EIA Annual Energy Outlook Projections

CODE ▾

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```r
library(zoo)
library(lubridate)
library(readxl)
library(scales)
library(grid)
library(gridExtra)
library(janitor)
library(ggpubr)
library(cowplot)
library(patchwork)
library(ggthemes)
library(directlabels)
library(pdfetch)
library(gghighlight)
library(viridis)
library(tidyverse)
library(ggrepel)
library(xml2)
library(rvest)

options(dplyr.summarise.inform = FALSE)

data_fetch<-function(key, cat){
  #key<-KEY
  #cat=476336
  ifelse(cat==999999999,
         url <- paste("https://api.eia.gov/category/?api_key=",
                      key, "&out=xml", sep="" ),
         url <- paste("https://api.eia.gov/category/?api_key=",
                      key, "&category_id=", cat, "&out=xml", sep="" )
  )

  x <- read_xml(url)
  doc <- XML::xmlParse(file=x)


  Parent_Category <- tryCatch(XML::xmlToDataFrame(,stringsAsFactors = F,nodes =
                                                    XML::getNodeSet(doc, "//category/parent_category_id")),
```

```r
                        warning=function(w) FALSE, error=function(w) FALSE)
    Sub_Categories <- XML::xmlToDataFrame(,stringsAsFactors = F,nodes =
                                    XML::getNodeSet(doc, "//childcategories/row"))
    Series_IDs <- XML::xmlToDataFrame(nodes =
                                    XML::getNodeSet(doc, "///childseries/row"),stringsAsFactors = F)
    Categories <- list(Parent_Category, Sub_Categories, Series_IDs)
    names(Categories) <- c("Parent_Category", "Sub_Categories", "Series_IDs")
    Categories
}


 get_children<-function(category_id=476336){
   subs<-data_fetch(KEY,cat=category_id)
   sub_cats<-subs$Sub_Categories
   #build list from sub_cats
   cat_store <- list()
   cat_count<-1
   for (cat in sub_cats$category_id) {
     #cat<-sub_cats$category_id[1]
     series<-data_fetch(KEY,cat=cat)
     cat_store[[cat_count]]<-series$Series_IDs
     cat_count<-cat_count+1
   }
   data.frame(do.call(rbind,cat_store))
 }
 #get_children()

 get_series<-function(category_id=476336){
   #series,name,f,units,updated
   subs<-data_fetch(KEY,cat=category_id)
   subs$Series_IDs
 }
 #get_series()



pd_fix<-function(data,name){
   data<-data.frame(date=index(data), coredata(data))
   data$date<-ymd(data$date)
```

```r
  data <- setNames(data, c("date",name))
 }

EIA_to_DF<-function(series_info){
   data<- pdfetch_EIA(series_info$series_id,KEY)
   pd_fix(data,series_info$name)
   }




eia_aeo_comp<-function(start_year=2014,end_year=2022,api_series=".SUP_NA_LFL_NA_DCP_NA_USA_MILLBRLPDY.A",
                  label="US Total Crude Oil Production",
                  units="mmbbl/d",
                  history=FALSE,
                  hist_series="PET.MCRFPUS2.A",
                  hist_conversion=1,
                  hist_year=1950,
                  zero_y=TRUE
                  ){ #use oil as the default
  #testing
  #api_series<-".GEN_NA_ELEP_NA_SLR_PHTVL_NA_BLNKWH.A"
  #start_year=2015
  #end_year=2022
  #label="Oil Production"
  #units="mmbbl/d"
  #hist_series<-"PET.MCRFPUS2.A"
  #hist_conversion=1000
  series<-paste("AEO.",seq(start_year,end_year),".REF",seq(start_year,end_year),api_series,sep="")
  labels<-paste(seq(start_year,end_year)," AEO",sep="")
  elements=end_year-start_year+1
  data<-pd_fix(pdfetch_EIA(series,KEY),labels)%>%
    pivot_longer(-date,names_to = "variable")
  plot<-ggplot(data)+
  geom_line(aes(date,value,group=variable,color=variable,size=variable==paste(end_year,"AEO")),lty="31")+
  #geom_point(data=data %>% filter(variable==paste(end_year,"AEO")),aes(date,value,group=variable,color=variable),size=2.25)
+
  scale_y_continuous(breaks=pretty_breaks(),expand=c(0,0))+
  scale_x_date(breaks=pretty_breaks(n=10),expand=c(0,0))+
```

