

Southwest: Reading a Regional Energy System

How It Works or Fails · Southwest · Grades 11–12 / First-Year College

Name _____ Date _____ Class _____

How to use this sheet. A ride-alongside worksheet: keep the interactive Southwest map open beside you. This guide is about reading a region's whole energy system — its lenses, emissions app, vulnerability scores, and scenarios — not tracing one fuel. The thesis underneath every part: a region's energy mix is a set of bets — each source earns its place with a real strength — and the Southwest carries the widest mix in the country, every bet shaped by two desert scarcities: water and heat.

The map	Open the Southwest Fuel Flow Map full-screen — AZ, NV, NM and the California ties. It carries the widest energy mix in the country.
Lens row	Solar, wind, nuclear, natural gas, coal, hydro, geothermal — the SW has every major source. Notice it has them ALL.
Year slider	Play or drag it to watch solar and batteries grow, coal retire, and the Colorado reservoirs fall.
Emissions	The button opens the emissions app — EPA/EIA data on who emits what. Note the large low-carbon share and Fires.
Vulnerability	Press VULNERABILITY and open a card. It carries the evidence behind the risk — what the asset depends on and what could take it down. Read it as a judgment that can move, not a fixed grade.
Scenarios	The story-row buttons run a real Southwest event — Powell hits 3,490, ShakeOut, cyberattack, marine layer, heat dome, ARkStorm — and move the supply×demand (CURVES) window.

Part 1 · The mix — the widest in the country

Sweep the lens row — the SW carries every major source at once. The thesis starts here: a region's energy mix is a set of bets, and in the desert every bet is shaped by sun, geology, the Colorado, and legacy coal.

Pick ONE source to characterize (different groups take different sources):

- Solar (the desert's midday flood)
- Palo Verde nuclear (largest US plant)
- Geothermal (Great Basin firm floor + Salton)
- Natural gas (the evening backfill)
- Colorado River hydro (Glen Canyon + Hoover)
- Coal (the retiring workhorse) / Wind

1.1 For your source, hover its assets and name its strength — what is it genuinely good at here — with one number or fact from the map.

1.2 The Southwest carries every major source — the widest mix on any of these maps. Why HERE? Point to what the region physically has that stacks the deck: sun, heat in the rock, the Colorado, legacy coal.

1.3 Sort your source and one other into **firm** (runs day and night) versus **intermittent** (comes and goes). Which SW sources are the firm floor, and which need firming (support)?

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

Open the emissions button — the EPA/EIA app. The SW runs a large low-carbon share (solar, nuclear, geothermal, hydro) alongside gas and retiring coal.

2.1 The Southwest has low-carbon power — solar, the largest US nuclear plant, geothermal, hydro — yet almost none of the emissions come from those. The carbon is concentrated in the two fossil fuels. Which two? And what has been happening to the largest carbon dioxide emitter? Why might that be?

2.2 Switch to a fine-particulate / air-toxics view or the Fires layer. What non-power force can dominate the Southwest's air picture?

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

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

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

- Glen Canyon Dam — drought floor, imminent
- Hoover Dam — derated, its fate set upstream at Powell
- Palo Verde nuclear — one plant, desert-cooled on a contract
- Diablo Canyon nuclear — last-of-kind, on a policy clock
- Crescent Dunes CSP — a first-of-kind that failed on its hardware
- Great Basin geothermal — the firm floor (the low-risk one)

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? Cite the card.

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. Think about what the risk actually rides on: a wetter or drier decade, a second water source or transmission path, a plant retired or added, a policy decision, a proven-out technology.

3.3 (Optional — needs outside research.) Now judge the map's rating for your asset: is it well-supported, understated, or overstated? Take a position and back it with evidence beyond the card — recent reservoir elevations, the status of a policy decision, an operator's own risk filings. A vulnerability rating is only as current as the evidence behind it.

Part 4 · The shock — run a scenario

Each scenario runs a real Southwest event on today's infrastructure and moves the supply×demand (CURVES) window. The SW theme: a wide, sun-heavy mix built in a desert short on water and pounded by heat.

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

- Powell hits 3,490 — Glen Canyon's 8 turbines stop
- Cyberattack — ransomware darkens the West's product pipelines (Colonial 2021, Western edition)
- Marine Layer — a cloudy week starves the solar peak
- Heat Dome — extreme heat spikes demand
- ARkStorm — a Western megastorm
- ShakeOut — M7.8 San Andreas severs the fuel lines at Cajon Pass

4.1 Run your scenario. What does it hit FIRST, and — given the SW's reliance on sun, dams, and one big nuclear plant — what has no easy backup? Then trace what fails next as the failure spreads (cascades) to other energy assets (pipes, power plants, refineries, etc.).

4.2 Watch the supply×demand CURVES window. Which curve moves, and what happens to price/quantity? Sum it up in one line: how would you recognize this shock?

4.3 Look back at the Southwest scenario shocks you described in 4.1 and 4.2. What do they all have in common — and why would that make the Southwest hard to protect?

Part 5 · Judgment — defend a claim

Use evidence from at least two earlier parts. There is no single right answer — the argument is graded, not the side.

5.1 The Southwest has the widest and fastest-decarbonizing mix in the country — solar, nuclear, geothermal, hydro, gas — yet it is built in a desert short on water and battered by heat, with a drought-bound Colorado and one big nuclear plant carrying much of the firm low-carbon load. **Is the Southwest a model for the energy transition, or an unstable and vulnerable mix of power sources?** Take a position and defend it with specific evidence from at least two parts (a source strength, an emissions/benefit reading, a vulnerability judgment, or a scenario signature).

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