



EMA Pre-Interview Assignment

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INTRODUCTION

An electricity demand forecasting model has to be developed for EMA to better inform EMA and the industry to ensure sufficient infrastructure is set up to cater for increasing electricity demand.

This presentation will cover what are the main drivers of electricity demand in Singapore and why, new developments that may serve as electricity demand drivers as well as proposed solution(s) to take into account such new drivers.

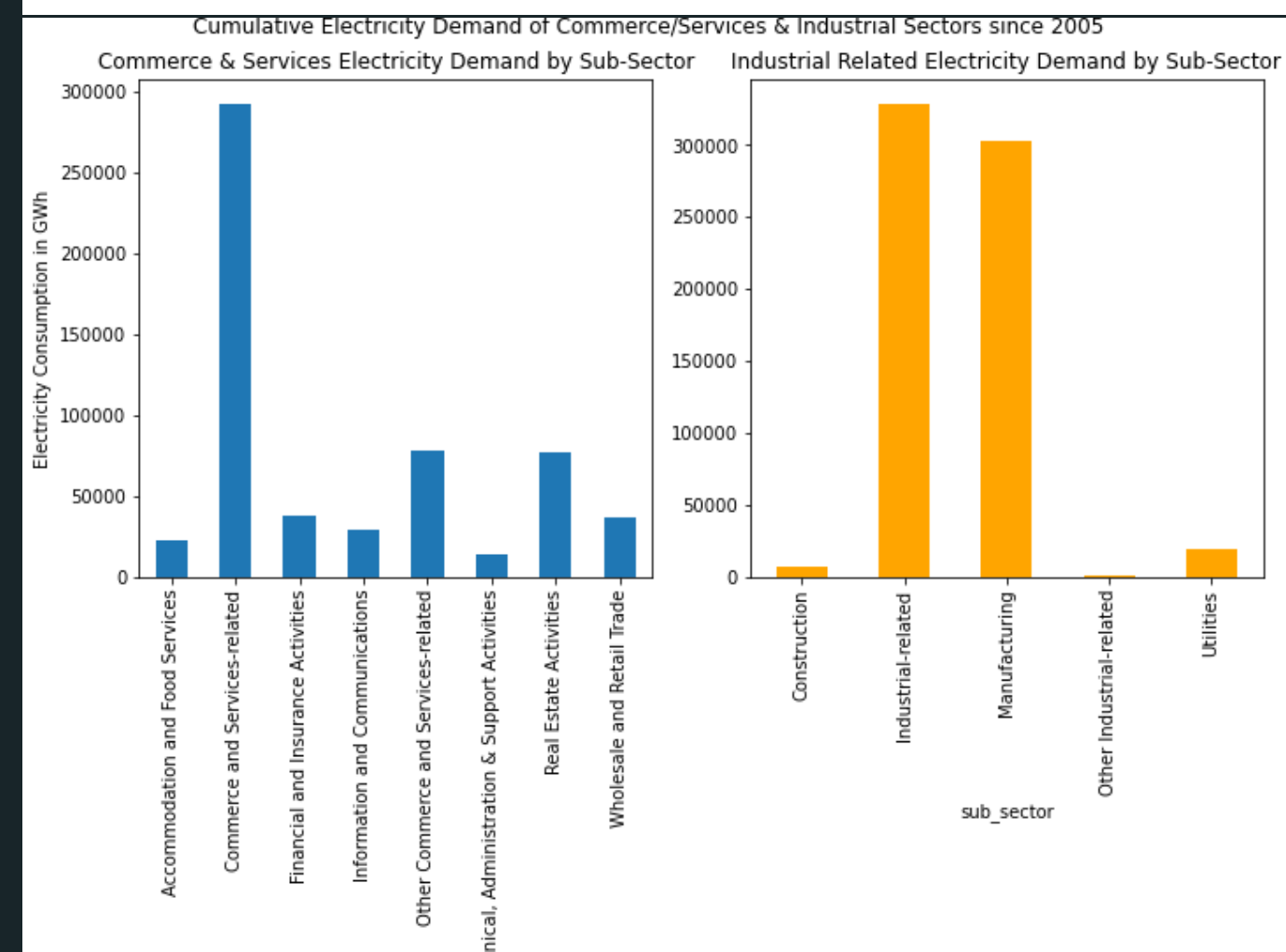
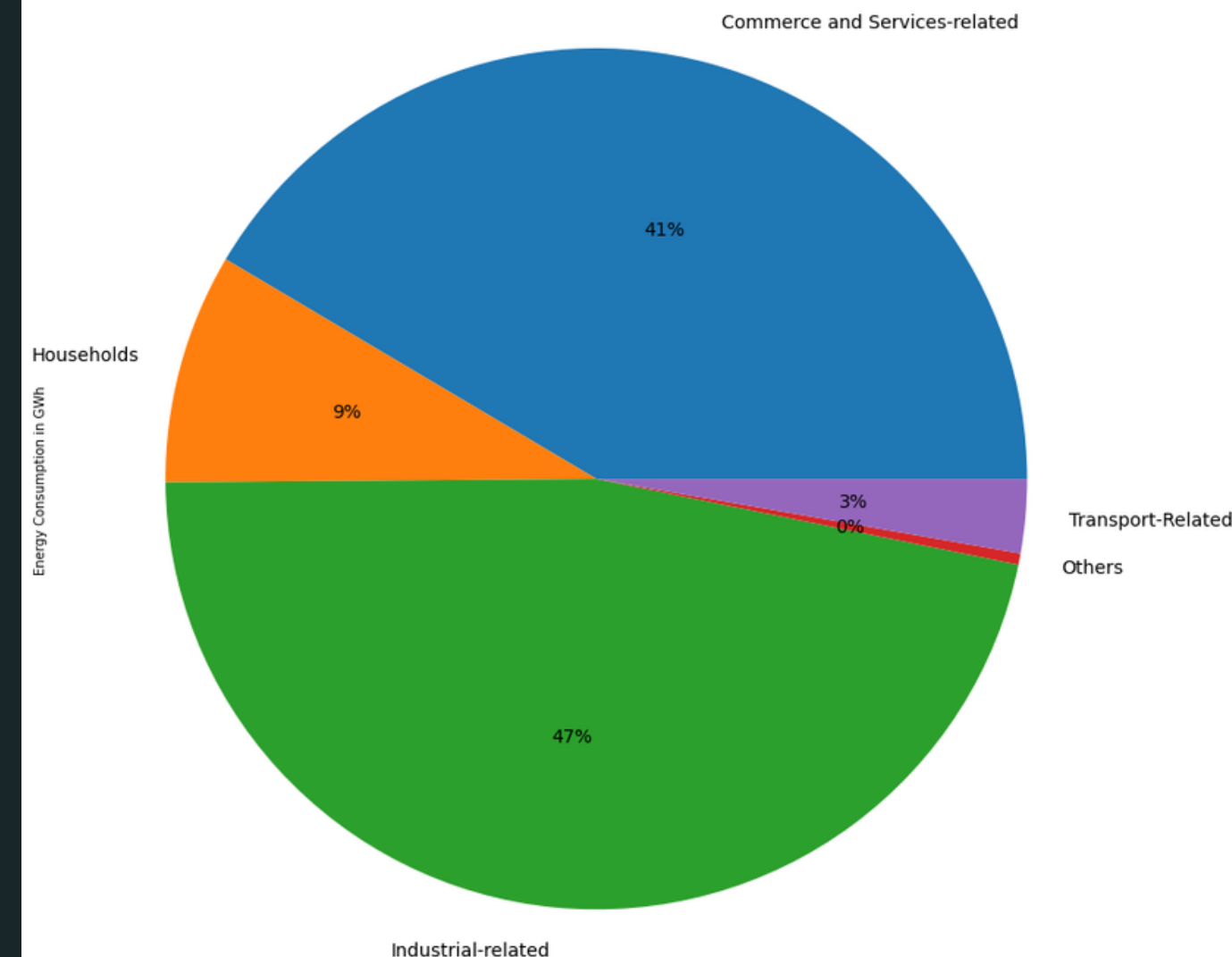
This presentation will also feature preliminary predictions of an early stage electricity demand forecasting model