```r
    scale_color_viridis("",discrete = T,option="A",direction = -1,end = .9)+
    scale_size_manual("",values=c(1,1.5))+
    scale_linetype_manual("",values=c("solid"))+
    theme_minimal()+weekly_graphs()+
      theme(axis.title.y = element_text(margin = margin(t = 0, r = 10, b = 0, l = 0)))+
    guides(linetype=guide_legend(order = 1,keywidth = unit(1.6,"cm")),
           size="none",
            #shape = guide_legend(keywidth = unit(1.6,"cm"),nrow = 2),
           #linetype = guide_legend(keywidth = unit(1.6,"cm"),nrow = 2),
           #colour = guide_legend(keywidth = unit(1.6,"cm"),override.aes = list(lty = "11")  ,nrow = 2),
           colour = guide_legend(keywidth = unit(1.6,"cm"),nrow = trunc(elements/6)+1,
                                 override.aes = list(size=c(rep(1,elements-1),1.5))),
           #fill = guide_legend(keywidth = unit(1.6,"cm"),nrow = 2)
           NULL)
  if(zero_y)
    plot<-plot+expand_limits(y=0)

  #get historical data
  if(history)
    {
    hist_data<-pd_fix(pdfetch_EIA(hist_series,KEY),"Historical data")%>%
      pivot_longer(-date,names_to = "variable")%>%
      mutate(value=value/hist_conversion)%>%
      filter(year(date)>=hist_year)
    plot<-plot+
    geom_line(data=hist_data,aes(date,value,lty="Historical Data"),size=1)+
    labs(y=paste(label," (",units,")",sep=""),x="",
         title=paste("Historical",label,"and EIA AEO Reference Case Projections"),
         caption="Source: Data via EIA AEO, graph by Andrew Leach.")
   }

  if(!history){
    plot<-plot+
    labs(y=paste(label," (",units,")",sep=""),x="",
         title=paste("EIA Annual Energy Outlook",label,"Forecasts"),
         caption="Source: Data via EIA AEO, graph by Andrew Leach.")
    }
  plot
```

