Stakeholder Consultation on The Draft Long Term Generation Expansion Plan 2025-2044

Public Utilities Commission of Sri Lanka

1. Background

Ceylon Electricity Board (CEB) has prepared their Long Term Generation Expansion Plan (LTGEP) 2025-2044, which outlines the generating capacity requirement of the power sector during the two decades ahead, to realise a secure, reliable, economical and sustainable supply of electricity and submitted for the approval of the Commission under Section 43 of the Sri Lanka Electricity Act No. 20 of 2009 (as amended)

This report contains the results of the latest electricity expansion planning studies which has decided the generation mix for the period 2025 – 2044 while adhering to the government policies and regulations. This plan provides a comprehensive overview of the prevailing generating system, forecasted electricity demand growth, candidate generating technologies most suitable to provide the capacity requirement, environmental and climate change considerations, operational characteristics of the future system, risk evaluation, and sensitivities to major changes such as fuel prices.

The primary objectives of the generation planning study conducted by CEB can be summarized into following,

- Forecasting of National Long Term Electricity Demand for the next 25 years
- Investigating the techno economic feasibility of candidate generating technologies to expand the generating system
- Identifying the most appropriate generating capacity mix and required grid support interventions to meet the forecasted demand for electricity at lowest economic cost while meeting the reliability requirements and declared sector specific policies and regulations of the government as required under law
- Analysis of the operation of the proposed future system for each year of the study horizon
- Preparing the capital investment program for the expansion of the generating system
- Verifying the robustness of the economically optimum plan by analyzing its sensitivity to changes in the key input parameters
- Conducting scenario analysis to facilitate national level policy making
- Conducting contingency analysis to see possible risks in the near term

The Stakeholders are invited to provide their comments with regard to the followings of the draft LTGEP 2025-2044;

1. Electricity demand forecast
2. Proposed candidate generation technologies, their costs and technical parameters
3. Forecast of fuel prices
4. Generation expansion planning methodology and parameters
5. Proposed (Base case) generation plan/ plant additions
6. Environmental Impact of future generation mix

The above points are described in detail, in the LTGEP 2025-2044. All stakeholder comments on these shall be sent on or before November 17, 2024, in writing via email, fax or post. A session for oral submissions will be held under and by virtue of powers vested with the Commission under Section 17 of the Public Utilities Commission of Sri Lanka Act No 35 of 2002 and the interested parties will be given the opportunity to present their views at the aforesaid session. The Date, Time and Venue of the session for oral submissions will be informed in due course.

2. Base Demand Forecast 2025-2049

Year	Demand	Net Loss	Net Generation		Day Peak		Night Peak
	GWh	%	GWh	Growth Rate (%)	MW	Growth Rate (%)	MW
2025	16,319	7.93	17,725	5.2	2,727	5.3	2,696
2026	17,203	7.76	18,650	5.2	2,872	5.3	2,824
2027	18,135	7.62	19,630	5.3	3,027	5.4	2,959
2028	19,118	7.48	20,662	5.3	3,190	5.4	3,101
2029	20,153	7.34	21,750	5.3	3,362	5.4	3,250
2030	21,245	7.34	22,927	5.4	3,548	5.5	3,411
2031	22,264	7.33	24,026	4.8	3,722	4.9	3,560
2032	23,329	7.33	25,174	4.8	3,904	4.9	3,714
2033	24,438	7.32	26,369	4.7	4,094	4.9	3,874
2034	25,602	7.32	27,624	4.8	4,294	4.9	4,041
2035	26,842	7.31	28,961	4.8	4,507	5.0	4,219
2036	28,188	7.31	30,411	5.0	4,738	5.1	4,412
2037	29,619	7.31	31,953	5.1	4,985	5.2	4,616
2038	31,141	7.3	33,594	5.1	5,247	5.3	4,833
2039	32,702	7.3	35,275	5.0	5,516	5.1	5,055
2040	34,338	7.29	37,038	5.0	5,798	5.1	5,286
2041	36,058	7.29	38,892	5.0	6,095	5.1	5,528
2042	37,798	7.28	40,767	4.8	6,397	4.9	5,772
2043	39,582	7.28	42,689	4.7	6,706	4.8	6,020
2044	41,424	7.27	44,673	4.6	7,026	4.8	6,275
2045	43,235	7.27	46,624	4.4	7,342	4.5	6,524
2046	45,062	7.26	48,592	4.2	7,660	4.3	6,773
2047	46,922	7.26	50,594	4.1	7,985	4.2	7,025
2048	48,732	7.25	52,544	3.9	8,303	4.0	7,267
2049	50,592	7.25	54,546	3.8	8,630	3.9	7,516
5 Year Avg	**5.40%**		**5.2%**		**5.4%**		**4.8%**
10 Year	**5.10%**		**5.1%**		**5.2%**		**4.6%**
20 Year	**5.00%**		**5.0%**		**5.1%**		**4.5%**
25 Year	**4.80%**		**4.8%**		**4.9%**		**4.4%**

