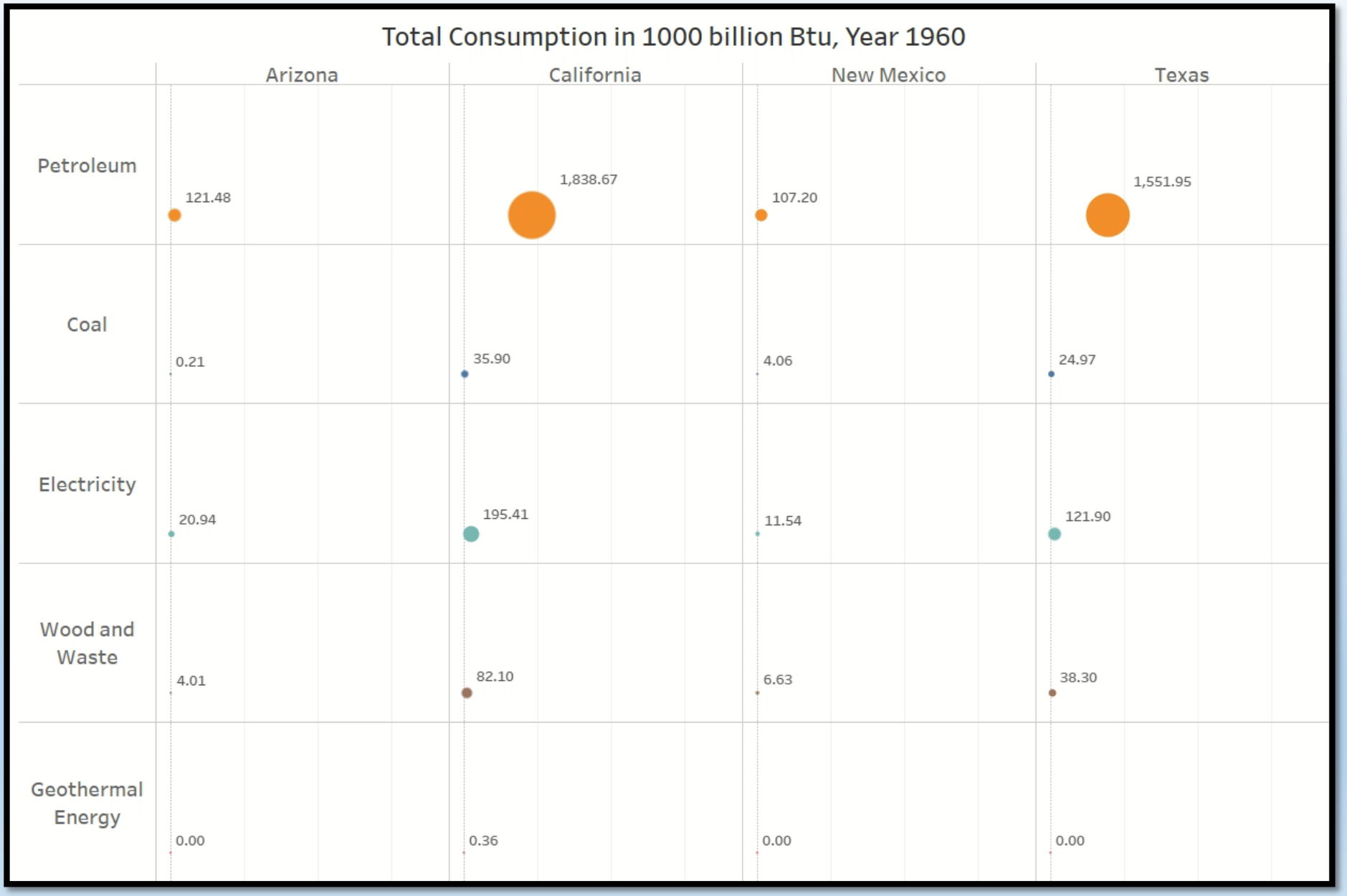
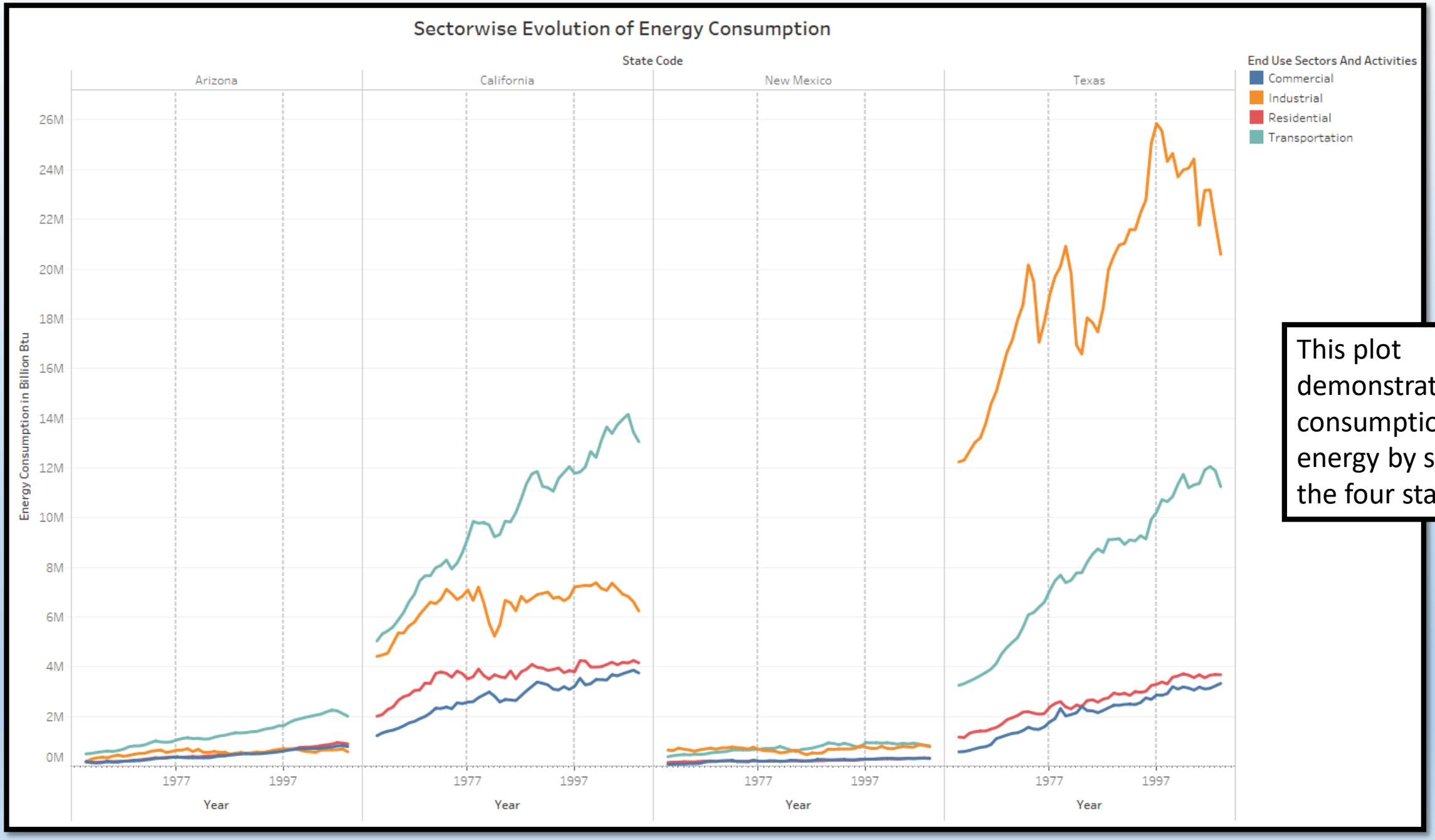
Data analysis and modeling report on Energy data for the states of CA, TX, NM and AZ.

