Smart Energy, Sustainable Future

SINGAPORE ELECTRICITY MARKET OUTLOOK

(SEMO) 2020

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Fifth Edition

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SECTION 1 INTRODUCTION

1.1 In Singapore's liberalised market environment, power generation investments are commercially driven. Prices in the electricity market send signals to investors to make investment decisions with respect to the timing of new plantings, as well as the amount of capacity and the type of technology. For such a market-based approach to work well, it is important that there should be sufficient and reliable information for investors to make investment decisions. This is especially so for the power sector, considering the high capital cost and significant lead time required for power generation planting.

1.2 The Energy Market Authority (EMA) continually seeks to work with the industry to ensure a conducive environment for power generation investments. A public consultation paper was launched in October 2015 to seek feedback on initiatives and enhancements to prepare for future power generation investments in Singapore. This led to the publication of the EMA's Final Determination paper "Preparing for Future Power Generation Investments in Singapore" (29 July 2016)[1], where EMA indicated that it will release an annual information package to improve visibility on the longer-term outlook of the energy landscape in Singapore.

1.3 In this fifth edition, the EMA continues to provide the projected demand and supply conditions[2] in Singapore, complementing existing publications such as the Singapore Energy Statistics.

1.4 The EMA welcomes feedback on information that may be useful to include for future editions to enhance visibility on the longer-term outlook of the energy landscape in Singapore, to support power generation investment decisions.

[1] More information on the initiatives can be found in the Final Determination paper "Preparing for Future Power Generation Investments in Singapore", published on 29 July 2016 https://www.ema.gov.sg/cmsmedia/Determination_Paper_%20Preparing_for_Future_Power_Generation_Investments_Final_29_Jul.pdf

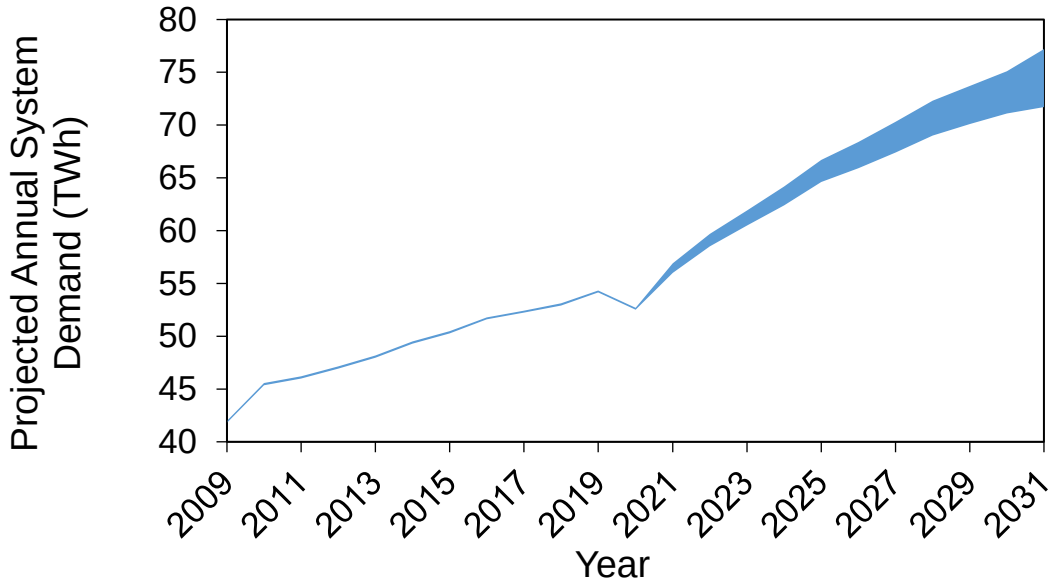
[2] The projections are indicative and non-binding, and are dependent on factors such as prevailing assumptions and projections, policy considerations and the broader macroeconomic climate.