```
}
```

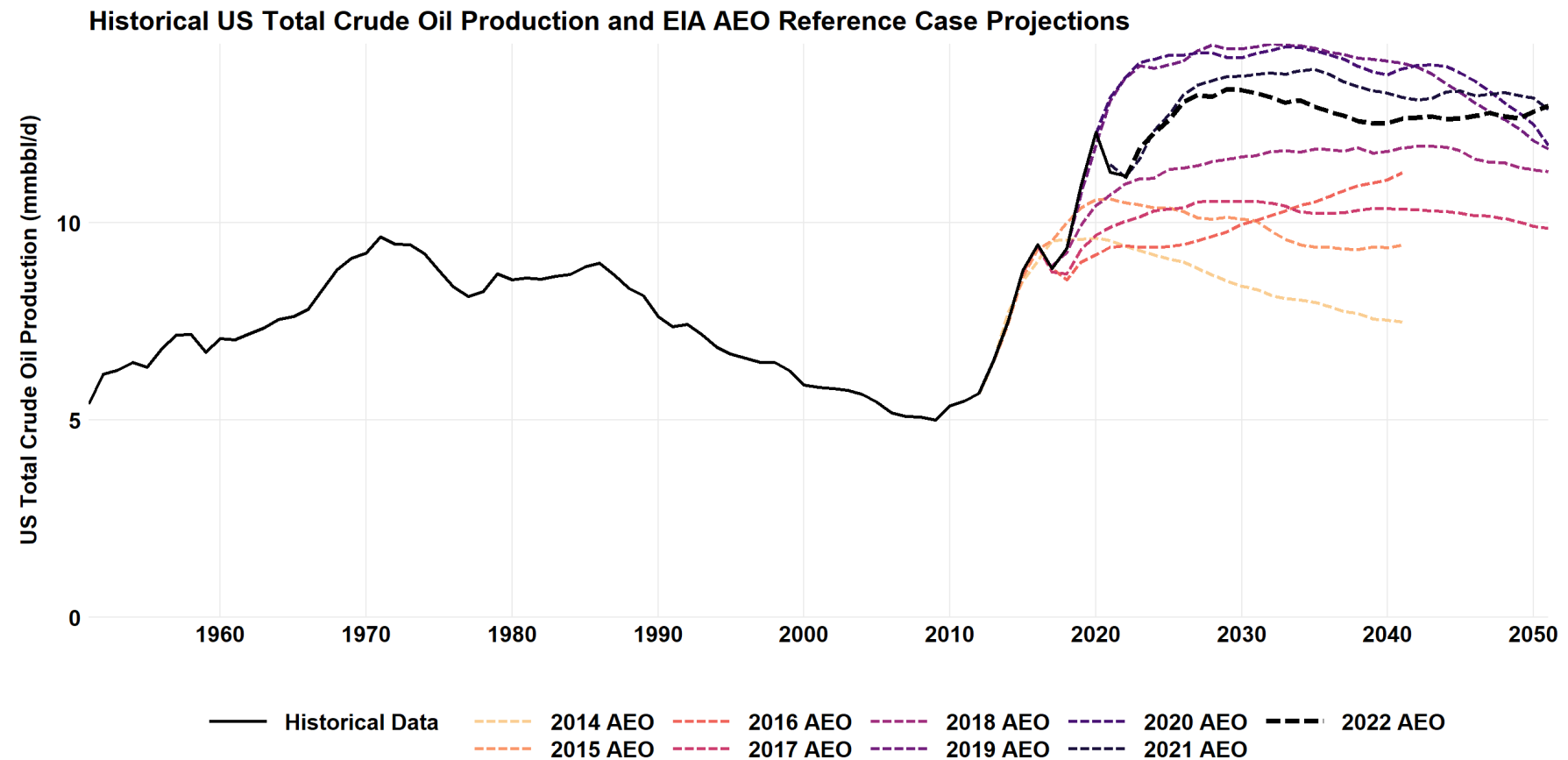# Oil Production, Trade, and Prices

| US Oil Production | US Oil Imports | US Oil Exports | WTI Oil Prices |

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```
eia_aeo_comp(history = TRUE,hist_conversion = 1000)
```

Historical US Total Crude Oil Production and EIA AEO Reference Case Projections

Source: Data via EIA AEO, graph by Andrew Leach.

Natural Gas Production, Trade, and Prices

| US Natural Gas Production | US Natural Gas Imports | US Natural Gas Exports | Henry Hub Natural Gas Prices | Trade Flows |