Rutvik Gavaskar
February 2020

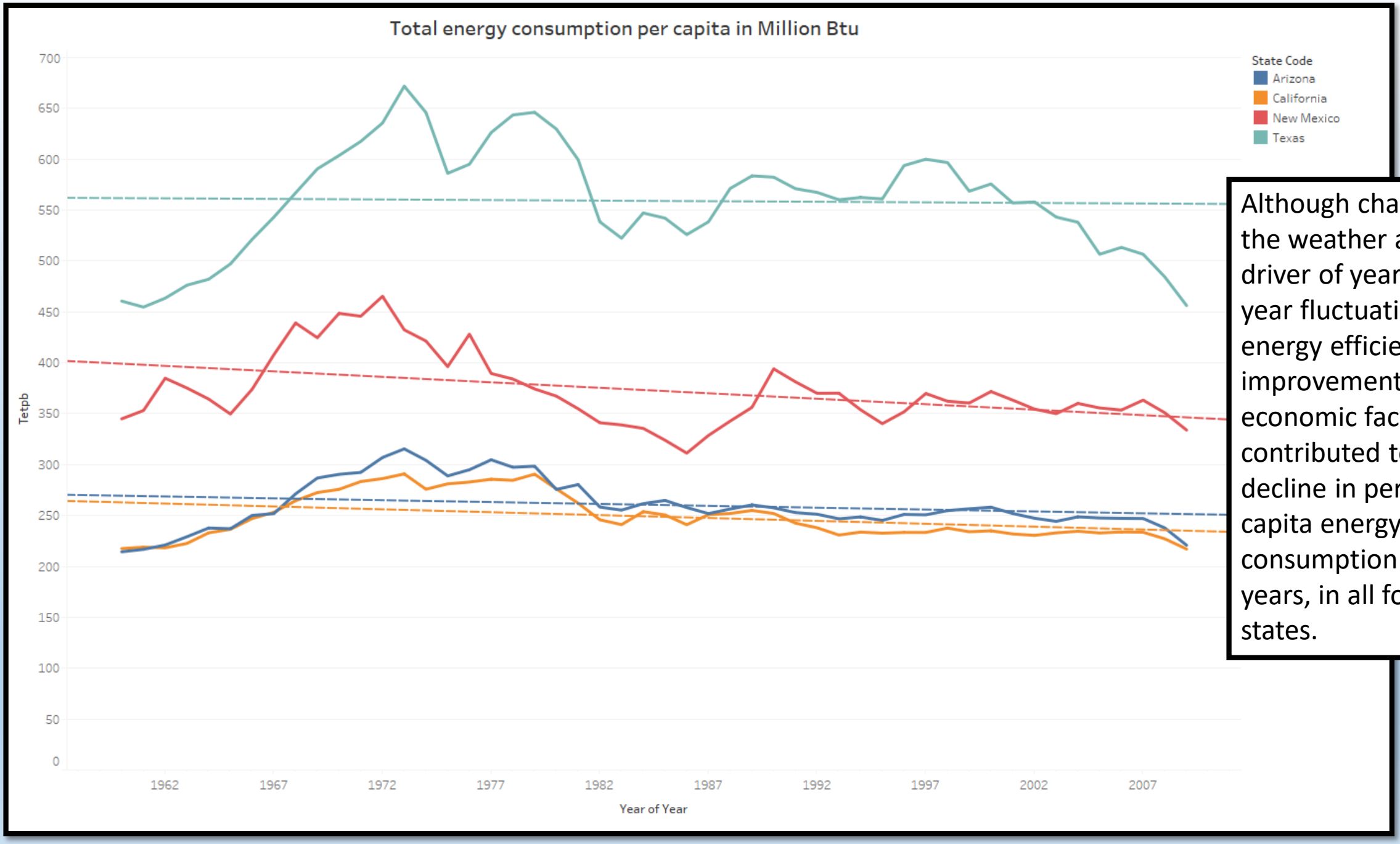


Over the years from 1960 until 2009, the energy consumption from 5 major energy sources has increased. While there has been drastic increase in energy consumption by the state of Texas and surpassed California.

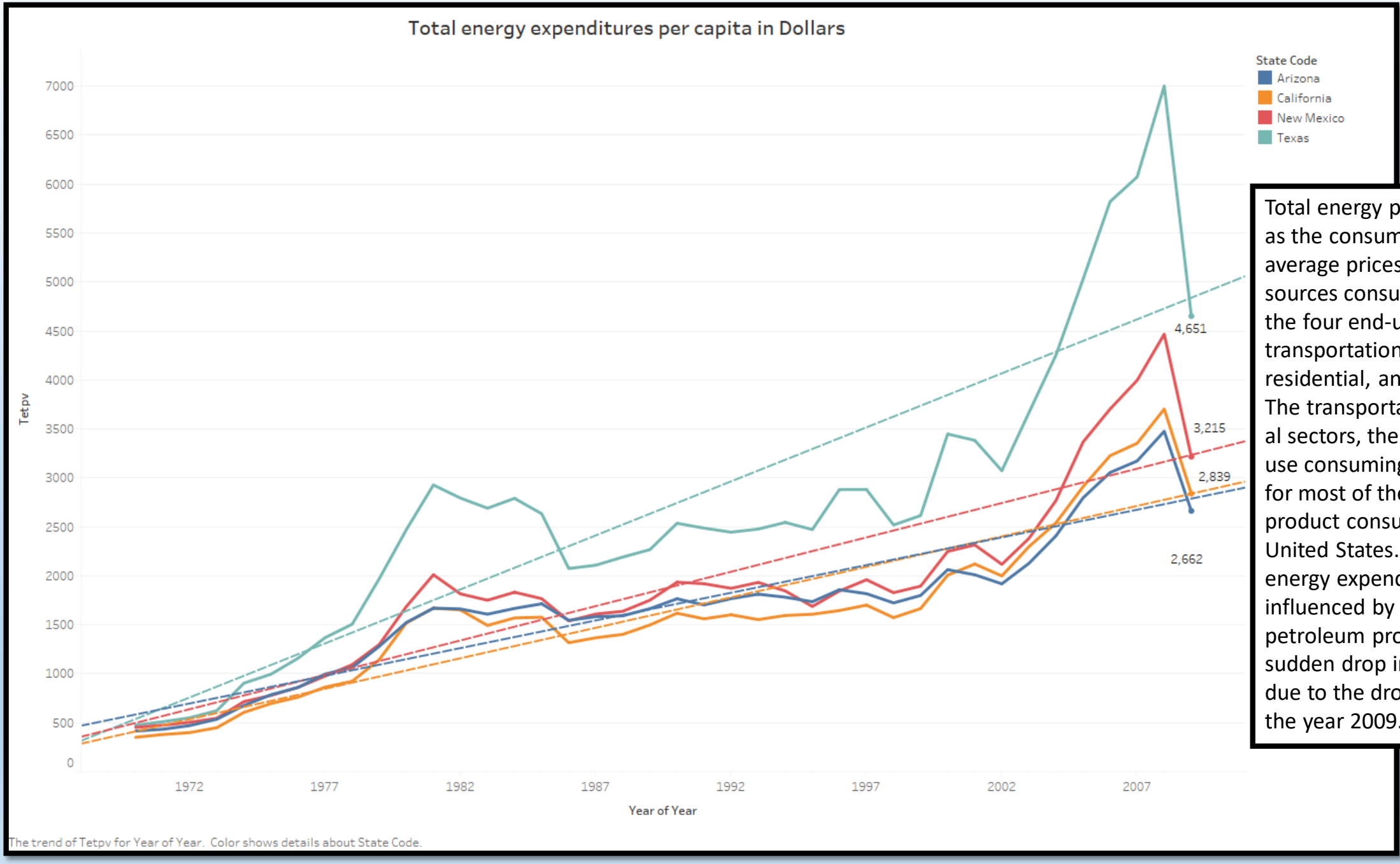
Animated graphic
(view in PowerPoint show)



This plot demonstrates consumption of energy by sector in the four states.