SECTION 2 ELECTRICITY DEMAND OUTLOOK

2.1 Singapore's system demand[3] has increased from about 42 TWh in 2009 to about 54 TWh in 2019 at a compound annual growth rate (CAGR)[4] of 2.6%. System peak demand grew from 6,041 MW to 7,404 MW over the same period at a CAGR of 2.1%.

2.2 Over the next 10 years, from 2021 to 2031, the annual system demand and system peak demand are projected to grow at a CAGR[5] of between 2.5-3.1% (see Figures 1 and 2). These take into account various factors, including changes to population, temperature[6], projected Gross Domestic Product (GDP) growth rates, and projected demand from new high-growth sectors such as data centres.

Figure 1: Projected Annual System Demand



Year	Projected Annual System Demand (GWh)
2021	56,000 – 56,900
2022	58,500 – 59,700
2023	60,500 – 61,900
2024	62,400 – 64,200
2025	64,600 – 66,700
2026	65,900 – 68,400
2027	67,400 – 70,300

[3] System demand refers to gross electricity generation, including autoproducers with their own generation and consumers with solar generation, required to meet electricity consumed by all consumers. Autoproducers are enterprises that produce electricity but for whom the production is not their principal activity.

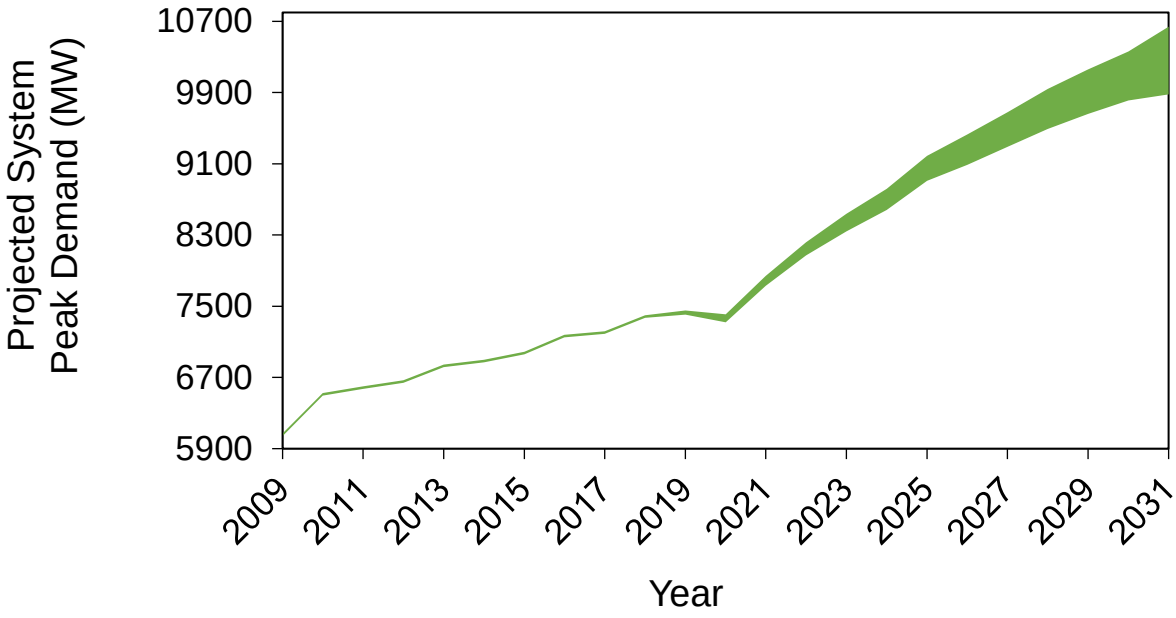
[4] The CAGR is calculated using 2009 figures as the base year.

[5] The CAGR is calculated using 2021 figures as the base year.

[6] For instance, higher temperatures may lead to increased electricity demand due to air-conditioning.

