Energy analysis and predictive modeling to investigate renewable energy trends in the states of Arizona, California, New Mexico, and Texas

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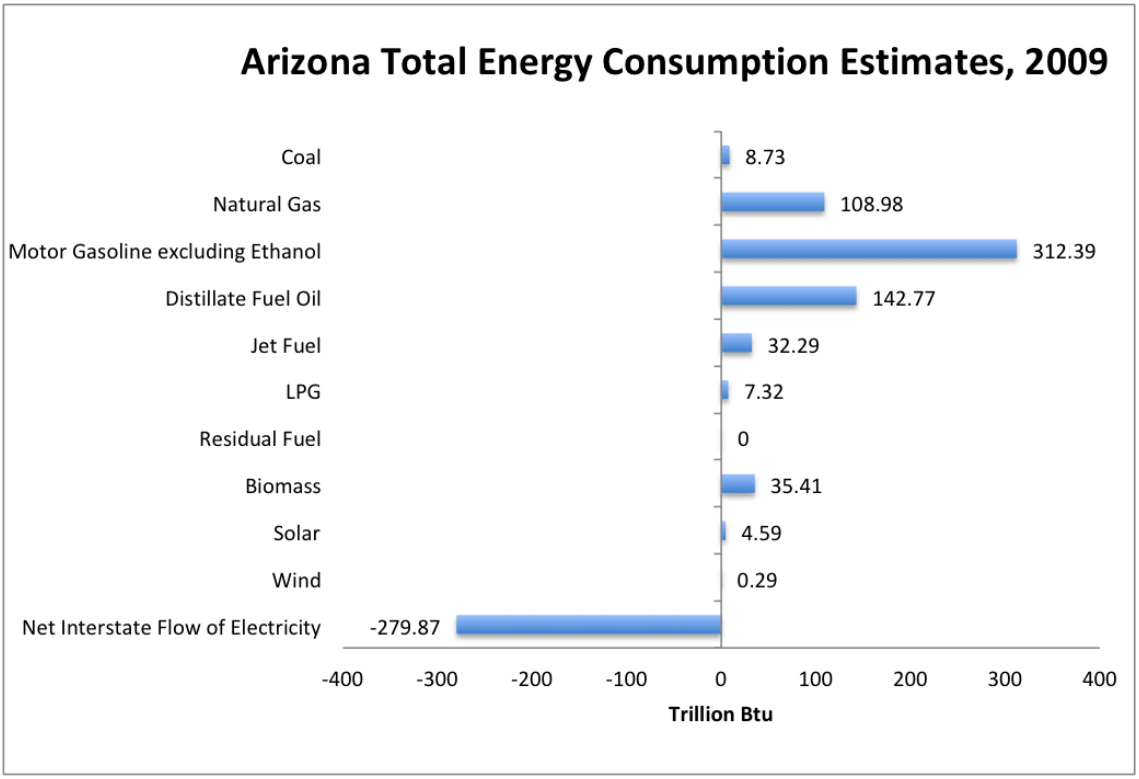