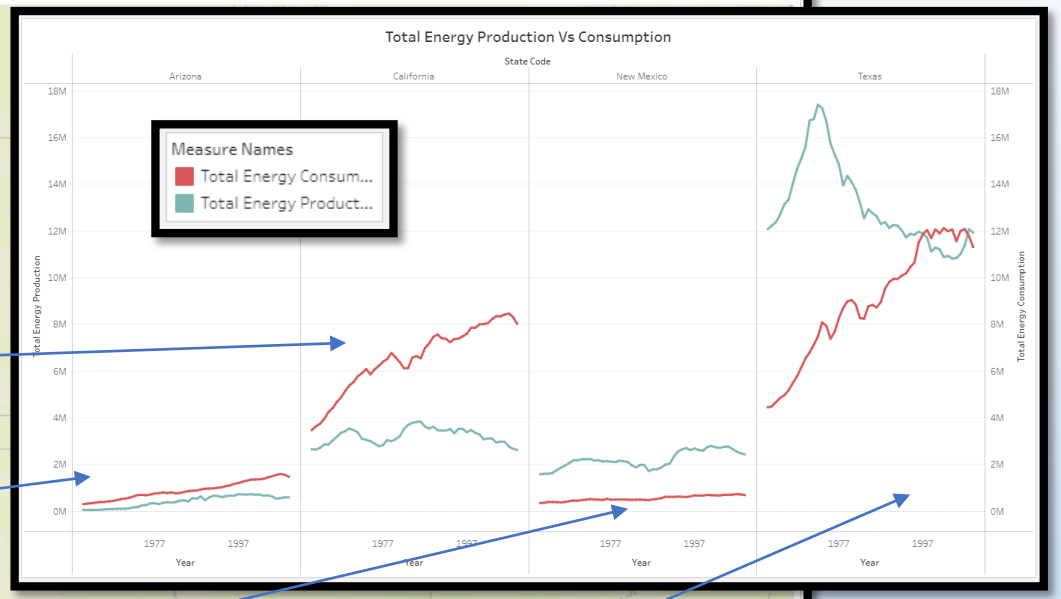


Although changes in the weather are a key driver of year-over-year fluctuations, energy efficiency improvements and economic factors have contributed to the decline in per capita energy consumption over the years, in all four states.



Total energy price is calculated as the consumption-weighted average prices of all energy sources consumed in each of the four end-use sectors: transportation, industrial, residential, and commercial. The transportation and industrial sectors, the two largest end-use consuming sectors, account for most of the petroleum product consumption in the United States. For this reason, energy expenditures are heavily influenced by prices of petroleum products. The sudden drop in expenditures is due to the drop in demand in the year 2009.