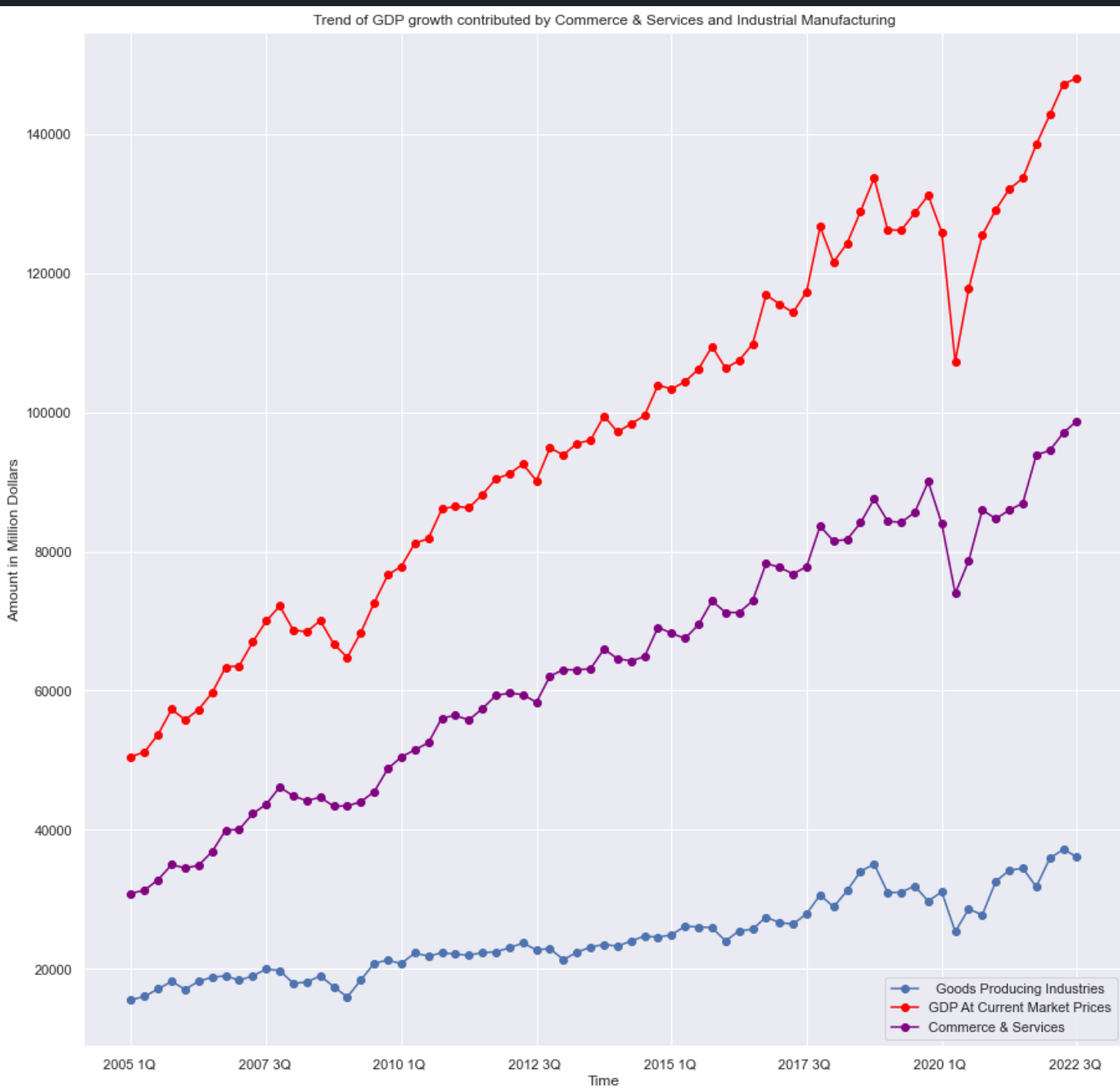
WHERE DOES SINGAPORE'S ELECTRICITY DEMAND COME FROM?

