run. Roughly when do the two lines cross, and what does the region become after that?

1.4 Each state generates an electricity budget, which it “spends” on consumption. On the ELECTRICITY lens, compare two states’ generation and consumption.

Part 2 · The tradeoff — what it costs and what it buys

Open the emissions app (AIR QUALITY / GHG / SINKS).

2.1 In AIR QUALITY, compare Power: Coal, Power: Gas and Power: Oil. Switch between two or three pollutants. Which pollutant does coal dominate, and which one barely registers for it?

2.2 In GHG, compare the sectors. What non-power force dominates this region’s emissions picture?

Part 3 · The weak point — a vulnerability judgment that can change

Press VULNERABILITY and open a card. A vulnerability score here is not fixed — it is a judgment about how this asset can fail, built from the evidence on the card, and it can change: a changed condition, or new research, can legitimately raise or lower it.

Pick ONE asset to read (different groups take different assets):

- Dakota Access — the single dominant pipeline out for Bakken crude
- Ethanol rail — the only way ethanol can leave (it corrodes pipelines)
- Grain Belt Express — the wind's single planned transmission line, fought for a decade
- Northern Border gas corridor — the old import pipe with no alternative
- The SPP freeze (Feb 2021) — wind and gas failing together in the cold
- Gavins Point — the Missouri River flood-control choke point

3.1 Open your asset's card and read its evidence — what it depends on, what has already happened to it, what its failure would take down. In your own words, what is this asset's real vulnerability: where and how does it fail?

3.2 A rating is a snapshot of today's conditions. Name one specific change that would make your asset MORE vulnerable and one that would make it LESS — and say why.

Part 4 · The shock — run a scenario

*Each scenario runs a real event on today's infrastructure and moves the supply×demand (CURVES) window.
The theme: when everything leaves on one artery, cutting the artery is the shock.*

Pick ONE scenario to run (different groups take different shocks):

- Bakken Takeaway Cut — Dakota Access goes dark and crude reverts to rail
- Enbridge Line 5 Shutdown — the Canadian corridor darkens; Twin Cities / Pine Bend lose their feed
- Midcontinent Freeze (Uri, Feb 2021) — the Kansas refining cluster and the SPP grid fail together

4.1 Run your scenario. What does it hit FIRST, and — because so much rides on one artery — what has no easy backup? Name the cascade (downstream or secondary effects).

4.2 Watch the supply×demand CURVES window. Which curve moves, and what happens to price and quantity? In a few short words, what is the overall effect of this shock?

Part 5 · Judgment — defend a claim

Use evidence from at least two earlier parts. There is no single right answer.

5.1 Use the map (the VULNERABILITY cards) and current news to answer. This region feeds and fuels the country — corn and ethanol, Bakken crude, and world-class wind — yet nearly all of it leaves on a single artery: one pipeline, one railroad, one power line, one old gas pipe. If this region is too dependent on single arteries, how can that be mitigated? Is this happening? Take a position and defend it with specific evidence from at least two parts (a state's role, an emissions or benefit reading, a vulnerability judgment, or a scenario signature).

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