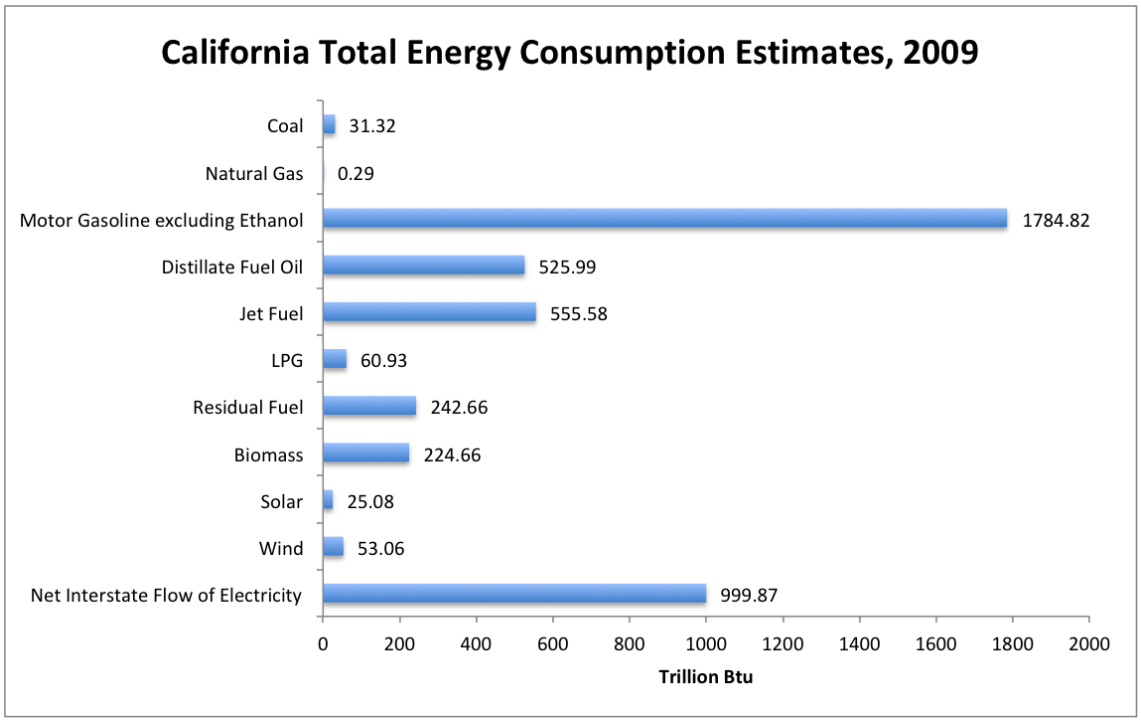
California Total Energy Consumption Estimates, 2009
Coal
31.32
Natural Gas
0.29
Motor Gasoline excluding Ethanol
1784.82
Distillate Fuel Oil
525.99
Jet Fuel
555.58
LPG
60.93
Residual Fuel
242.66
Biomass
224.66
Solar
25.08
Wind
53.06
Net Interstate Flow of Electricity
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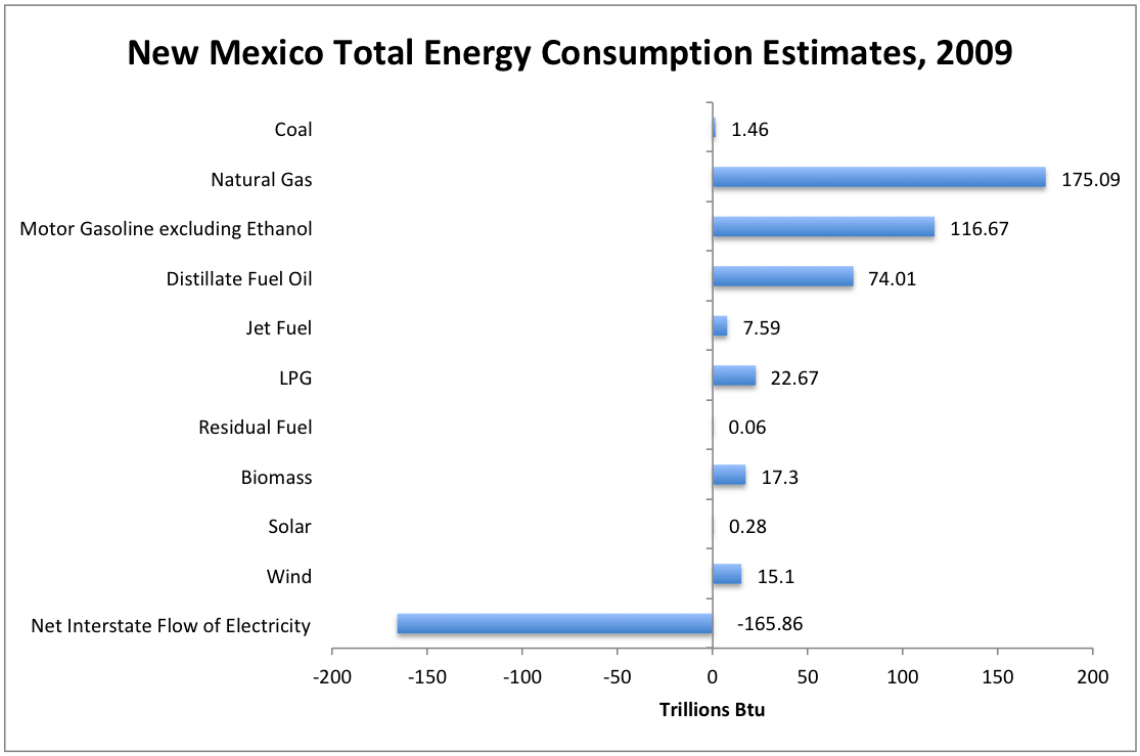
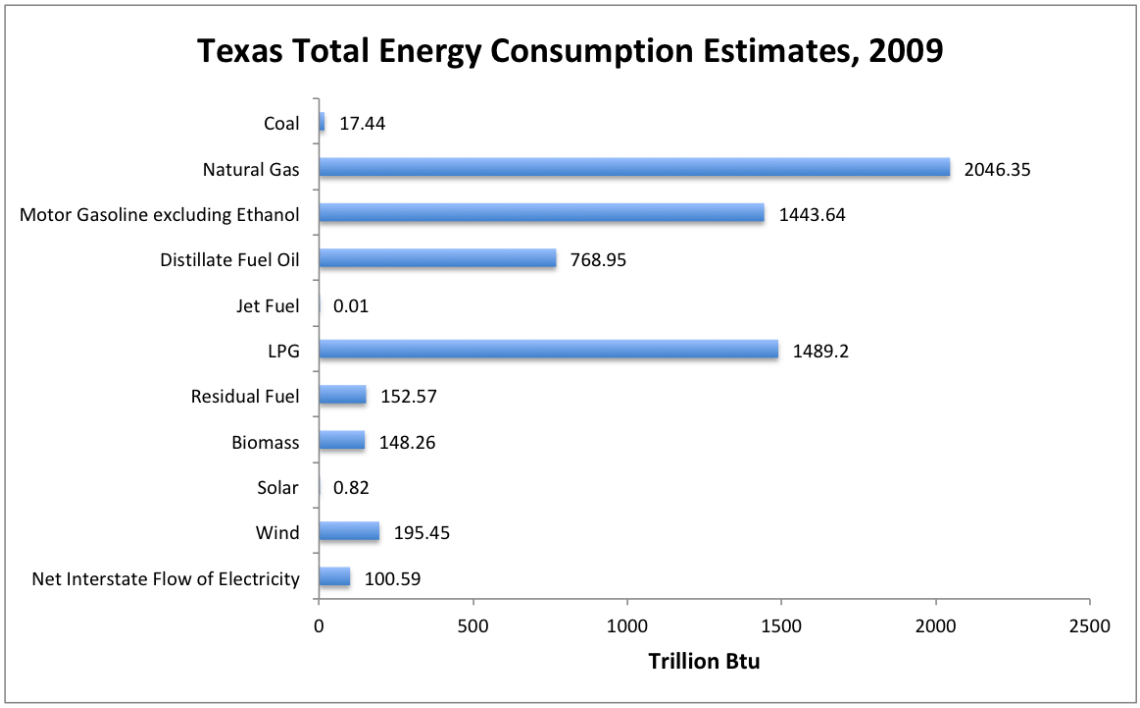
200
400
600
800
1000
1200
1400
1600
1800
2000
Trillion Btu