- Historically, industry & commerce/services consume the most electricity (47% & 41% respectively)¹
- In 2022, the trend is still the same, albeit with households accounting for a larger share of Singapore's electricity demand (14%)¹
- Delving deeper into industry, one of the key demand electricity users is the manufacturing sector.
- Growth in these sectors are key drivers of electricity demand



ECONOMIC DRIVERS OF ELECTRICITY DEMAND

GDP growth will be used as an indicator of growth in the industrial manufacturing & commerce/services sectors^{2 3}



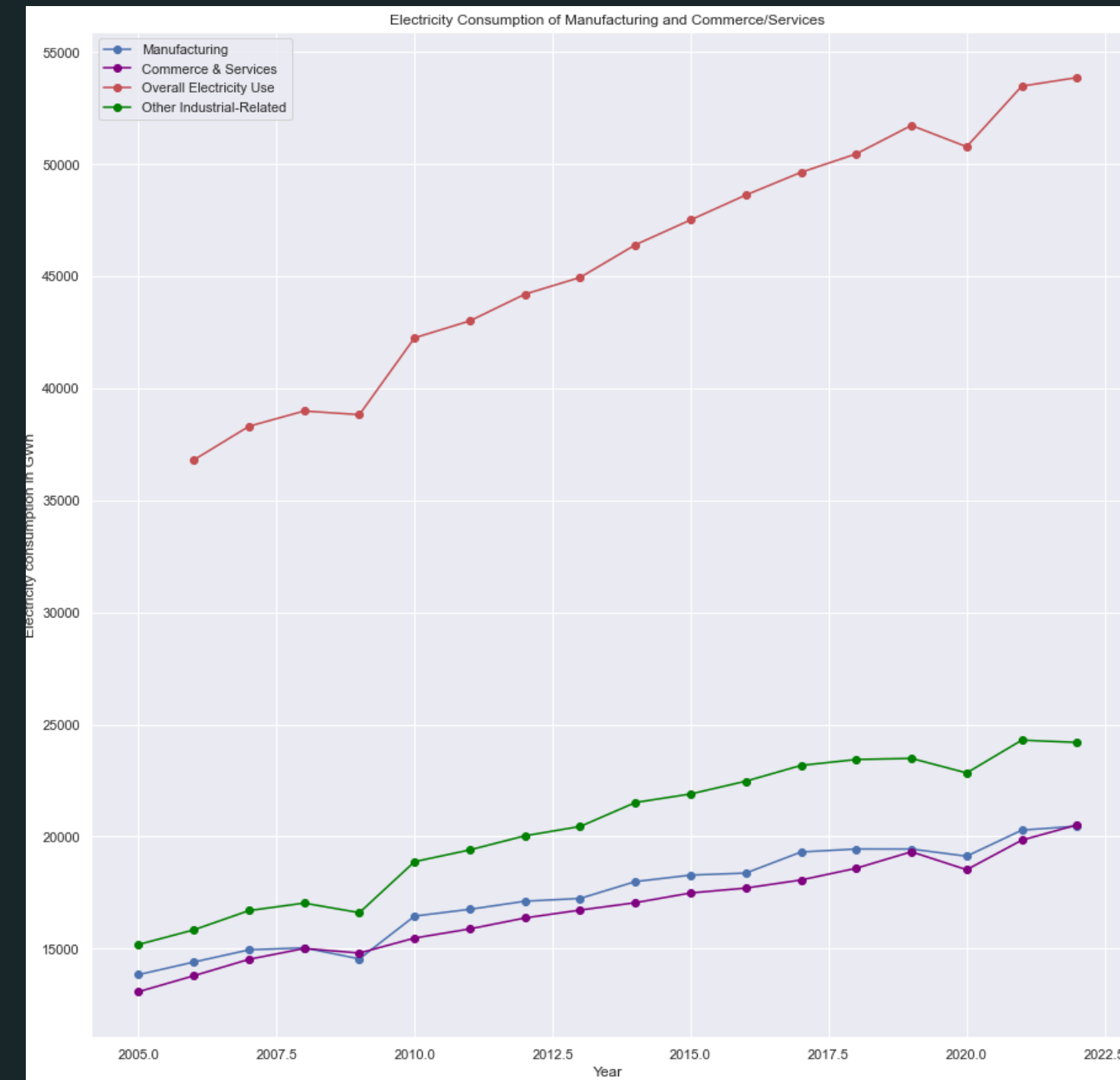
- Similar trends observed in GDP generated by identified economic sectors and electricity consumed by those sectors