3. Proposed candidate generation technologies, their costs and technical parameters

3.1 Characteristics of Candidate Thermal Plants

Plant	Net Capacity (MW)	Min Load (MW)	Heat Rate (kcal/kWh)		Full Load Efficiency (Net, HHV) %	Forced Outage Rate %
			Full	min		
50 MW NG IC Engine	54	1	1,987	2,647	43.3	10.0
50 MW FO IC Engine	59	1	2,086	2,681	41.3	10.0
50 MW Dual fuel IC Engine	47	2	2,067	2,746	41.7	10.0
100 MW NG IC Engine	108	1	1,987	2,647	43.3	10.0
100 MW FO IC Engine	108	1	2,086	2,681	41.3	10.0
100 MW Dual fuel IC Engine	106	2	2,067	2,746	41.7	10.0
200 MW NG IC Engine	205	1	1,987	2,647	43.3	10.0
200 MW FO IC Engine	206	1	2,086	2,681	41.3	10.0
200 MW Dual fuel IC Engine	200	2	2,067	2,746	41.7	10.0
50 MW NG Gas Turbine	41	16	2,921	3,798	29.5	8.0
50 MW NG Gas Turbine (Aero)	49	25	2,377	3,091	36.2	8.0
100 MW NG Gas Turbine	106	53	2,469	3,312	34.9	8.0
100 MW NG Gas Turbine (Aero)	128	64	2,337	3,134	36.9	8.0
200 MW NG Gas Turbine	192	77	2,489	3,595	34.6	8.0
300 MW NG Gas Turbine	287	66	2,307	3,332	37.3	8.0
200 MW NG Combined Cycle	206	95	1,755	2,457	49.1	8.0
300 MW NG Combined Cycle	289	115	1,751	2,451	49.2	8.0
400 MW NG Combined Cycle	440	176	1,581	2,215	54.5	8.0
500 MW NG Combined Cycle	535	213	1,557	2,180	55.3	8.0
300 MW High Efficient Coal Plant	270	135	2,241	2,547	38.4	3.0
600 MW Super Critical Coal Plant	564	338	2,082	2,246	41.4	3.0
600 MW Nuclear Power Plant	552	497	2,685	2,723	32.1	0.5

3.2 Cost Details of Thermal Expansion Candidates

Plant	Pure Unit Cost (USD/kW) 2024	Construction Period (Years)	Total Unit cost with IDC @10% (USD/kW)	Economic life (Years)	Fixed O&M cost (USD/kW Month)	Variable O&M cost (USD/MWh)
50 MW NG IC Engine	935	1.5	996	20	3.25	6.31
50 MW FO IC Engine	1124	1.5	1,198	20	3.25	6.31
50 MW Dual fuel IC Engine	1149	1.5	1,224	20	3.25	6.31
100 MW NG IC Engine	872	1.5	929	20	3.25	6.31
100 MW FO IC Engine	1062	1.5	1,131	20	3.25	6.31
100 MW Dual fuel IC Engine	1087	1.5	1,158	20	3.25	6.31
200 MW NG IC Engine	810	1.5	863	20	3.25	6.31
200 MW FO IC Engine	1000	1.5	1,065	20	3.25	6.31