Total Energy Production v/s Consumption in 1000 Billion Btu , Year - 1960



Nevada

Utah

Colorado

California

1960 Consumption 3,452

1960 Production 2,631

Arizona

1960 Consumption 283

1960 Production 37

New Mexico

1960 Consumption 329

1960 Production 1,563

Texas

1960 Consumption 4,432

1960 Production 12,067

Mississippi

Baja California

Sonora

Chihuahua

Coahuila de Zaragoza

Baja California Sur

Sinaloa

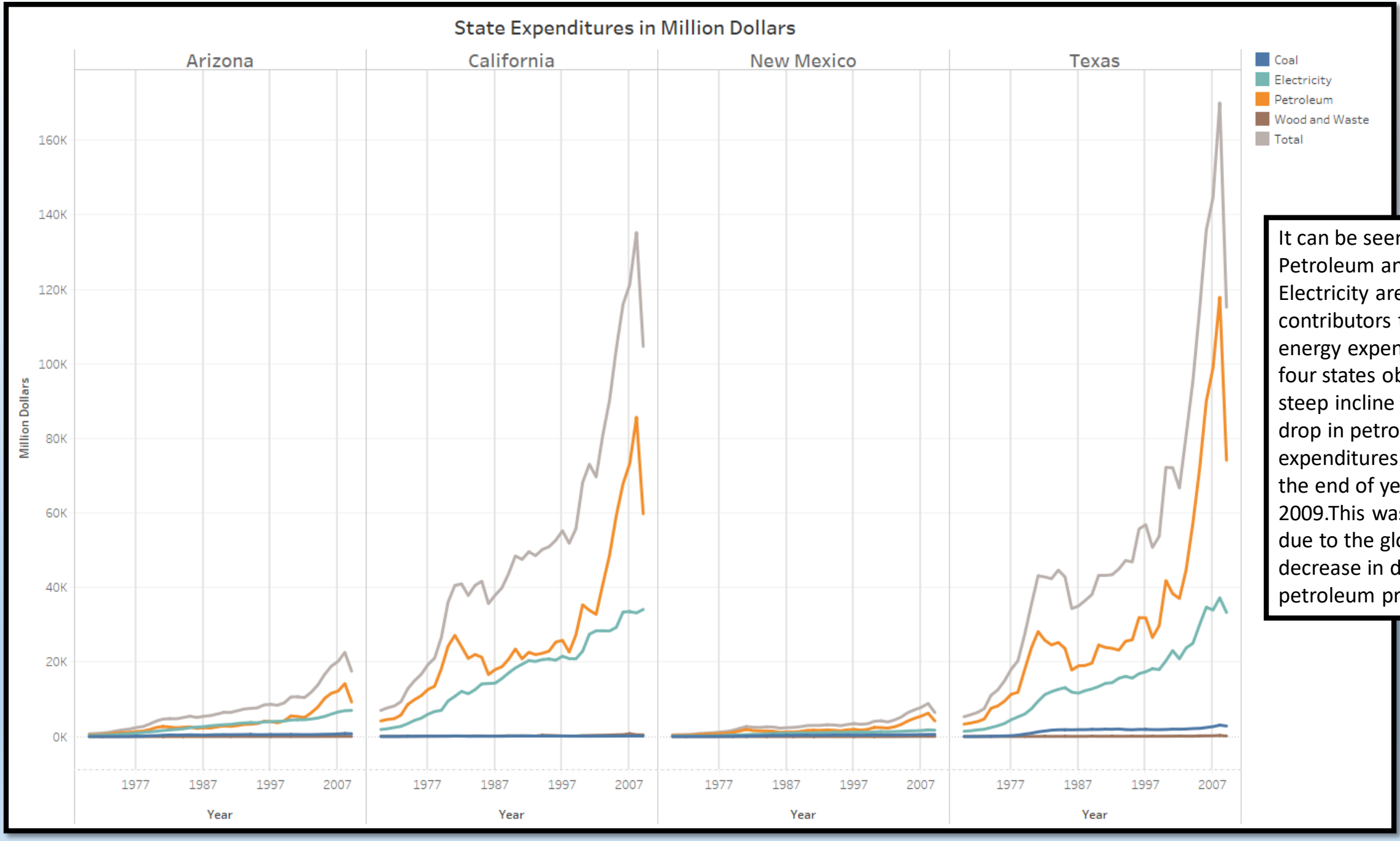
Durango

Nuevo León

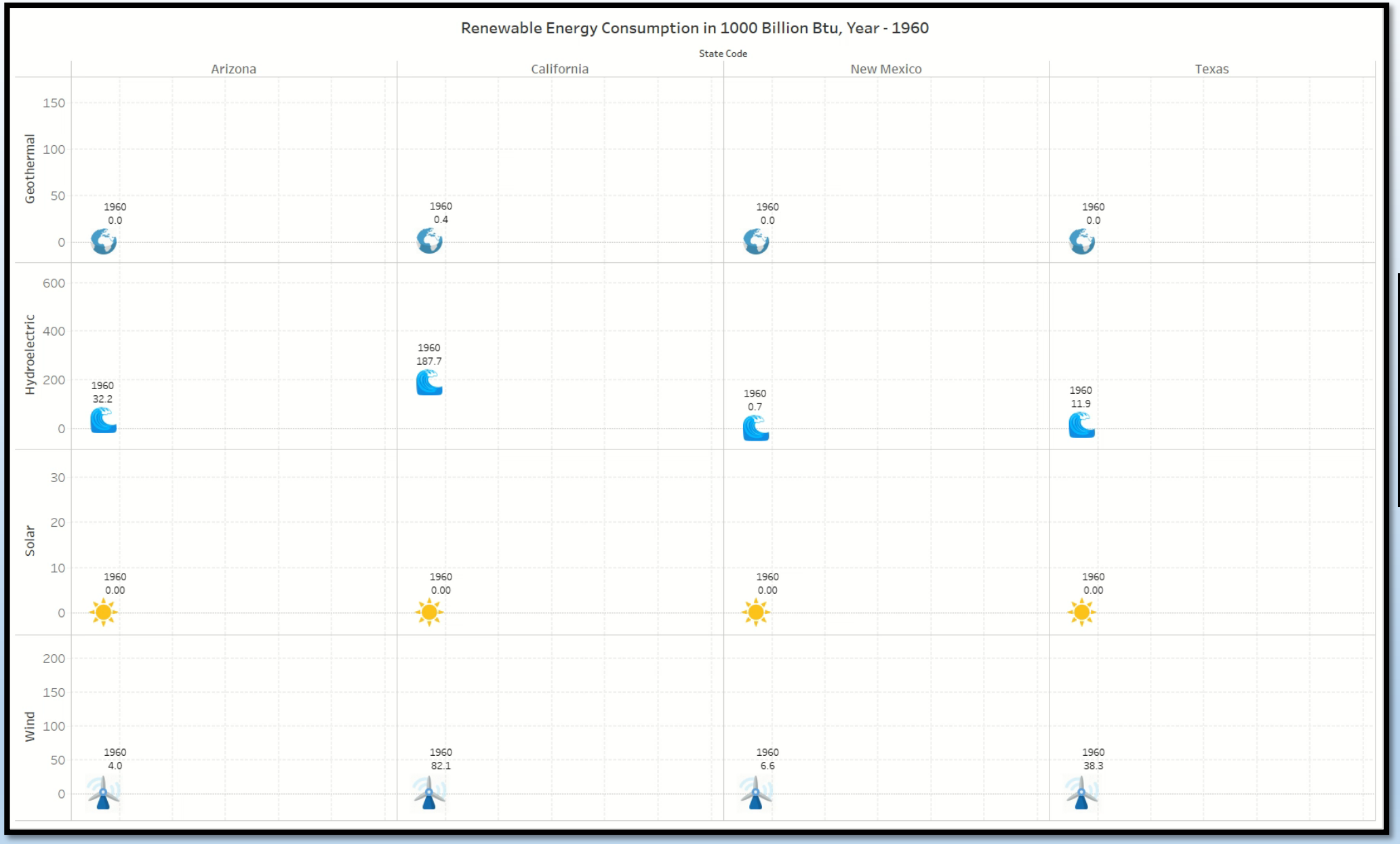
Tamaulipas

This graphic shows the evolution of Total Energy Production and Consumption over the years in the four states.

Animated graphic
(view in PowerPoint show)

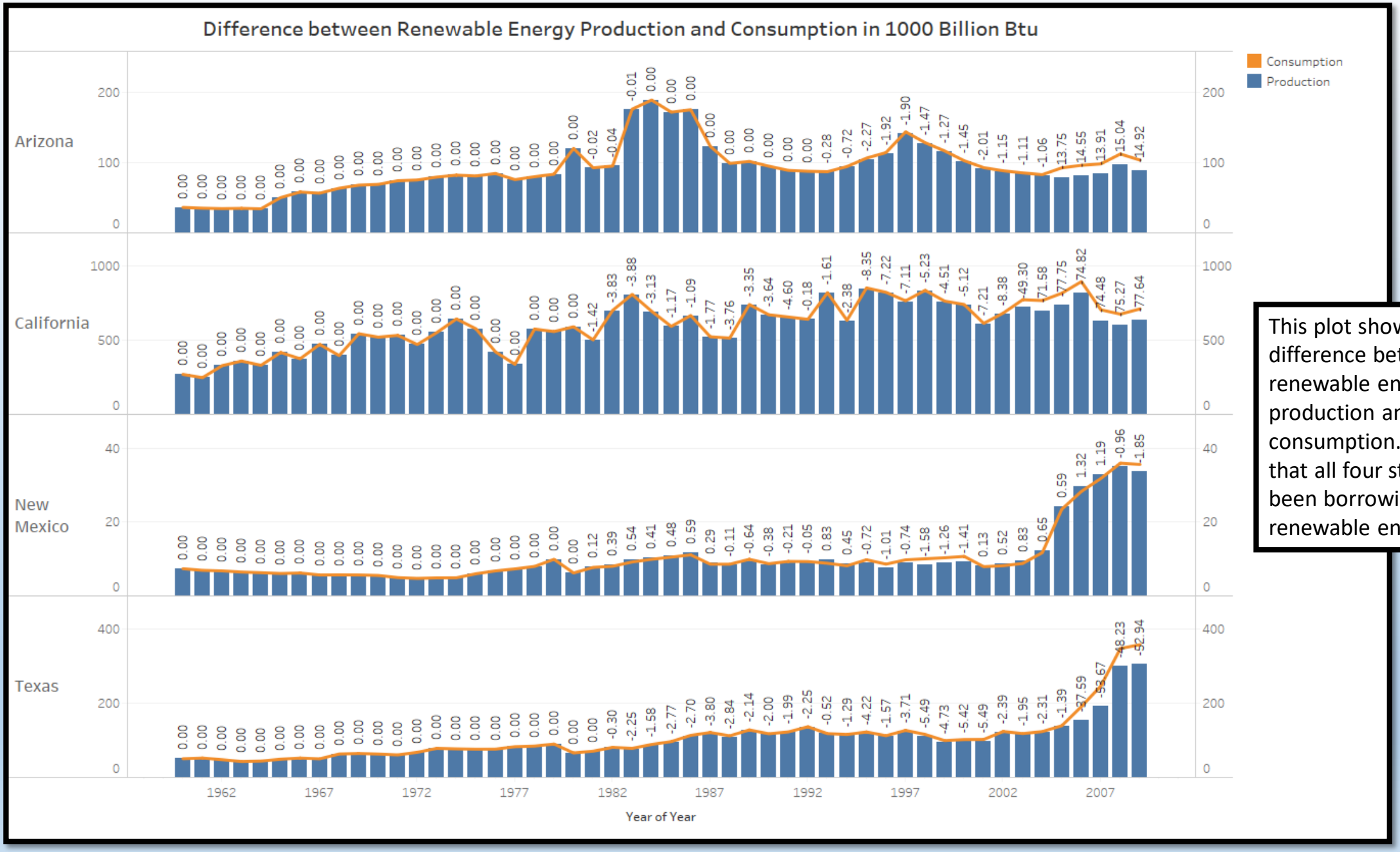


It can be seen that Petroleum and Electricity are the main contributors to the total energy expenditures. All four states observed a steep incline and then a drop in petroleum expenditures towards the end of year 2009.This was caused due to the global decrease in demand of petroleum products.