2008

Dip in GDP & electricity consumed due to financial crisis

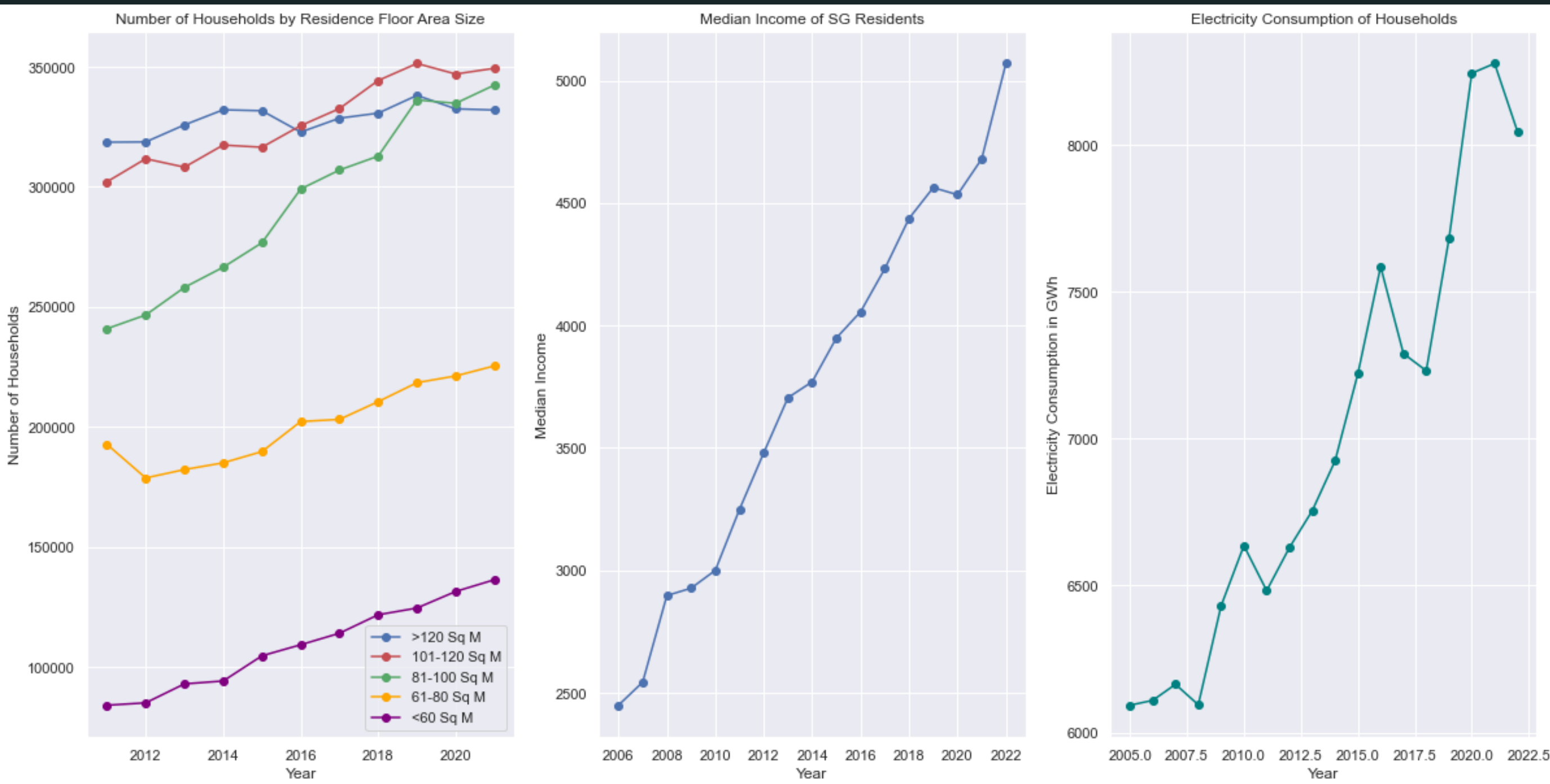
2020

Dip in GDP & electricity consumed due to COVID-19 pandemic



POPULATION AS A KEY DRIVER OF ELECTRICITY DEMAND

Another key driver for electricity demand, traditionally, is also population size and average income of that population.



- In Singapore's context, population size is projected to have limited growth or even a decline.⁴
- What will be a more impactful driver of electricity demand will be the average income of Singapore's population
- A trend of increasing income⁵ among Singaporeans leads to higher electricity consumption per capita⁶ (refer to annex)
- Evidenced by increasing number of households (more people moving out to stay by themselves) and an increasing number of large size residences (the larger a residence, the more electricity it consumes generally)⁷