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```
eia_aeo_comp(start_year = 2014,api_series =".SUP_DPR_NA_NA_NG_TOT_USA_TRLCF.A",label = "US Dry Natural Gas Production",
                        units = "TCF",
                        history = TRUE,
                        hist_series = "NG.N9070US2.M",
                        hist_conversion = 10^6/12,
                        hist_year=1950)
```

Historical US Dry Natural Gas Production and EIA AEO Reference Case Projections

Source: Data via EIA AEO, graph by Andrew Leach.
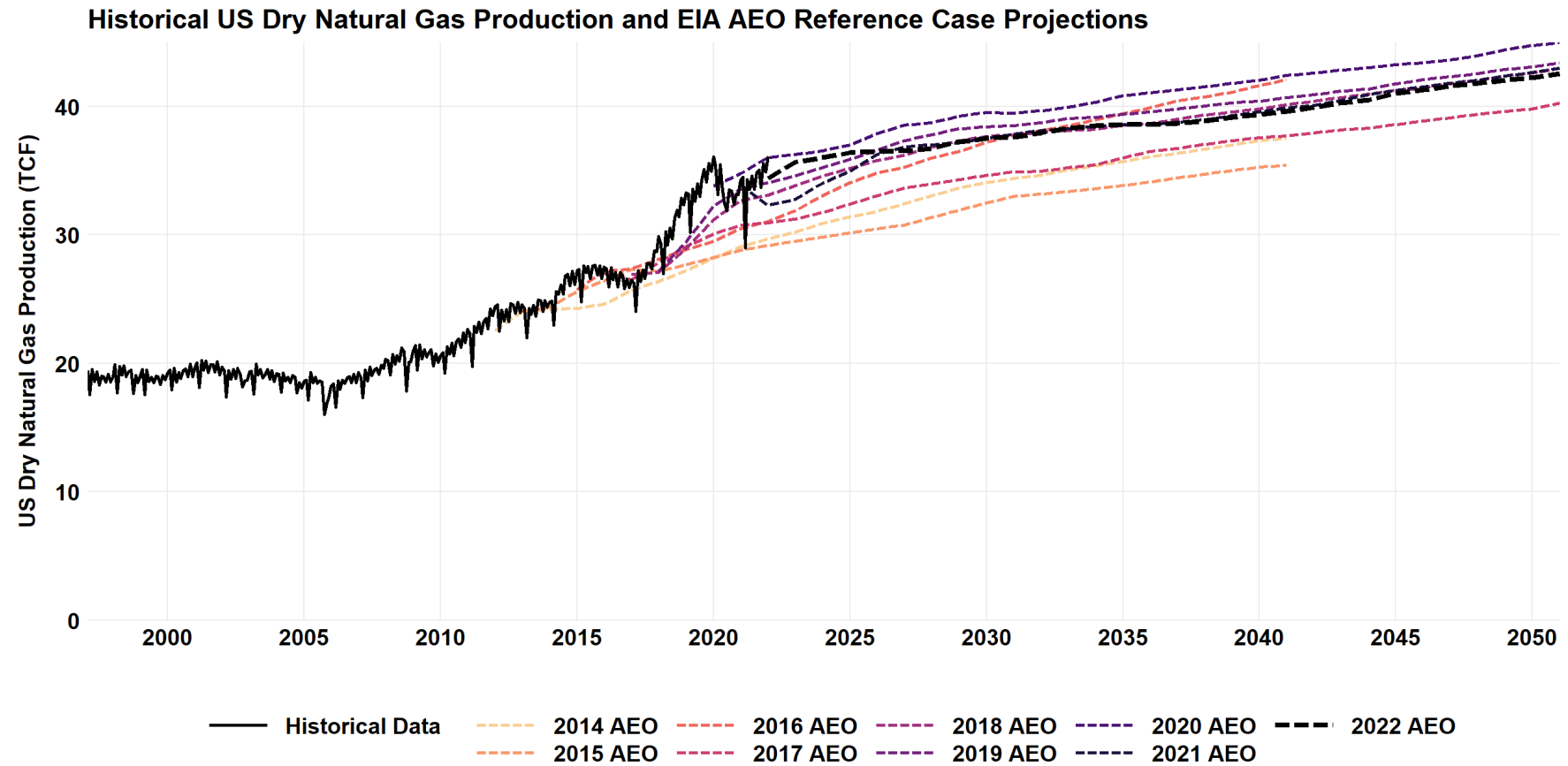