New Mexico Total Energy Consumption Estimates, 2009
Coal
1.46
Natural Gas
175.09
Motor Gasoline excluding Ethanol
116.67
Distillate Fuel Oil
74.01
Jet Fuel
7.59
LPG
22.67
Residual Fuel
0.06
Biomass
17.3
Solar
0.28
Wind
15.1
Net Interstate Flow of Electricity
-165.86
-200
-150
-100
-50
0
50
100
150
200
Trillions Btu



State Information

Arizona.

- Geography
  - Northeastern 2/5 consists mainly of plains, mesas, and plateaus
  - Grand Canyon
  - Volcanic, forest-covered mountains
- Resources/Industry
  - Coal from Black Mesa area of Native American reservations — coal-fired stations generate much of the electricity for the southwestern United States
  - Petroleum and large amounts of uranium from northeastern area
  - Strong lumber/pulp-paper industry
- Population
  - "In the early 21st century Arizona's population experienced dramatic growth at almost three times the national rate."
  - The overall population was projected to reach 10 million by the year 2027.
- Climate
  - 1/2 semiarid, 1/3 arid, remainder humid
  - "Most of the region receives from 10 to 15 inches (250 to 375 mm) of precipitation annually, with the Mogollon Rim and White Mountains receiving the state's largest average, 25 inches (625 mm)."
- Special notes
  - "Altogether, nearly a dozen dams control the Mogollon Rim's runoff, impounding and diverting the water to provide flood control and lakes for water storage. This hydrologic pattern has been a source of much political and legal trouble for Arizona, including years of litigation with California over rights to water from the Colorado River system. The state's internal sharing of water is also a major problem because groundwater has been depleted, particularly around Phoenix and Tucson, and there are no new sources of surface water. Cities have found it necessary to buy water rights from distant areas, and litigation involving municipalities, Native American tribes, and federal agencies over water rights is increasingly common."