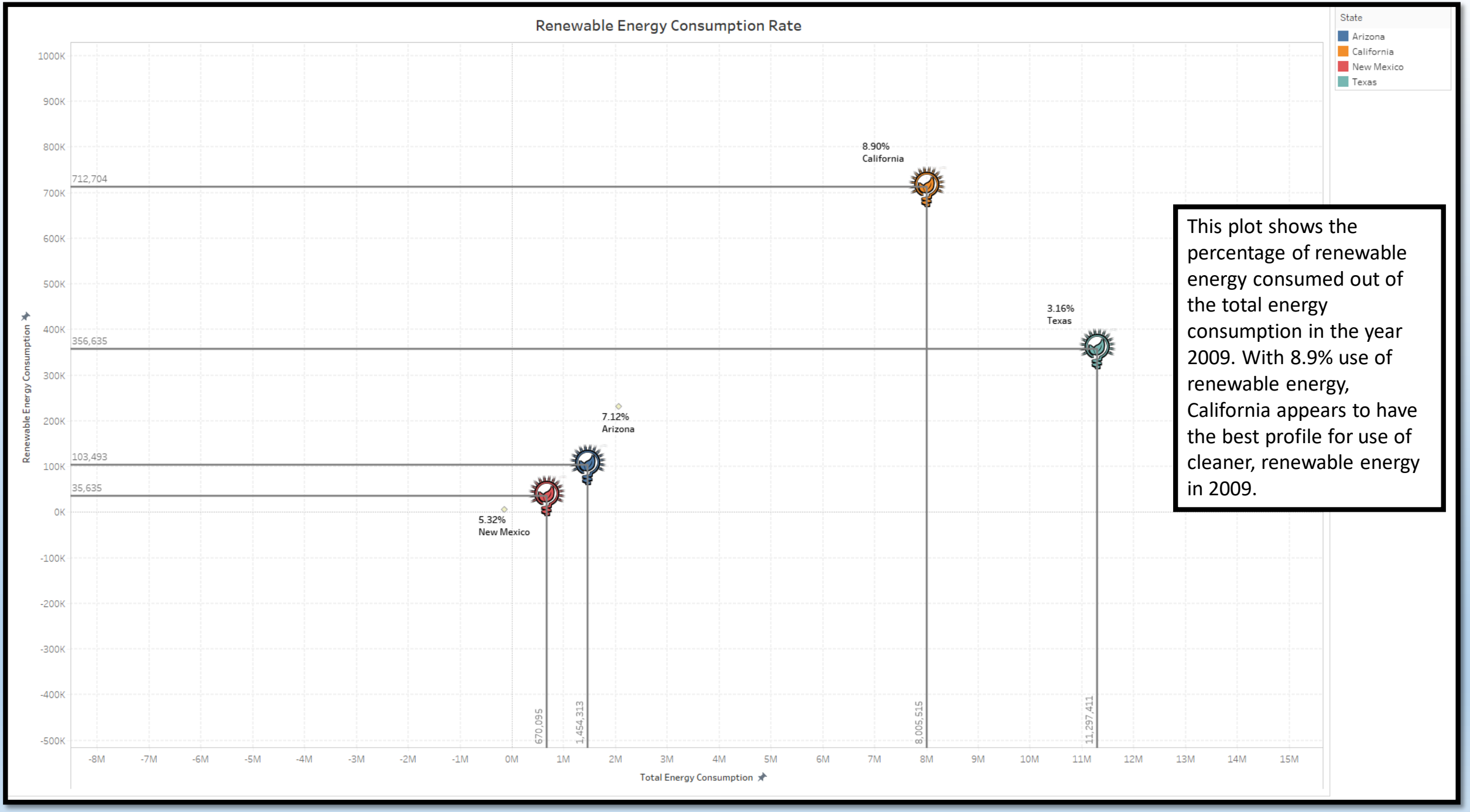


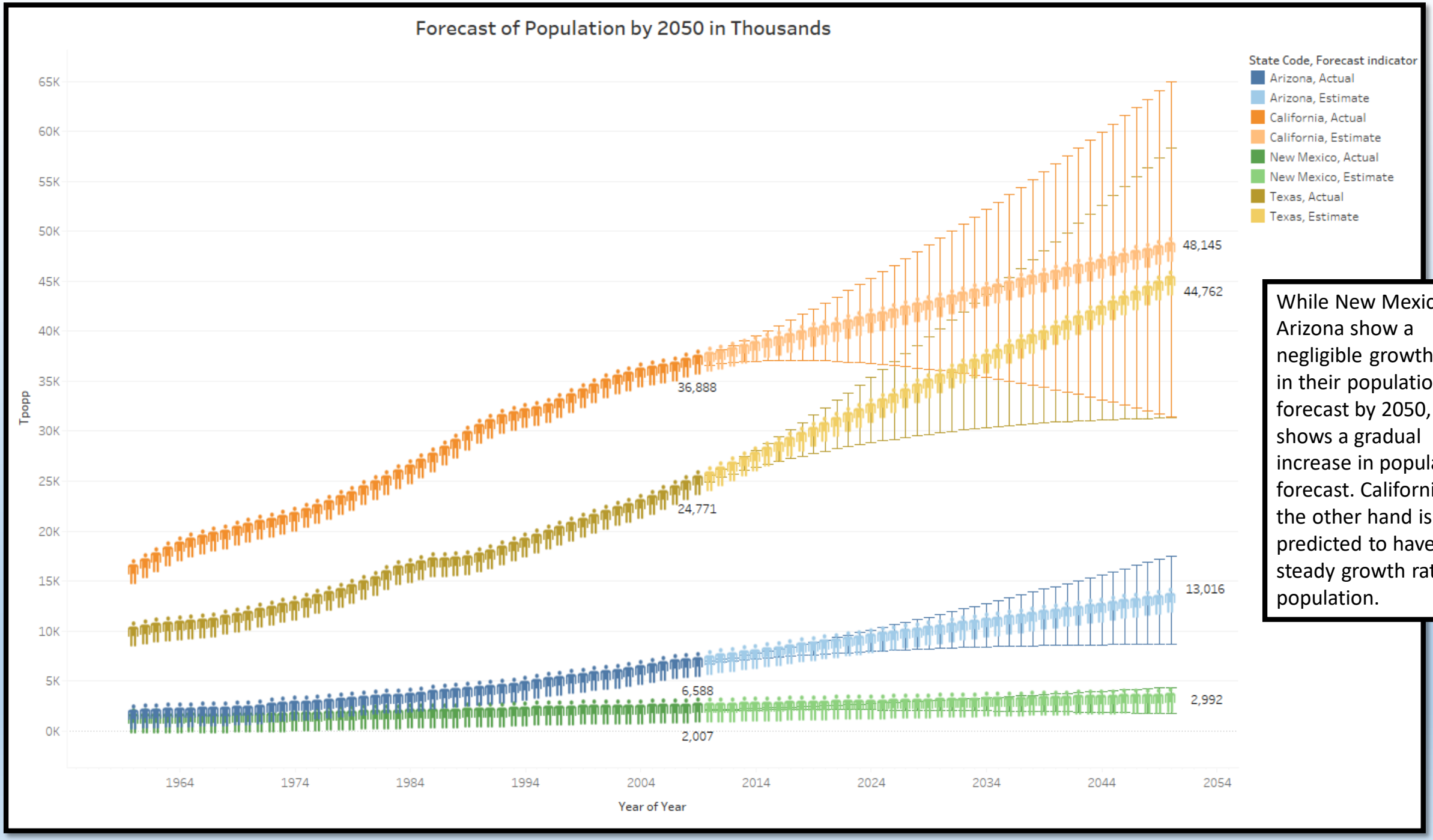
It can be seen that California is overall the best in clean energy consumption. One major reason for this could be its geographical location.