Electricity supply

| Total Electricity Supply | Solar Generation | Coal Generation |

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```
eia_aeo_comp(start_year = 2015,api_series =".GEN_NA_ELEP_NA_TEG_NA_USA_BLNKWH.A",label = "Electricity Generation",
             units = "billion kWh",
             history = TRUE,
             hist_conversion = 1000,
             hist_series = "ELEC.GEN.ALL-US-99.A"
             )
```
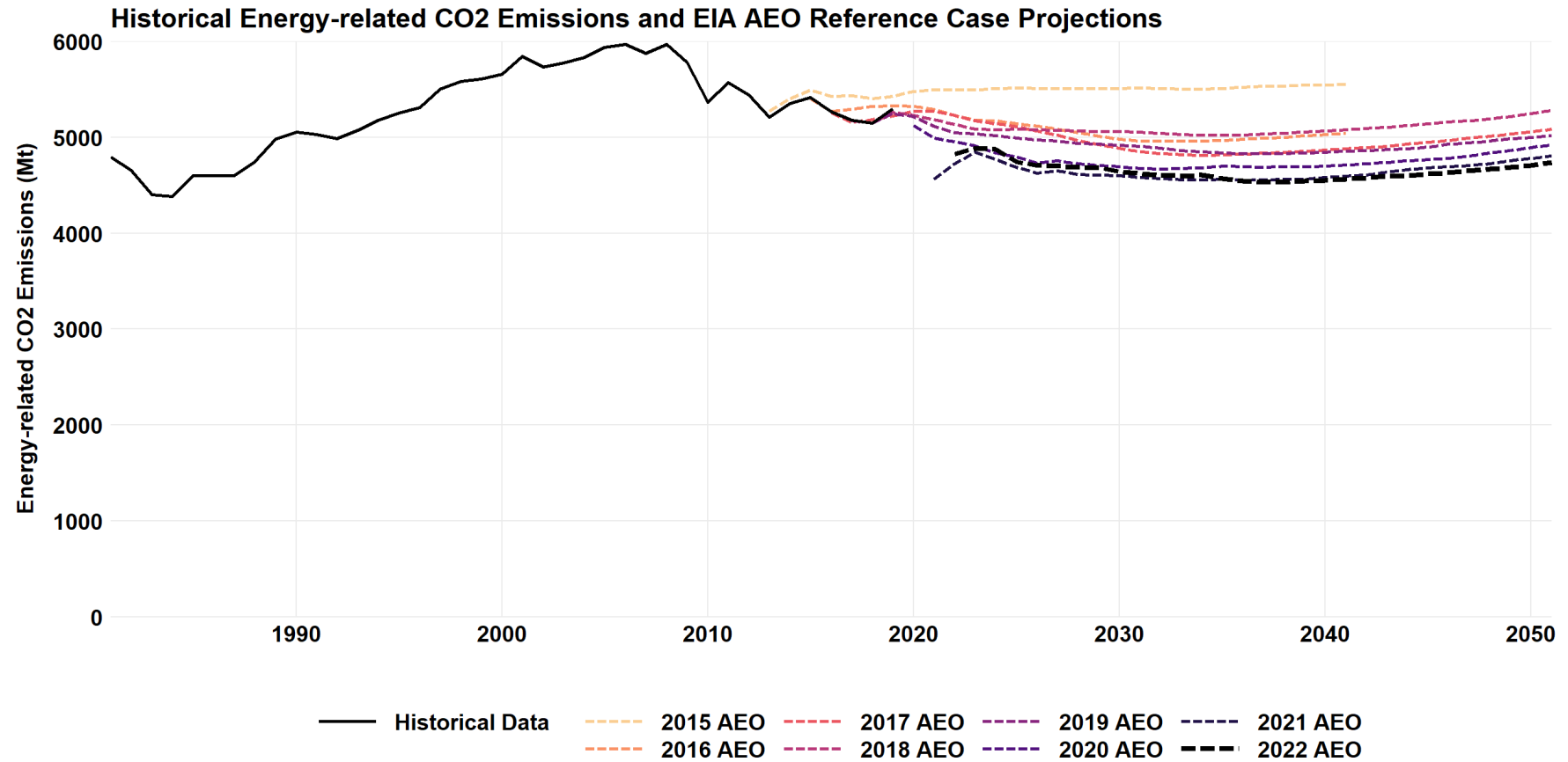
Historical Electricity Generation and EIA AEO Reference Case Projections
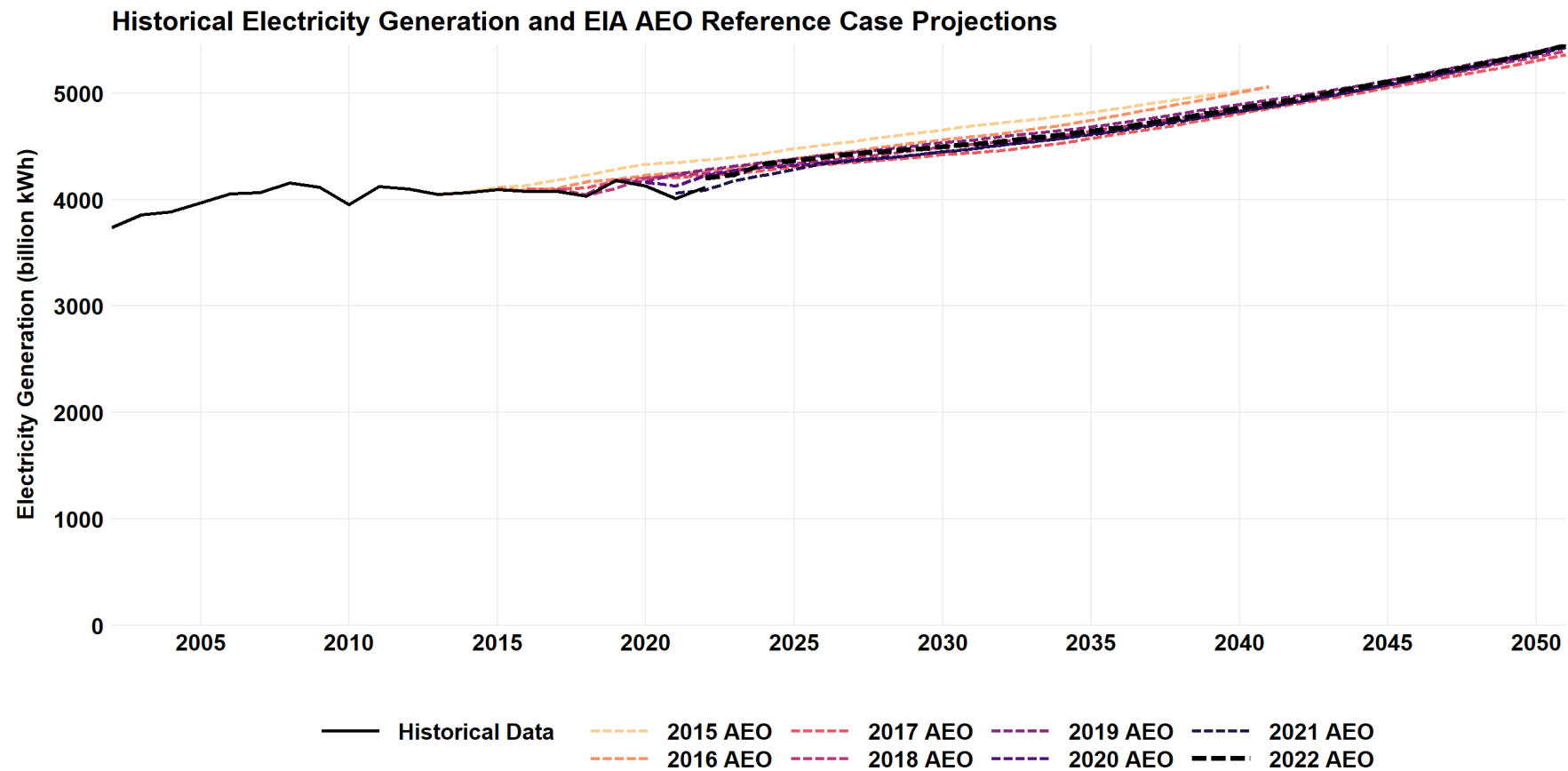
Source: Data via EIA AEO, graph by Andrew Leach.

Energy-related carbon dioxide emissions

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```
eia_aeo_comp(start_year = 2015,api_series =".EMI_CO2_TEN_NA_NA_NA_NA_MILLMETNCO2.A",label = "Energy-related CO2 Emissions",
                    units = "Mt",
                    history = TRUE,
                    hist_series = "EMISS.CO2-TOTV-TT-TO-US.A",
              zero_y = TRUE)+expand_limits(y=6000)
```

Historical Energy-related CO2 Emissions and EIA AEO Reference Case Projections

Source: Data via EIA AEO, graph by Andrew Leach.