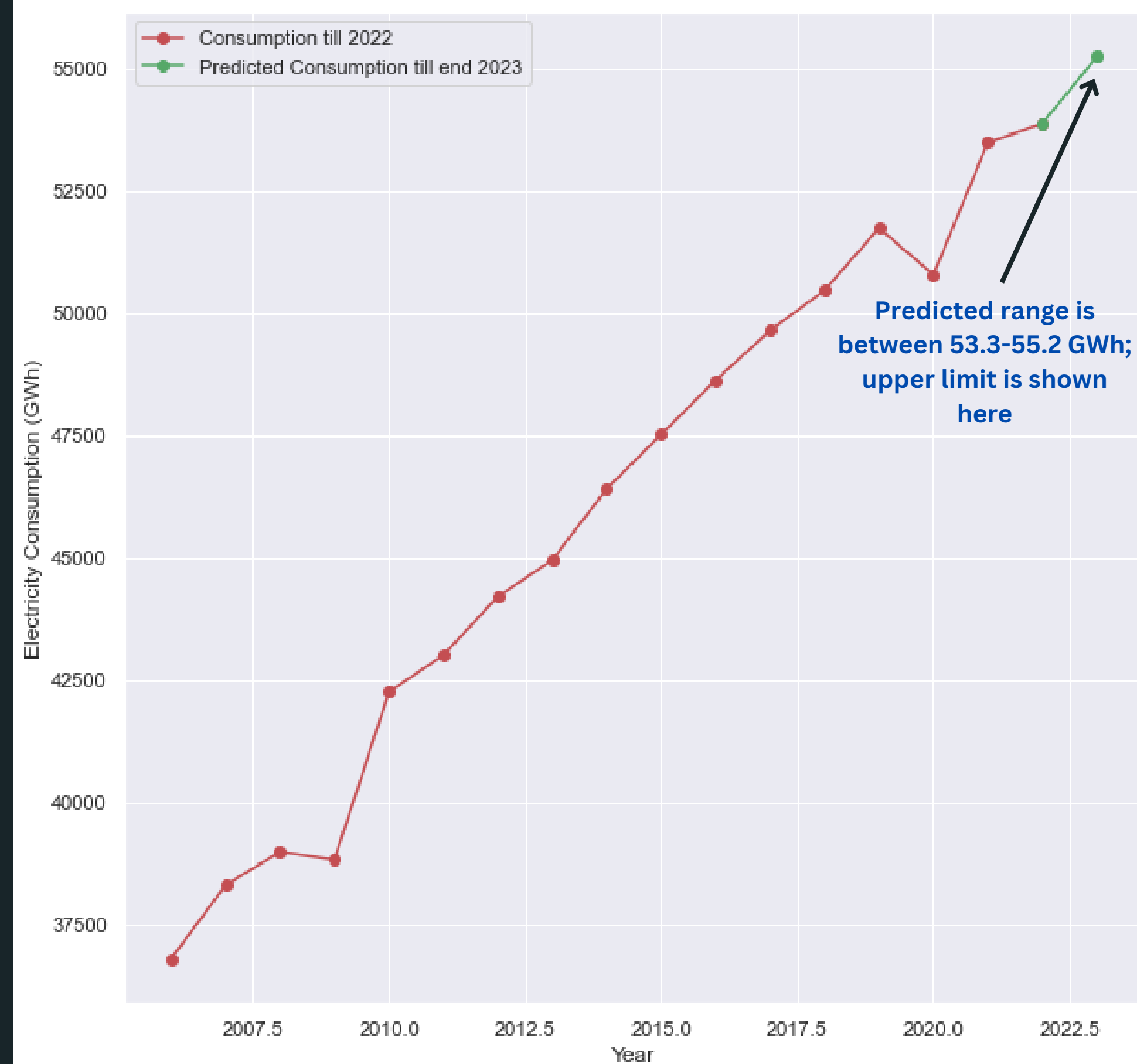


KEY PARAMETERS/FEATURES

- Growth in Manufacturing Sector (measured as GDP generated)
- Growth in Commerce/Services Sector (measured as GDP generated)
- Average Income of Singapore Residents



fed into a machine learning model to forecast electricity consumption in 2023



NEW POSSIBLE KEY DRIVERS OF ELECTRICITY DEMAND

1. Push for mass EV adoption

- Model does not take into account transport-related electricity demand as it currently accounts for only about 5% of Singapore's total electricity demand
- Push for mass EV adoption for public & private transport will necessitate installation of chargers, which will increase the demand for electricity in the transport-related sector.
- To a lesser extent, upgrades to our public transport infrastructure (i.e. new MRT/LRT lines) may also contribute to increased electricity demand.

2. Growth of new data centres

- Data centres themselves accounted for 7% of Singapore's electricity demand in 2020 and poised to account for 12% in 2030.⁸
- As digitalisation continues to proliferate and companies rely more on data, more data centres will be required. Data centres are power-intensive and may lead to much higher electricity demand in economic sectors than predicted.

POSSIBLE SOLUTIONS TO ACCOUNT FOR NEW DRIVERS

Proposed solutions rely on information about development plans/projected growth of the new drivers and can be collected through working with respective government agencies/corporations

1. Push for mass EV adoption

- Data collection from respective govt. agencies(e.g. LTA, URA), EV & EV charger manufacturers to obtain information on projected growth of number of chargers & electricity load for each kind of charger being considered.
- Data modelling on transport-related electricity demand can be performed with this added information and can be included in a key parameter in the forecasting model

2. Growth of new data centres

- Data collection from respective govt agencies (e.g. MTI) to obtain information about projected growth, quotas on new data centres. Power limitations are already imposed on new data centres.⁹
- Data modelling can be done with projected increase in number of data centres and the power limitations each data centre is restricted to.
- This will be the additional electrical load attributed to data centres and can be factored into the projected electricity demand of commerce/services industry