Animated graphic
(view in PowerPoint show)

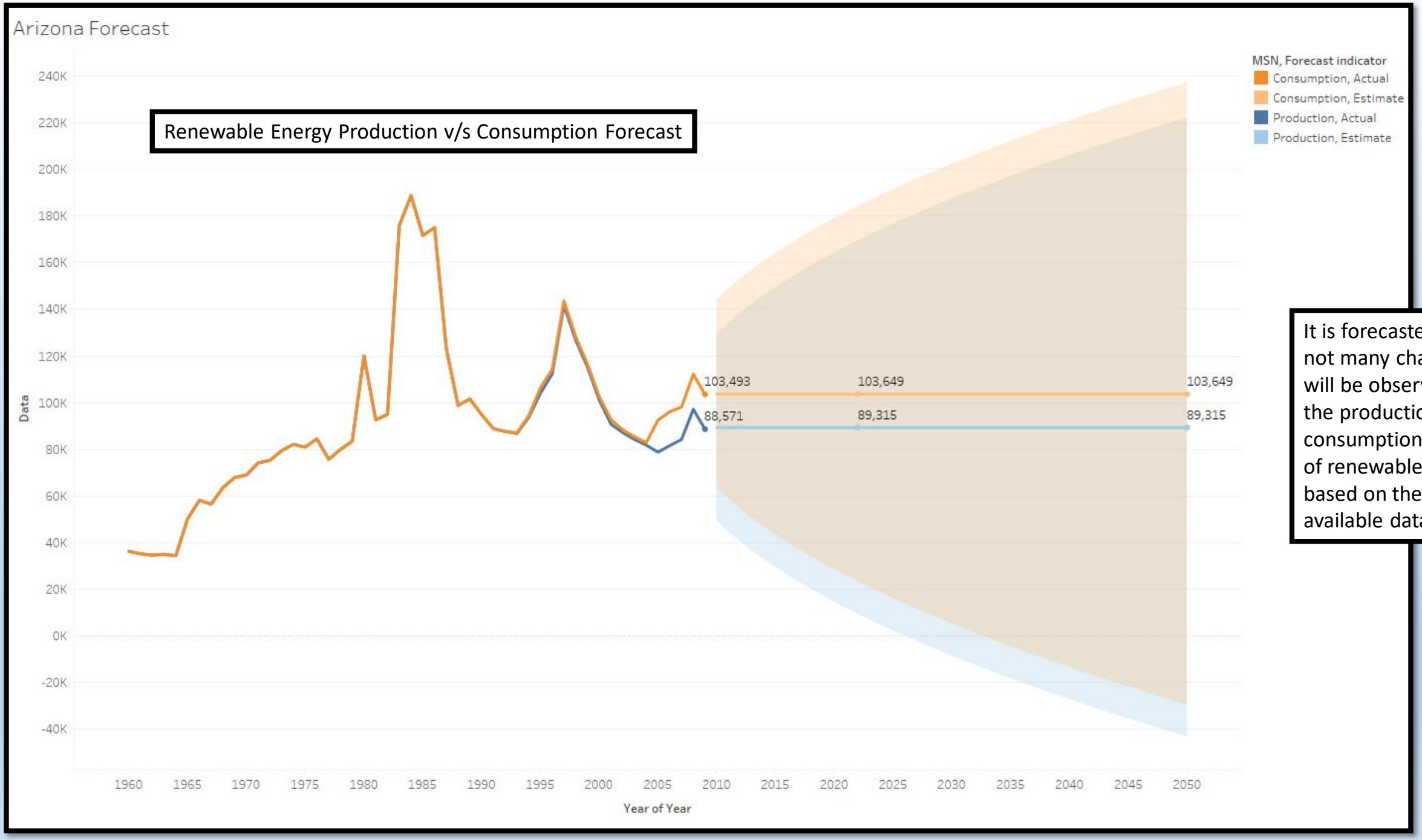


This plot shows the difference between renewable energy production and consumption. It appears that all four states have been borrowing renewable energy.

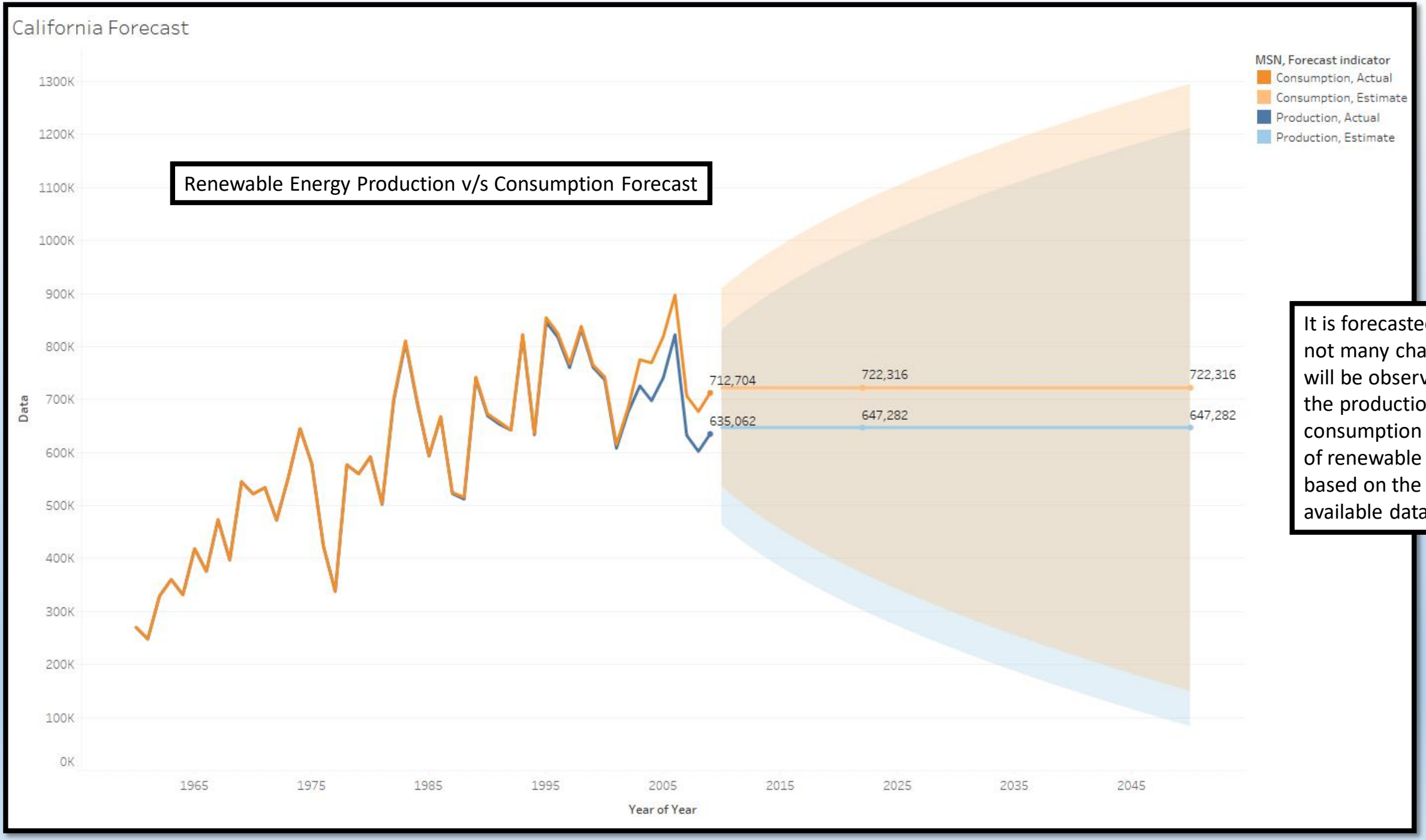

Renewable Energy Consumption Rate
State
Arizona
California
New Mexico
Texas
Renewable Energy Consumption
Total Energy Consumption
712,704
356,635
103,493
35,635
8.90%
California
3.16%
Texas
7.12%
Arizona
5.32%
New Mexico
670,095
1,454,313
8,005,515
11,297,411
This plot shows the percentage of renewable energy consumed out of the total energy consumption in the year 2009. With 8.9% use of renewable energy, California appears to have the best profile for use of cleaner, renewable energy in 2009.