200 MW Dual fuel IC Engine	1025	1.5	1,091	20	3.25	6.31
50 MW NG Gas Turbine	709	1.5	755	20	0.64	4.99
50 MW NG Gas Turbine (Aero)	847	1.5	902	20	1.48	5.21
100 MW NG Gas Turbine	525	1.5	560	20	0.64	4.99
100 MW NG Gas Turbine (Aero)	636	1.5	678	20	1.48	5.21
200 MW NG Gas Turbine	430	1.5	458	20	0.64	4.99
300 MW NG Gas Turbine	360	1.5	383	20	0.64	4.99
200 MW NG Combined Cycle	1507	3	1,711	30	1.13	2.83
300 MW NG Combined Cycle	1400	3	1,590	30	1.13	2.83
400 MW NG Combined Cycle	1325	3	1,504	30	1.13	2.83
500 MW NG Combined Cycle	1273	3	1,445	30	1.13	2.83
300 MW High Efficient Coal Plant	1982	4	2,349	30	3.75	4.99
600 MW Super Critical Coal Plant	2132	4	2,527	30	3.75	4.99
600 MW Nuclear Power Plant	5103	5	6,316	40	11.18	2.63

3.3 Parameters of Other Renewable Sources

ORE Technology	Pure Capital Cost (USD/kW)	Capital Cost with IDC (USD/kW)	Annual Fixed O&M Cost (% of the capital cost)	Construction years
Solar (Large Scale)	849	904	1.5%	1.5
Solar (Distributed)	982	1,024	0.9%	1
Floating solar	1,244	1,325	1.5%	1.5
Onshore Wind	1,391	1,482	3.0%	1.5
Offshore Wind (Fixed Bottom)	3,781	4,201	3.0%	2.5
Offshore Wind (Floating)	5,238	5,821	3.0%	2.5
Biomass	1,782	1,899	4.0%	1.5
Mini hydro	1,840	1,959	2.5%	1.5

4. Forecast of Fuel Prices

Fuel Type	Price
Auto Diesel	CIF Price = 112.2 ($/bbl)
Fuel Oil	CIF Price = 116.7 ($/bbl)
Naphtha	CIF Price = 86.1 ($/bbl)
Coal	133 USD/MT (With handling charges)
Regasified Liquefied Natural Gas	CIF Price = 11.2 USD/MMBtu (With handling charges)

5. Proposed (Base case) generation plan/ plant additions

Proposed Base Case Plan of LTGEP 2025-2044 is provided in Annexure 1

5.1 Annual Generation Capacity Addition

Year	Gross Capacity Additions (MW)									
	Gas Turbine	**IC Engine**	**Combined Cycle**	**Nuclear**	**Major Hydro**	**Other Renewable**	**Battery**	**Pumped Storage**	**HVDC Interconnection**	**Thermal Plant Retirements**
2024	-	-	-		30	159	-	-	-	
2025	-	-	115	-	-	230	5	-	-	
2026	-	-	235	-	-	485	100	-	-	(115)
2027	-	-	115	-	-	690	-	-	-	
2028	-	200	-	-	-	690	100	-	-	
2029	-	-	-	-	-	640	100	-	-	
2030	130	-	-	-	-	640	50	-	-	
2031	100	-	-	-	-	490	100	-	-	(202)
2032	-	-	-	-	-	490	200	-	-	
2033	100	-	-	-	-	490	100	-	-	(355)
2034	-	-	-	-	-	490	-	600	-	
2035	300	-	-	-	-	470	-	-	-	(300)
2036	300	-	-	-	-	520	-	-	-	
2037	200	-	-	-	-	520	100	-	-	
2038	-	200	-	-	-	510	-	-	-	
2039	-	-	-	-	-	510	-	-	500	
2040	200	-	-	-	-	510	-	-	-	
2041	500	-	-	-	-	460	-	-	-	(300)
2042	300	-	-	-	-	460	-	-	-	
2043	-	200	-	-	-	960	-	-	-	
2044	200	-	-	600	-	460	50	-	-	(600)
Total	**2,330**	**600**	**465**	**600**	**-**	**10,715**	**905**	**600**	**500**	**(1,872)**