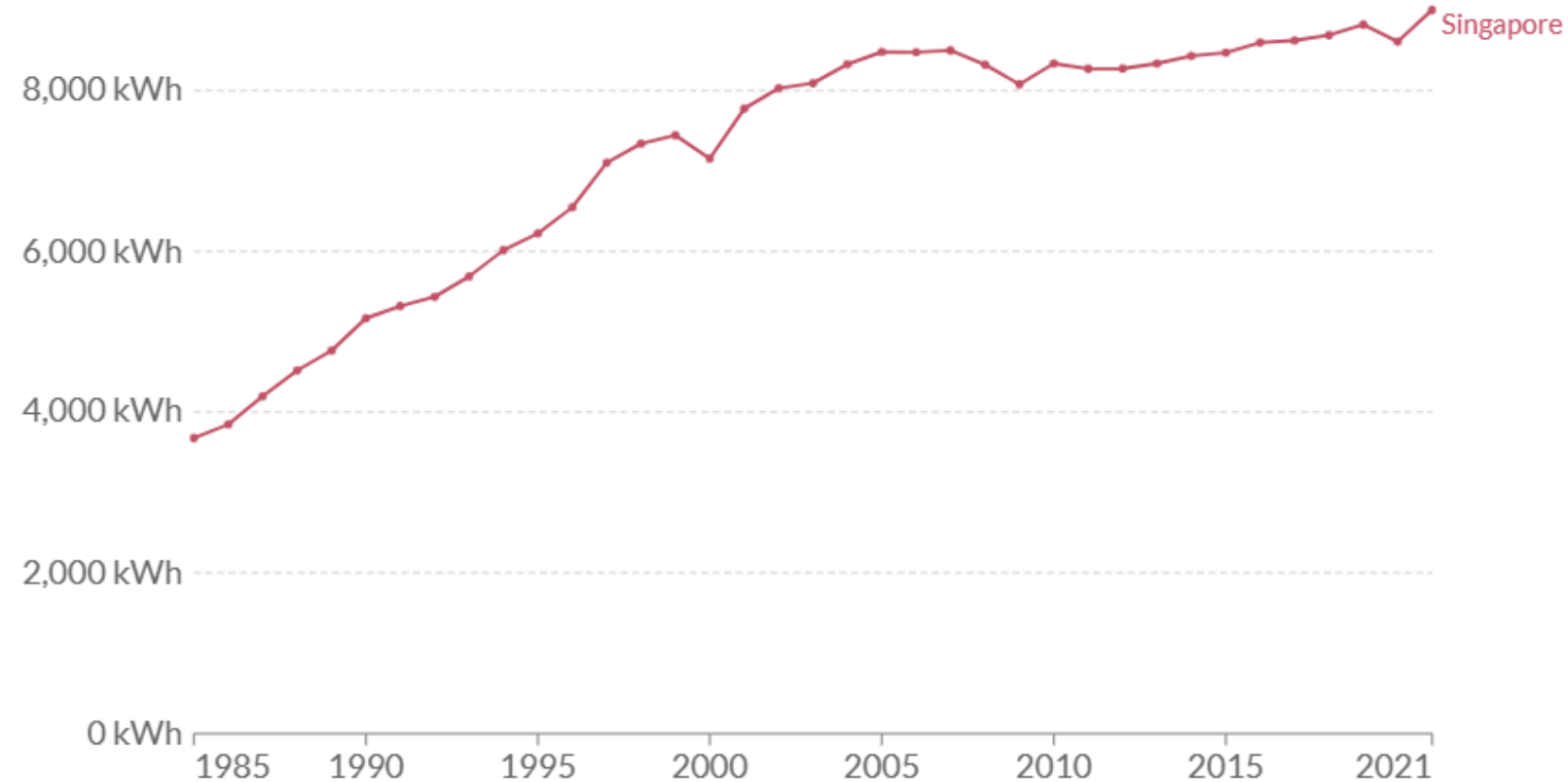
THANK YOU

ANNEX

Per capita electricity generation

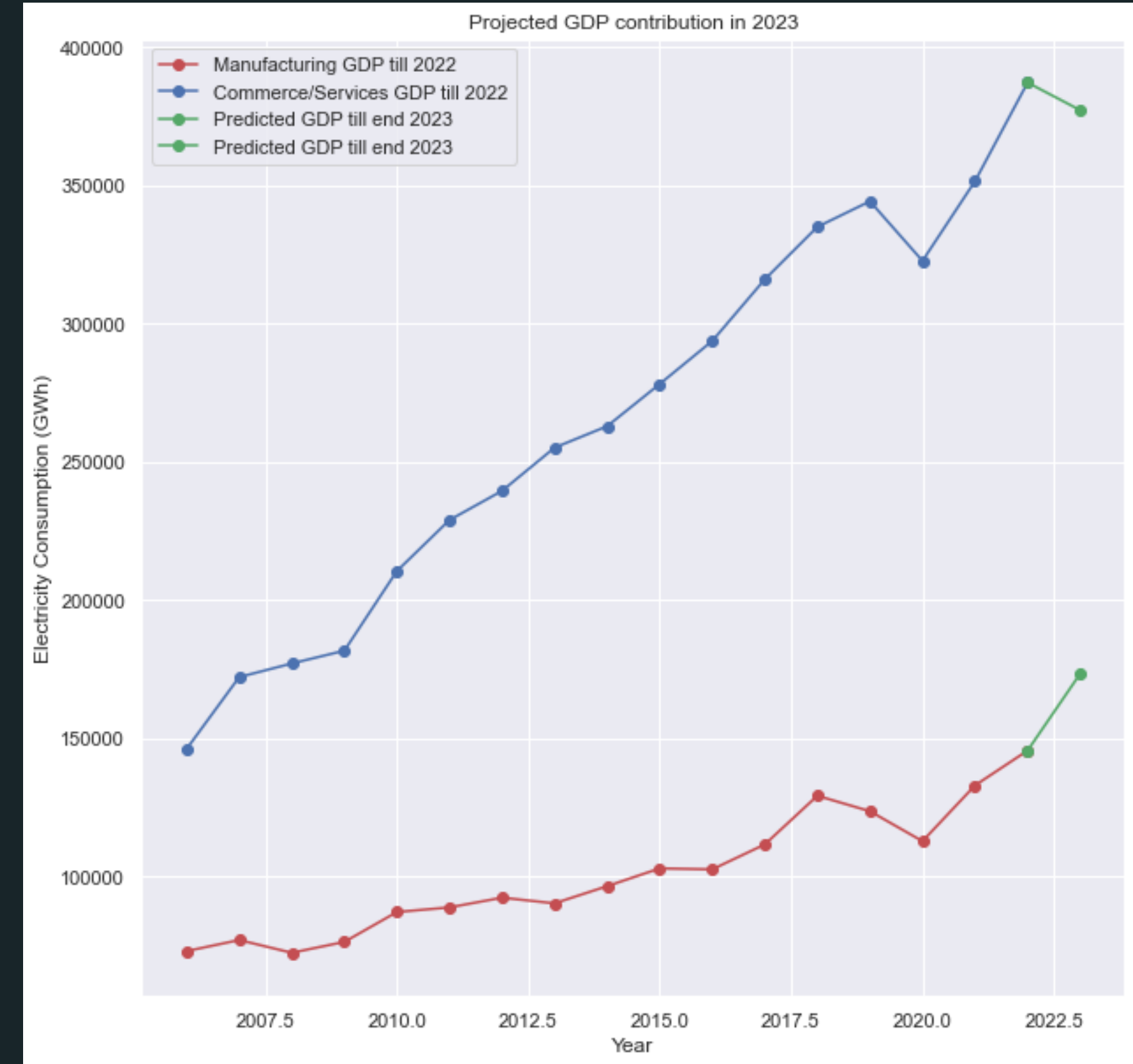
This is annual average electricity generation per person, measured in kilowatt-hours.

[+ Add country](#)



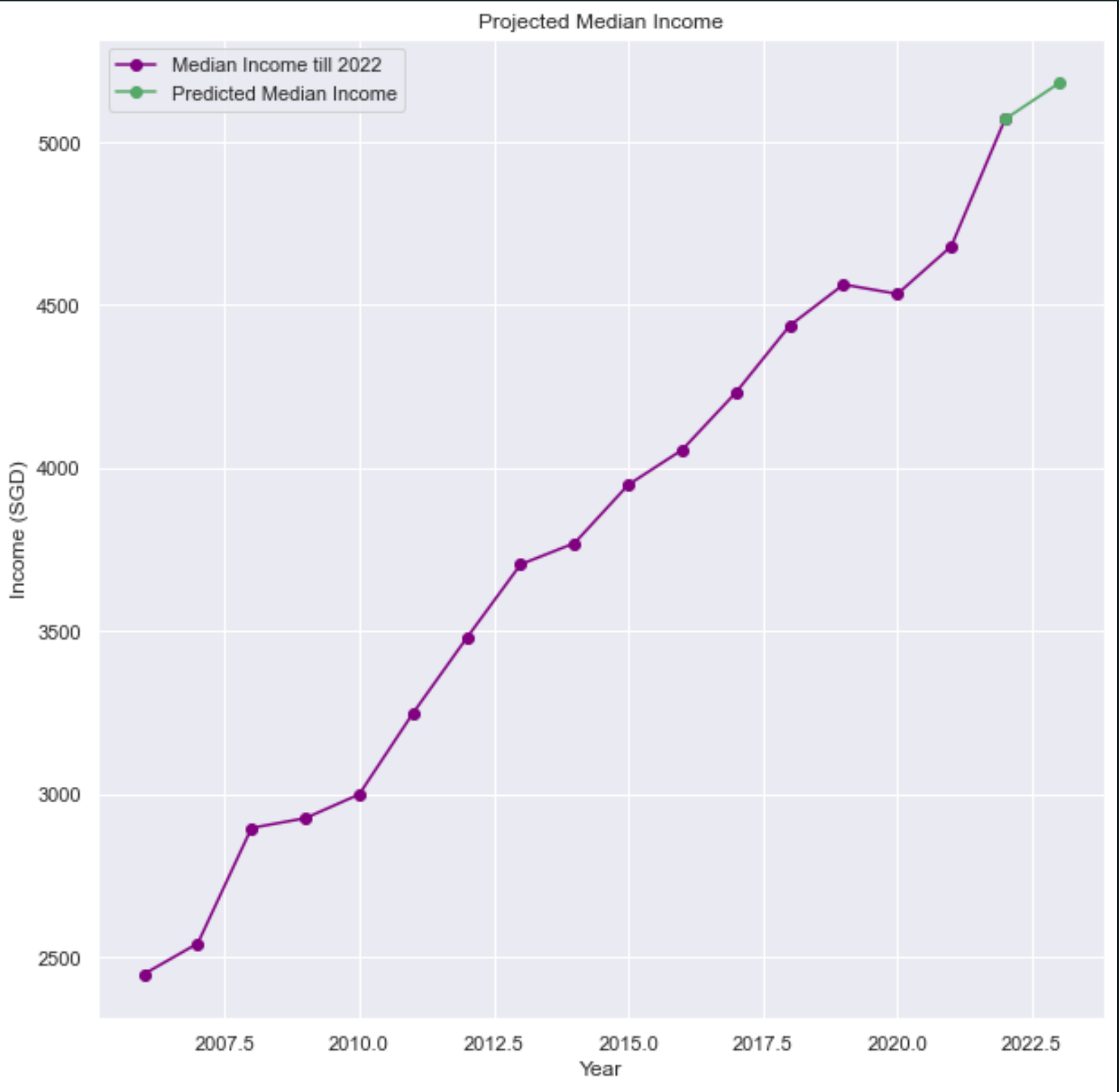
Source: Our World in Data based on BP Statistical Review of World Energy (2022); Our World in Data based on Ember's Yearly Electricity Data (2022); Our World in Data based on Ember's European Electricity Review (2022)
OurWorldInData.org/energy • CC BY