2028	69,000 – 72,300
2029	70,100 – 73,700
2030	71,100 – 75,100
2031	71,700 – 77,200

Figure 2: Projected System Peak Demand



Year	Projected System Peak Demand (MW)[7]
2021	7,730 – 7,840
2022	8,070 – 8,220
2023	8,340 – 8,540
2024	8,580 – 8,820
2025	8,910 – 9,190
2026	9,090 – 9,430
2027	9,290 – 9,680
2028	9,490 – 9,940
2029	9,660 – 10,160
2030	9,810 – 10,360
2031	9,880 – 10,640

2.3 The COVID-19 pandemic is expected to reduce electricity demand in 2020 to around 52,500 GWh and peak demand of around 7300 MW, as shown in Figures 1 and 2. Demand dipped by up to 13% year-on-year during the Circuit Breaker months of April and May, but gradually picked up over the past few months as the Circuit Breaker measure were gradually relaxed.

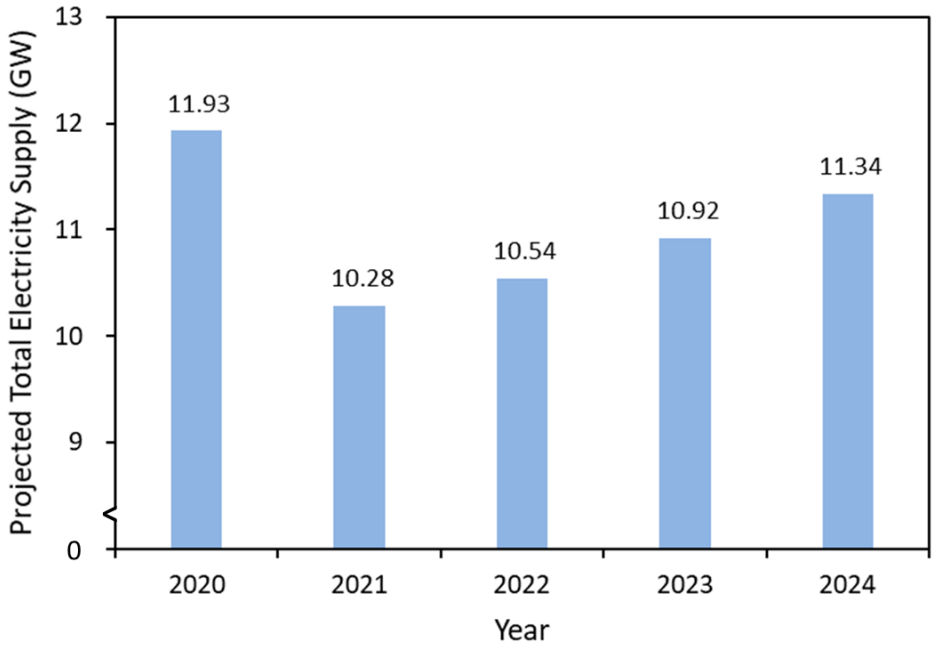
[7] 2020 projected system peak demand is 7,380MW.

2.4 As the economy recovers post-COVID-19, electricity demand over the medium to long term is expected to grow. This is due to growth in new and emerging electricity-intensive sectors such as data centres. Power requirements of these sectors are much larger and can ramp up very quickly. The government will continue to monitor these new electricity-intensive sectors to better understand their power requirements and update the projected growth into SEMO so that it can be factored into future energy infrastructures.

SECTION 3 ELECTRICITY SUPPLY OUTLOOK

3.1 Based on the submissions received from generation licensees on their indicative generation plans for the next 4 years[8] and projected growth of solar installed capacity in Singapore[9], the projected total electricity supply over the next 4 years is indicated in Figure 3.

Figure 3: Projected Total Electricity Supply (Capacity) (2020-2024)



[8] The Final Determination paper on "Preparing for Future Power Generation Investments in Singapore" stated that generation licensees are required to inform EMA of their indicative generation plans with at least a 4-year notice period.