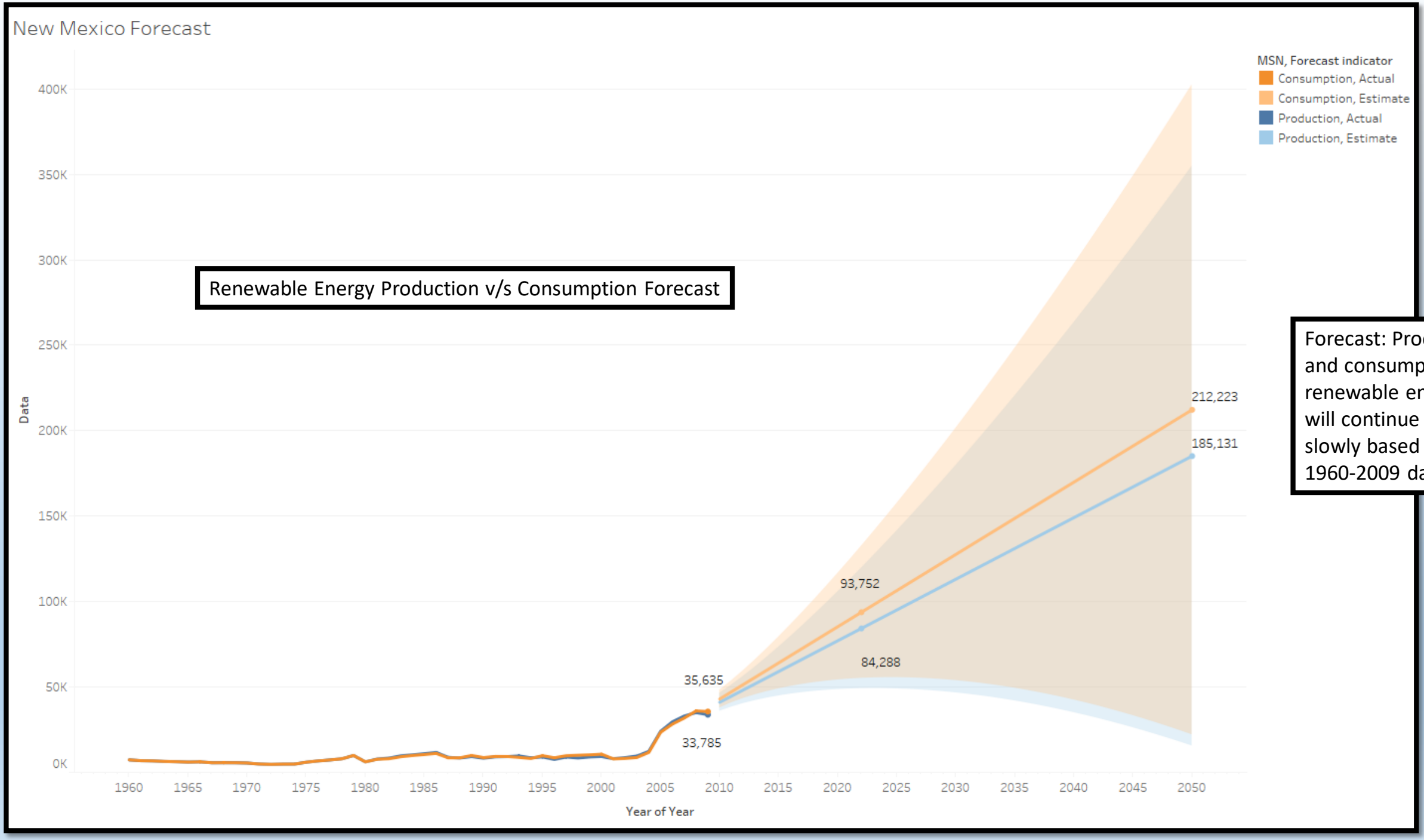
While New Mexico and Arizona show a negligible growth rate in their population forecast by 2050, Texas shows a gradual increase in population forecast. California on the other hand is also predicted to have steady growth rate in its population.

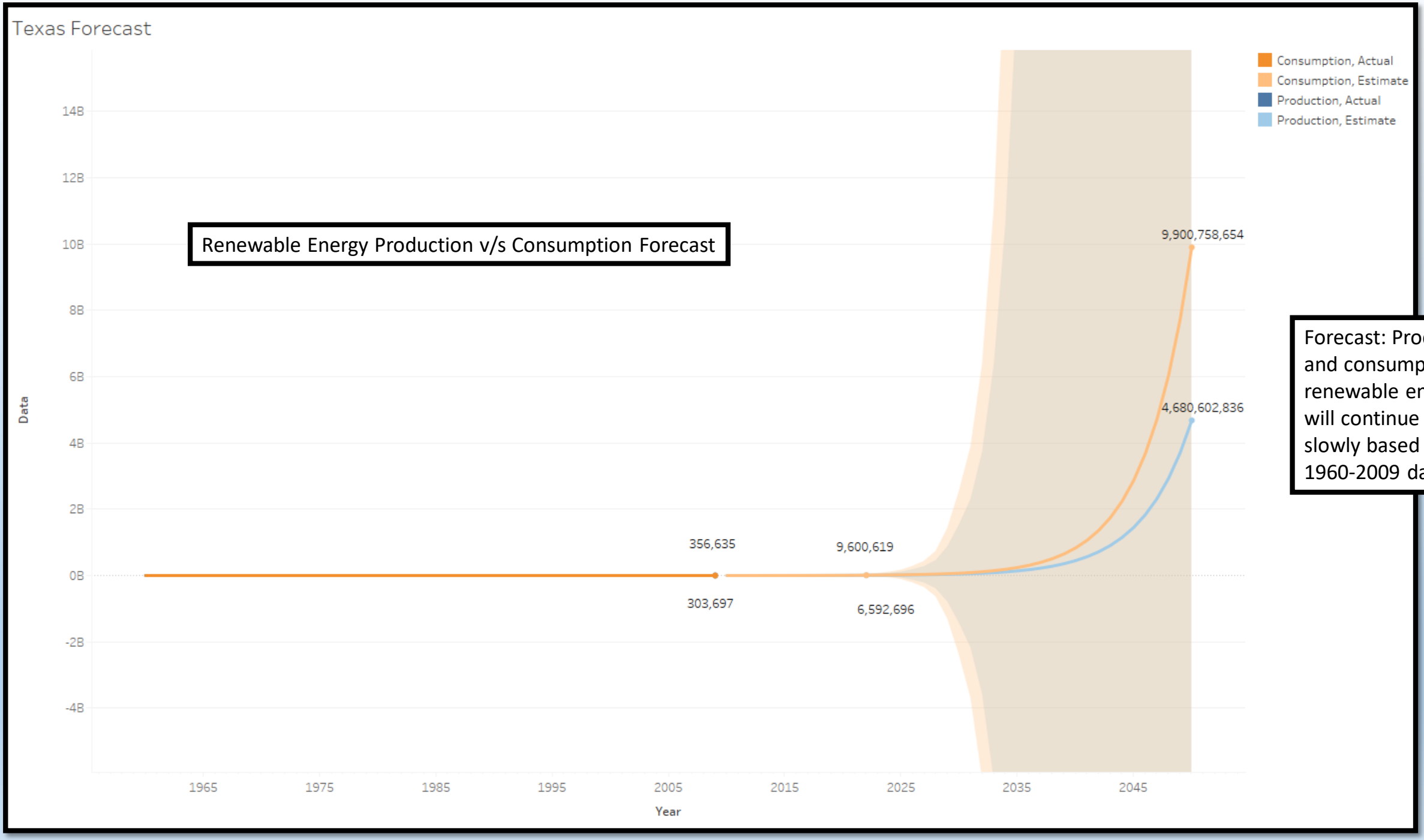


It is forecasted that not many changes will be observed in the production and consumption rates of renewable energy based on the available data.