Base Case Scenario 2025-2044

YEAR	RENEWABLE CAPACITY & GRID SCALE ENERGY STORAGE CAPACITY ADDITIONS AND RETIREMENTS (a) (b) (d)		THERMAL & INTERCONNECTION CAPACITY ADDITIONS AND RETIREMENTS (a) (c) (e) (f)	
2025	Distribution Connected Embedded Solar	150 MW	**Steam Turbine of Sobadhanavi Natural Gas Combined Cycle Plant (Kerawalapitiya)**	**115 MW**
	Grid Connected Solar	**50 MW**		
	Windnotr	**10 MW**		
	Mini Hydro	10 MW		
	Biomass	10 MW		
	Battery Energy Storage	5 MW/10 MWh		
2026	Distribution Connected Embedded Solar	150 MW	**Gas Turbine of Second Natural Gas Combined Cycle Plant (Kerawalapitiya)**	**235 MW**
	Grid Connected Solar	**220 MW**		
	Wind	**90 MW**		
	Mini Hydro	10 MW	*Retirement of*	
	Biomass	15 MW	*Gas Turbine (GT7)[2]*	*(115) MW*
	Battery Energy Storage (Western Region)[1]	**100 MW/ 50 MWh**		
			Extensions of plants to be retired[3]	
			Sapugaskanda Station A	68 MW
			Sapugaskanda Station B	72 MW
			Barge Mounted Plant	62 MW
2027	Distribution Connected Embedded Solar	150 MW	**Steam Turbine of Second Natural Gas Combined Cycle Plant (Kerawalapitiya)**	**115 MW**
	Grid Connected Solar	250 MW		
	Wind	260 MW		
	Mini Hydro	10 MW		
	Biomass	20 MW		
2028	Distribution Connected Embedded Solar	150 MW	**IC Engine Power Plant - Natural Gas**	**200 MW**
	Grid Connected Solar	300 MW		
	Wind	200 MW		
	Mini Hydro	20 MW		
	Biomass	20 MW		
	Battery Energy Storage (Southern Region)	100 MW/ 400MWh		
2029	Distribution Connected Embedded Solar	150 MW		
	Grid Connected Solar	300 MW		
	Wind	150 MW		
	Mini Hydro	20 MW		
	Biomass	20 MW		
	Battery Energy Storage	100 MW/ 400MWh		
2030	Distribution Connected Embedded Solar	150 MW	**Gas Turbine – Kelanitissa**	**130 MW**
	Grid Connected Solar	300 MW		
	Wind	150 MW		
	Mini Hydro	20 MW		
	Biomass	20 MW		
	Battery Energy Storage (Western Region)	50 MW/ 50 MWh		
2031	Distribution Connected Embedded Solar	150 MW	Gas Turbine - Natural Gas	100 MW
	Grid Connected Solar	200 MW		
	Wind	100 MW	*Retirements of*	
	Mini Hydro	20 MW	*Sapugaskanda Station A*	*(68) MW*
	Biomass	20 MW	*Sapugaskanda Station B*	*(72) MW*
	Battery Energy Storage	100 MW/400 MWh	*Barge Mounted Plant*	*(62) MW*
2032	Distribution Connected Embedded Solar	150 MW		
	Grid Connected Solar	200 MW		
	Wind	100 MW		
	Mini Hydro	20 MW		
	Biomass	20 MW		
	Battery Energy Storage	200 MW/800 MWh		
2033	Distribution Connected Embedded Solar	150 MW	Gas Turbine - Natural Gas	100 MW
	Grid Connected Solar	200 MW		
	Wind	100 MW	*Retirements of*	
	Mini Hydro	20 MW	*Combined Cycle Power Plant (KPS)*	*(165) MW*
	Biomass	20 MW	*Combined Cycle Power Plant (KPS-2)*	*(163) MW*
	Battery Energy Storage	100 MW/ 400MWh	*Uthuru Janani Power Plant*	*(26.7) MW*