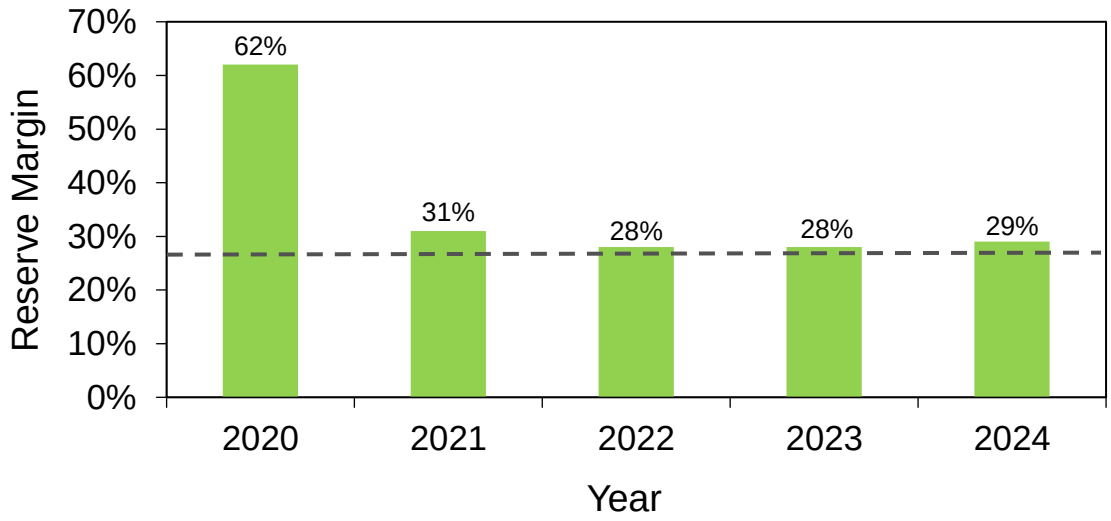
[9] Solar is assumed to have an average growth rate of about 140 MWac per year to reach 1.5 GWp by 2025. With a solar PV effective capacity of 28%, this means that 140 MWac of solar provides about 39 MWac of effective supply during peak periods. More details are available on EMA's website.

	Projected Total Electricity Supply (Capacity) (MW)[10]	Change(s) in Capacity (MW) compared to previous year
2020	11,930	– 600
2021	10,280	– 1,650
2022	10,540	260
2023	10,920	380
2024	11,340	420

3.2 About 600MW of generation capacity has been retired in 2020. Generation licensees have indicated refurbishment, mothball and retirement plans for an additional 1,700 MW of generation capacity[11] in 2021. In 2022, it is assumed that Singapore imports up to 100MW through the Lao PDR, Thailand, Malaysia, Singapore – Power Integration Project (LTMS-PIP) and another 100MW from the electricity imports trial with Malaysia. In 2023 and 2024, changes in capacity are mainly due to existing plants that are expected to (i) complete refurbishment work and (ii) reactivate from mothballed state.

3.3 With these developments, the projected reserve margins for 2020-2024 remain at above 27% as shown in Figure 4[12]. The reserve margin is calculated based on the upper bound of the projected system peak demand (shown in Figure 2) and the indicative retirement or mothballing plans of generation licensees that are subject to EMA's approval (see formula in Figure 5).

Figure 4: Projected Reserve Margins (2021-2024)



[10] This is based on the projected total electricity supply (capacity) as at end of the calendar year. The projections have been rounded off.

[11] There are 7 indicative plants retiring, refurbishing or mothballing, which include combined-cycle gas turbine (CCGT), open cycle gas turbine (OCGT) and steam plants.

[12] In Singapore, the minimum reserve margin has been set at 27% to ensure system security. The reserve margin is a system-wide indicator.

Figure 5: Reserve Margin Formula

$$\text{Reserve Margin} = \frac{\text{Total Electricity Supply (Capacity)} - \text{System Peak Demand}}{\text{System Peak Demand}} \times 100\%$$