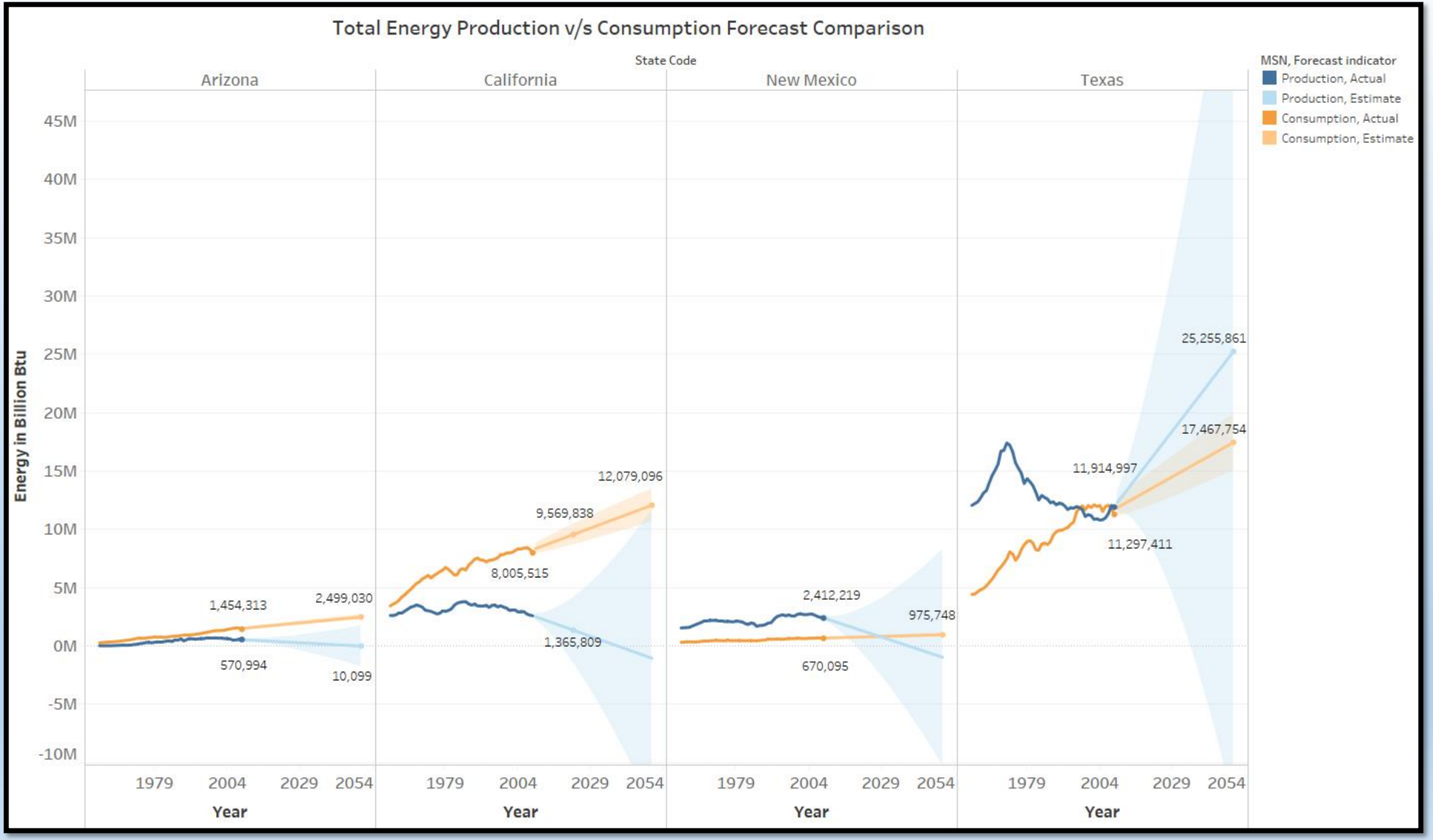


It is forecasted that not many changes will be observed in the production and consumption rates of renewable energy based on the available data.


New Mexico Forecast
MSN, Forecast indicator
Consumption, Actual
Consumption, Estimate
Production, Actual
Production, Estimate
Renewable Energy Production v/s Consumption Forecast
Forecast: Production and consumption of renewable energy will continue to grow slowly based on 1960-2009 data.
Data
400K
350K
300K
250K
200K
150K
100K
50K
0K
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
Year of Year
212,223
185,131
93,752
84,288
35,635
33,785



Forecast: Production and consumption of renewable energy will continue to grow slowly based on 1960-2009 data.


Total Energy Production v/s Consumption Forecast Comparison
State Code
Arizona
California
New Mexico
Texas
MSN, Forecast indicator
Production, Actual
Production, Estimate
Consumption, Actual
Consumption, Estimate
Energy in Billion Btu
45M
40M
35M
30M
25M
20M
15M
10M
5M
0M
-5M
-10M
1,454,313
2,499,030
570,994
10,099
8,005,515
9,569,838
12,079,096
1,365,809
2,412,219
975,748
670,095
11,914,997
11,297,411
25,255,861
17,467,754
1979
2004
2029
2054
Year

Summary

- TX and CA have super-economic and technological capabilities, and are rich in natural resources, among the four states. In these, NM and AZ are then weaker.
- According to the historical analysis from 1960 to 2009, it is found that the total energy consumption rises year by year with the economic development. The use of fossil fuels tends to be saturated because of the reserve of fossil fuels, and the use of clean energy, such as renewable energy and nuclear energy, is growing rapidly.
- To optimize resource allocation among states and to make rational use of r esources, it is necessary to form the energy compact. The cooperation on e nergy includes technical cooperation and the sharing of energy.

Memo

From 1969, during the fifty years. We may say that California has the best energy infrastructure of its kind. And during these years all the energy indicators are developing in a balanced way. Since the 1970s, Arizona has expanded its economic system in particular for the production of crude oil and natural gas and coal. Before 1970, New Mexico had a slow growth in all energy metrics, but then deteriorated before dramatically recovering in 1990. Before 1972, Texas had an obvious development of energy indicators, but it continued to decline until 2006, and all indicators appear to be poised for growth. And it's clear that the primary source of energy for each state is non-renewable. Only California and Arizona are experiencing a slow increase in the share of renewable energy in total energy, the other two states are falling.

In the next few years, we predict that, the total energy consumption will continue to grow steadily for Arizona and rapidly for California and Texas. New Mexico will have a steady but not steep increase in energy demand. It can be seen that energy production will increase in Texas and decline in all other states. It should be kept in mind that majority of the energy consumed is non-renewable and it is likely the natural resources are bound to exhaust. This represents the evolution of the path of energy structure in four states is in the wrong direction. As for their energy economic benefits, we expect that the current status of energy economic benefits will be maintained only in Arizona. Yet the economic benefits of energy will continue to fall in the other three states.

Also it can be seen that the projected growth rate in population of Texas is very high while the population in California continues to grow at a steady pace. The state of Arizona and New Mexico will have low population growth rates comparatively. It is highly recommended that these states should be ready and equipped to supply energy to the growing population's demand.

From above, we can conclude that the most pressing issue for these states is energy structure and sustainable energy development. We therefore recommend that all states attach importance to increasing the diversity of energy structures and increasing the development and use of renewable energy. So every state should try your best to improve energy efficiency through various policy methods. As for the energy contract between the states, we believe each state should give its own energy advantage to energy deficient states to increase the diversity of its energy systems.

Renewable energy production between States is unequal, and the creation of renewable energy by the state is weak. The following three measures are suggested in order to achieve the target on renewable energy.

- States work together to develop clean energy generation technologies to increase clean and renewable energy production. It'll also reduce the cost of produ ction.
- The government can subsidize the renewable energy sector to stimulate renewable energy production. And to increase the share of renewable energy in total energy, the government should increase taxes on non-renewable and polluting energy industries.
- States should share their own renewable energy resources reasonably to make the use of renewable energy in various states be at a similar level.

References:

- Tableau Viz Gallery
- MSN code nomenclature
- Forecasting in Tableau