YEAR	RENEWABLE CAPACITY & GRID SCALE ENERGY STORAGE CAPACITY ADDITIONS AND RETIREMENTS [a] [b] [d]		THERMAL & INTERCONNECTION CAPACITY ADDITIONS AND RETIREMENTS [a] [c] [e] [f]	
2034	Distribution Connected Embedded Solar Grid Connected Solar Wind Mini Hydro Biomass Pumped Storage Power Plant (Maha)	150 MW 200 MW 100 MW 20 MW 20 MW 600 MW		
2035	Distribution Connected Embedded Solar Grid Connected Solar Wind Mini Hydro Biomass	150 MW 200 MW 100 MW 10 MW 10 MW	Gas Turbine – Natural Gas & Hydrogen Blend *Retirement of* *West Coast Combined Cycle Power Plant*	300 MW *(300) MW*
2036	Distribution Connected Embedded Solar Grid Connected Solar Wind Mini Hydro Biomass	150 MW 250 MW 100 MW 10 MW 10 MW	Gas Turbine - Natural Gas & Hydrogen Blend	300 MW
2037	Distribution Connected Embedded Solar Grid Connected Solar Wind Mini Hydro Biomass Battery Energy Storage	150 MW 250 MW 100 MW 10 MW 10 MW 100 MW/ 400MWh	Gas Turbine - Natural Gas & Hydrogen Blend	200 MW
2038	Distribution Connected Embedded Solar Grid Connected Solar Wind Mini Hydro	150 MW 250 MW 100 MW 10 MW	IC Engine Power Plant – Natural Gas & Hydrogen Blend	200 MW
2039	Distribution Connected Embedded Solar Grid Connected Solar Wind Mini Hydro	150 MW 250 MW 100 MW 10 MW	HVDC Interconnection	500 MW
2040	Distribution Connected Embedded Solar Grid Connected Solar Wind Mini Hydro	150 MW 250 MW 100 MW 10 MW	Gas Turbine - Natural Gas & Hydrogen Blend	200 MW
2041	Distribution Connected Embedded Solar Grid Connected Solar Mini Hydro	150 MW 300 MW 10 MW	Gas Turbine - Natural Gas & Hydrogen Blend Gas Turbine - Natural Gas & Hydrogen Blend *Retirement of* *Lakvijaya Coal Power Plant Unit 1*	200 MW 300 MW *(300) MW*
2042	Distribution Connected Embedded Solar Grid Connected Solar Mini Hydro	150 MW 300 MW 10 MW	Gas Turbine - Natural Gas & Hydrogen Blend	300 MW
2043	Distribution Connected Embedded Solar Grid Connected Solar Wind-Offshore Mini Hydro	150 MW 300 MW 500 MW 10 MW	IC Engine Power Plant – Natural Gas & Hydrogen Blend	200 MW
2044	Distribution Connected Embedded Solar Grid Connected Solar Mini Hydro Battery Energy Storage	150 MW 300 MW 10 MW 50 MW/200 MWh	Gas Turbine - Natural Gas & Hydrogen Blend Nuclear Power Plant *Retirements of* *Lakvijaya Coal Power Plant Unit 2* *Lakvijaya Coal Power Plant Unit 3*	200 MW 600 MW *(300) MW* *(300) MW*

General Notes

a) All plant capacities (MW) shown are the Gross Capacities. Committed Power Projects are shown in bold text and retiring projects are shown in italics with their capacity in brackets.

b) Mini-hydro and Biomass annual capacity additions are not restricted to the planned capacities mentioned in the table. Higher capacity additions will be evaluated case by case.

