EV Power - Lab 4 Project Report

Example Solution 1

Part 0: libraries

```r
library(maps)
library(stringr)
library(tidyverse)
```

```
── Attaching core tidyverse packages ──────────────────── tidyverse 2.0.0
──
✔ dplyr     1.1.4     ✔ purrr     1.1.0
✔ forcats   1.0.1     ✔ readr     2.1.5
✔ ggplot2   4.0.0     ✔ tibble    3.3.0
✔ lubridate 1.9.4     ✔ tidyr     1.3.1
── Conflicts ──────────────────────────── tidyverse_conflicts()
──
✖ dplyr::filter() masks stats::filter()
✖ dplyr::lag()    masks stats::lag()
✖ purrr::map()    masks maps::map()
ℹ Use the conflicted package (<http://conflicted.r-lib.org/>) to force all
conflicts to become errors
```

Part 1: Defining Research Question

Chosen Question: Does the % increase in average energy price per year cause a similar % decrease in total energy usage per year?

Part 2: Data Preparation and Cleaning

```r
#load in data
energy_price <- read.csv("data/av-energy-price-2021-2023.csv")
energy_use_21 <- read.csv("data/total-use-2021.csv")
energy_use_22 <- read.csv("data/total-use-2022.csv")

#Cleaning energy use for 21 and 22
energy_use_21$Energy_Source <- c("Coal_21", "Natural Gas_21", "Petroleum_21",
"Nuclear_21", "Renewable_21")

energy_use_22$Energy_Source <- c("Coal_22", "Natural Gas_22", "Petroleum_22",
"Nuclear_22", "Renewable_22")

#energy_price <- str_split(energy_price, ",")
```

```
#str_extract(energy_price$2021, "\\d+\\.{1}\\d{2}")
```

Part 3: Joining / Pivoting Datasets for Analysis

```
energy_use_21 <- pivot_longer(energy_use_21, cols = c('AK':'US'), names_to =
'State', values_to = 'Energy')

energy_use_21 <- pivot_wider(energy_use_21, names_from = "Energy_Source",
values_from = "Energy")

energy_use_22 <- pivot_longer(energy_use_22, cols = c('AK':'US'), names_to =
'State', values_to = 'Energy')

energy_use_22 <- pivot_wider(energy_use_22, names_from = "Energy_Source",
values_from = "Energy")

all_data <- left_join(energy_use_21, energy_use_22, by = "State")

all_data <- all_data |>
    mutate(Total_21 = Coal_21 + `Natural Gas_21` + Petroleum_21 + Nuclear_21 +
Renewable_21)

all_data <- all_data |>
    mutate(Total_22 = Coal_22 + `Natural Gas_22` + Petroleum_22 + Nuclear_22 +
Renewable_22)

all_data <- all_data |>
    mutate(Percent_change = ((Total_22 - Total_21)/Total_21)*100)

all_data <- all_data |>
    mutate(Percent_change = round(Percent_change, 2))
```

Part 4: Mapping Visualization

```
all_data <- all_data |>
    mutate(region = tolower(state.name[match(State,state.abb)]))

states_map <- map_data("state")

all_data_2 <- left_join(states_map, all_data, by = "region")


ggplot(all_data_2, aes(x = long, y = lat, group = group, fill =
Percent_change)) + geom_polygon(color = "white", linewidth = 0.2) +
scale_fill_gradient2(
    low = "red", mid = "white", high = "blue",
```
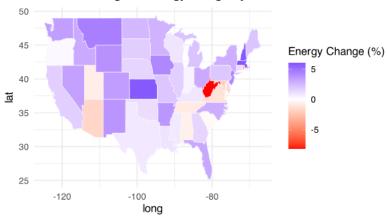
```
  midpoint = 0,
  name = "Energy Change (%)"
) +
labs(
  title = "Percent Change in Energy Usage by State",
  caption = "Negative = Decrease, Positive = Increase"
) +
theme_minimal()
```


Percent Change in Energy Usage by State