California.

- Geography
  - Great physical contrasts (rainy northern coast and southern deserts)
  - Most of eastern CA is desert (Mojave Desert 1/6 of land area of CA)
- Resources/Industry
  - Economy is largest of any U.S. state
  - "New Economy": leading focus on technology and computer/software service industry
- Population
  - Concentrated mostly along coast
  - Most urban in the United States (3/4 of population live in LA, SF, and SD)
- Climate
  - Water chronically scarce in Southern CA - excess rain/snowmelt cause winter flooding along rivers
  - Marked by 2 seasons: wet and dry
  - Precipitation > 170" in northwest to traces in southeast desert; moderate coast
  - Summer temp in Colorado Desert can reach 130F
- Special notes
  - Colorado River Aqueduct at the Arizona border carries water from that river across the southern California desert and mountains to serve the Los Angeles metropolitan area
  - The California State Water Project, launched in 1960, is the largest water-transfer system ever undertaken — designed to deliver water daily from the Feather River (a tributary of the Sacramento River) in north-central California to communities as far south as the Mexican border
  - http://www.latimes.com/projects/la-fi-electricity-solar/

New Mexico.

- Geography
  - Mainly high plateaus or mesas, several mountain ranges, canyons, and valleys
- Resources/Industry
  - "Principal industries of New Mexico are agriculture, mining, lumbering, gas and oil production, and recreation."
- Population
  - Population increase was one of the slowest in the nation from 2010-2017 – Can't be part of final report
- Climate
  - "New Mexico has a mild, arid or semiarid, continental climate characterized by light precipitation totals, abundant sunshine, low relative humidities, and a relatively large annual and diurnal temperature range."
- Special notes
  - The prices of oil after 2009 decreased dramatically, causing strain on the economic and governmental budget for the state since the production of oil and fuel is one of the largest in the nation. – Can't be part of final report

Texas.

- Geography
  - Coastal Plains encompass about 2/5 of land area
  - "In 1913 there were only 8 major lakes or reservoirs in Texas; by the early 21st century there were about 200, many of which were created to store water against periodic droughts."
  - "The North Plains subdivision, centered on Amarillo, depends on grain farming, ranching, oil, and small industries."
- Resources/Industry
  - "Texas leads all other states in oil and natural gas production. It also ranks first in oil-refining capacity. Oil deposits have been found under more than two-thirds of the state's area, though many finds have been too small for commercial development. The Gulf Coast area is the centre for the state's petrochemical industrial complexes."
  - "Texas economy has remained heavily dependent on oil and gas, and any fluctuations in oil prices have had a major impact on the state."
- Population
  - "Access to water transportation, reservoirs of natural gas and oil, and availability of raw materials have made the coastal area the centre of industry in Texas. "
- Climate
  - "January temperatures in the Rio Grande valley have been known to register well into the 90s F, while blizzards have blocked highways in the Panhandle section of the state during the same month" — fluctuations in weather patterns creates high/low pressure densities, ideal for wind/storm formation
  - Gulf coast of Texas especially prone to hurricanes
- Special notes
  - "Texas leads the country in the production of wind energy and generates about one-third of total U.S. wind capacity. Most of the state's wind turbines are located in the Panhandle and in the Trans-Pecos region. One of the largest wind farms in the world, the Horse Hollow Wind Energy Center, is spread across some 50,000 acres (20,000 hectares) near Abilene."
  - "Other renewable sources of growing importance in Texas are solar and geothermal energy."

Similarities and Differences Summary.

- Geography: Arizona and New Mexico of similar size; contains mostly plateaus and mesas. Texas has incredibly large amount of area in Coastal Plains - used for oil & petrochemical industries (convert towards solar/geothermal?). California large coastal region (a lot of hydro opportunities?). Smaller sizes/smaller urban areas of NM and AZ may cause lower road oil consumed by transportation compared to CA and TX
- Resources/Industry: Texas and New Mexico leaders in oil and natural gas. Arizona large amounts of coal reserves. California has incredibly large economy due to leading the software and computing industry: potential for investment in pricier forms of alternative energies(?). Texas's technology industry also on the rise - may follow suit in the future(?)
- Population: look at data sets that we have to interpret data
- Climate: Arizona and New Mexico similar in terms of being arid and dry; California and Texas more diverse climates overall, Texas more diverse in smaller areas - may be cause of strong wind energy production.

References

Britannica https://www.britannica.com/place/Texas-state
https://wrcc.dri.edu/narratives/NEWMEXICO.htm