   All future wind and grid connected solar shall be procured with necessary grid support capabilities as stipulated in Grid Code. It is required to procure at least 90% of future wind and grid connected solar capacity as projects with capabilities to operate according to the dispatch instructions from national system control centre.

   The capacity addition of battery energy storage devices is mainly to provide energy shifting requirements. It could either be developed as stand-alone or co-located with large scale solar parks with dispatch capability from national system control centre. Any additional battery storage capacity could be accommodated at detailed studies after evaluating grid support services requirement such as frequency regulation.

   All renewable and storage capacity additions are to be made available during the respective year.

   The retirement years of renewable energy capacities are not indicated. However, after the expiry of the PPA, they are expected to be refurbished or replaced with similar capacity from same renewable energy technology.

   The retirement years of battery energy storage systems are not indicated. However, they are expected to be replaced with similar capacity, at the end of their lifetime.

c) With the development of LNG supply infrastructure, the existing West Coast power plant (300 MW) and two Kelanithissa combined cycle plants (165 MW and 163 MW) are expected to be converted to natural gas in the mid of 2027. However, the viability of conversion of each power plant should be evaluated separately at the time of the natural gas availability.

   Considering the heavy dependency in future on liquefied natural gas as a fuel for electricity generation, all Natural Gas based power plants shall also have the dual fuel capability, including suitable fuel supply/storage arrangements locally for such secondary fuel, to ensure supply security in case of disruption to LNG supply.

   All new natural gas fired power plants should have the capability to operate from synthetic fuels such as Hydrogen, to satisfy the policy requirement of achieving carbon neutrality by 2050.

   All new natural gas based Combined Cycle Power plants should be technically, operationally and contractually capable of being operated regularly between simple cycle and combined cycle operations.

   Dates of all plant additions as contained in the table are the dates considered for planning studies, and considered as added at the beginning (as at 1st January) of the respective year.

(For example, a generating capacity addition indicated for year 2026 implies that the plant has been considered commissioned from the 1st of January 2026). However, for committed power projects actual commissioning month has been considered based on the present progress of the project.

Retirement dates of existing firm capacity plants are dates considered as inputs to planning studies. For existing power plants, the actual retirement month/PPA expiry month were considered for studies.

However, the ACTUAL retirement of all power plants is to be made after further evaluating the actual plant condition at the time of retirement, (including the availability of useful operating hours beyond the scheduled retirement date), and the implementation progress of planned power plant additions.

d) Moragolla Power Plant (30 MW) which is under construction is to be commissioned during 2024. Hence it is not shown in the base case and is considered as an existing plant.

e) 17 MWx 4 units of Kelanitissa small GTs are considered to be retired during the year 2024 for planning studies considering the extended lifetime. However, two number of units are expected to be kept as backup for Colombo power restoration in case of an island-wide power failure.

f) Short term supplementary power requirement is not seen during the coming years in this plan. However, short-term supplementary capacity requirement under different contingency events are assessed in the contingency analysis chapter of the LCLTGEP 2025-2044 report. Such requirements too shall be appropriately considered prior to initiating procurement.

Extension of the contracts of existing capacities could be considered as appropriate within the legal framework to meet short term requirement. Technology of supplementary capacity can be opened for both Gas Turbine and IC engine technology or any other dispatchable firm power technology as appropriate at the time of the procurement. Fuel option can be specified as appropriate at the time of procurement for suitable fuels that has established supply chains and having regulated, transparent pricing mechanisms.

Specific Notes

1. The Battery Energy Storage system shall be developed primarily to cater immediate requirements of frequency related services and restoration services. The storage capacity of the project may be updated depending on the site conditions of the project.

2. Upon retirement of GT7 in 2026, the possibility of retrofitting the asset as a synchronous condenser shall be evaluated.

3. Plant life extensions of Sapaugaskanda Station A, Sapugaskanda Station B and Barge Power Plant was considered in planning studies and these extensions become viable considering the relevant refurbishment costs of each plant.