Increase in Electricity Consumption
per capita of Singapore⁶

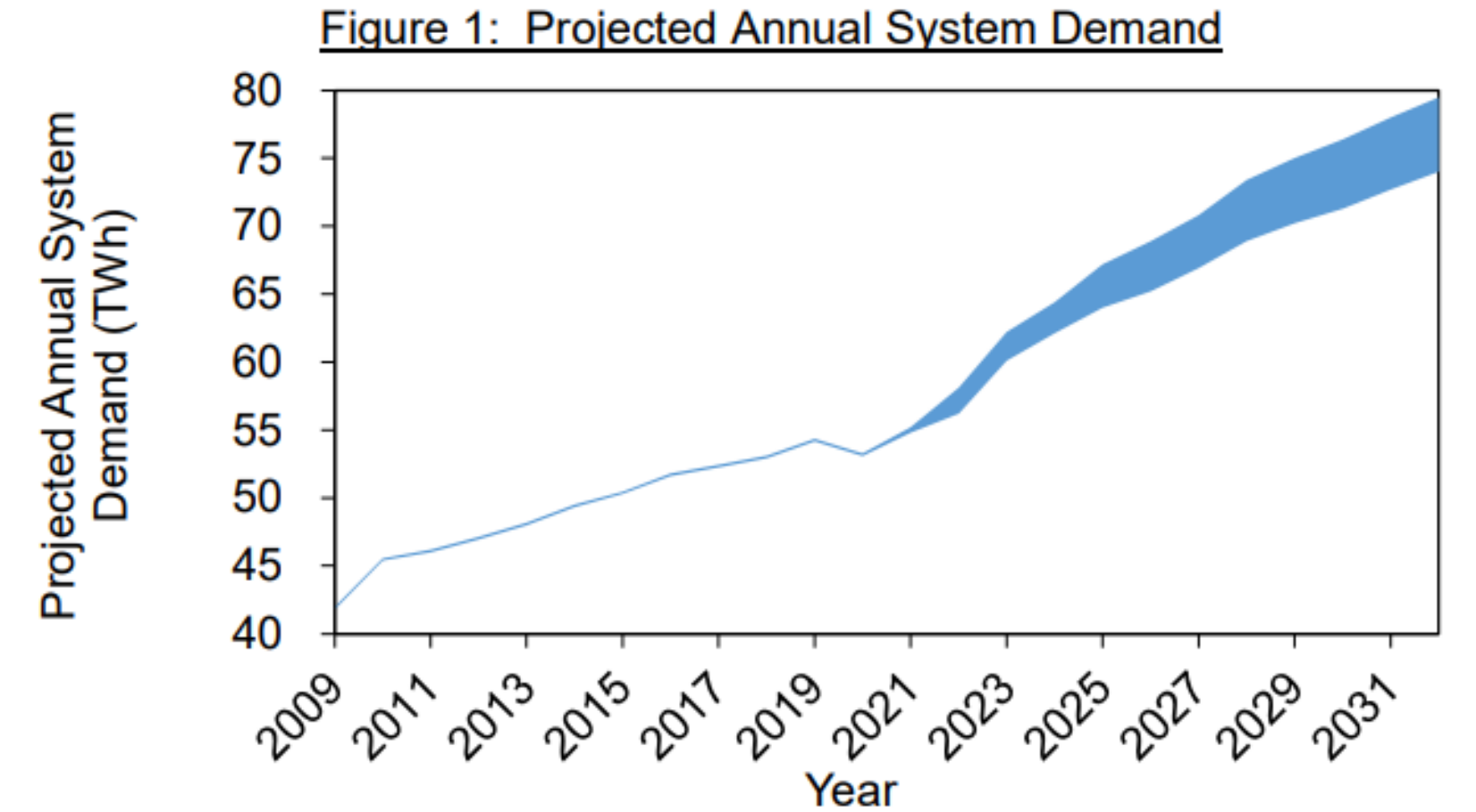


Predicted values of manufacturing &
commerce/services GDP in 2023
using LSTM

ANNEX



Predicted Median Income of Singapore residents in 2023 using LSTM



Year	Projected Annual System Demand (GWh)	
2022	56,200	58,100
2023	60,100	62,200
2024	62,100	64,400
2025	64,000	67,200

Projected Electricity Demand by EMA¹⁰. Prediction by forecasting model is less than EMA prediction

However, verified electricity consumption in 1H 2022 is only ~26,900GWh. It is also likely that the actual demand for 2022 will be below EMA's prediction.

Sources

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