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Energy Balance 2022

An Analysis of the Energy Sector Performance

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Sri Lanka Sustainable Energy Authority
No. 72, Ananda Coomaraswamy Mawatha, Colombo 07, Sri Lanka.

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ISSN: ISSN 2386-172X

First Printed in Sri Lanka 1976

Year 2022 was a tumultuous year for Sri Lanka, which saw the country plunging into a short-lived political *crisis*. We chose the theme *crisis* as our cover story, reflecting the ramification of the *crisis* on the energy sector and vice versa.

Many analysts were quick to point out the poor management of the economy as the root cause of the *crisis*, but failed to dissect the *crisis* and isolate the main contributor for closer inspection. We reckon that it was the energy sector, phrased differently – the bleeding out of the national wealth to import energy commodities by its many players was the root cause of the *crisis*. Sri Lanka escaped an even more perilous situation in 2012, bleeding 51% of all export earnings to import fuel. Fortunately for Sri Lanka, the global energy markets collapsed, leaving a life line for Sri Lanka to cling to and come out of a *crisis* of unimaginable proportions.

The balance of payment *crisis* is strongly built on our inability to reduce our dependence on expensive fuel imports. On one hand, the country is struggling with an aging refinery, catering to only a third of the country's needs. The country's transport system is crumbling and witnessing a mass exodus of commuters from efficient public transport to inefficient private transport modes, increasing the demand for fuel and adding to road congestion.

On the other hand, electricity sector is inching towards a renewable future without much vigour and transmission wherewithal to a speedy energy transition. It is in a helpless *crisis*, due to the massive untargeted subsidies given to homes and industries, which is a result of stagnant prices since 2013. Plagued by cancellations of many mature generation projects due to various acts of lobbying and activism it has eroded its ability to invest in generation and transmission development.

Naturally, the balance of payment *crisis* first impacted the main contributor to it, making energy imports ever more difficult and finally grinding it to a complete halt in early 2022. The wheels of the economy screeched to a halt, with thousands of Sri Lankans queuing up at fuel stations and LP gas stores, claiming their share of the now-scares fuels. The outer cover graphic illustrates the burden of the suffering masses as the earth would have felt it, in an abstract way. Power generation soon succumbed to the fuel shortage, leading to twelve-hour power shedding, freeing up a lot of social capital to fan the fires of the now evident political *crisis*.

The failures and sabotages in the energy sector which started the economic *crisis* also created a gaping hole in the national coffers, which kept on widening, leading to a deep economic *crisis*. The economic *crisis* affecting all strata of the society soon erupted as a social *crisis*, finally manifesting itself into the baptisms of fire of an unstoppable political *crisis*.

The turmoil has taught Sri Lanka an unforgettable lesson on the dire consequences of neglecting the nexus between energy security and everything else we identify with modern civilisation.

Executive Summary

The demand for petroleum products was met only partially owing to the severe economic crisis which manifested in 2022. As a result, the demand for petroleum fuel imports contracted by 11.3%.

Crude oil prices rose sharply in 2022, primarily driven by the geopolitical tensions in Eastern Europe and the tightened global oil supply conditions. The average Brent price stood at USD 99.06 per barrel in 2022, whereas the Brent price in 2021 was USD 70.80 per barrel, and rose by 39.9% in 2022. The net petroleum import bill in 2022 was USD 5,131 million, a 21% increase compared to the previous year. Further, with the demand for petroleum increasing over the past years, expenditure on oil imports as a percentage of non-petroleum exports rose to a staggering 36.4% in 2022. The average global prices of major refined petroleum products, including gasoline 92 octane, gasoline 95 octane, auto diesel, super diesel, and kerosene, also increased within the range of 40 – 75%, year-on-year, in 2022.

The year 2022 continued to witness comprehensive changes in the national upstream oil and gas sector. The Government, through the newly established PDASL, signed a Project Agreement with a subsidiary of a Norwegian firm , in February 2022, titled 'Pilot Project on Green Hydrogen Generation' to conduct feasibility studies and thereby prepare a road map for Sri Lanka and collaborate on a pilot project to generate green hydrogen in Sri Lanka and assess the export potential of the same.

New renewable energy development activities continued in 2022, but suffered owing to the non-payment of invoices since early 2021. The payment default spread to energy purchases of rooftop solar plants, straining this booming industry as well. However, on a positive note, the new renewable energy programme continued with the capacity additions resulting from the two rounds of competitive bidding for the procurement of solar and wind energy from differing locations in the country. Twenty two 1 MW power plants and a 10 MW commenced commercial operations in 2022, bringing the total ground mounted capacity in operation to 130.36 MW. The SPP sector continued to suffer owing to a legal issue, which was marked with a break in the fifteen year continuous addition of small hydropower plants, reporting no capacity additions during 2022. Additionally, the installation of solar rooftop PV systems gathered momentum, and by the end 2022, a total of 45,845 systems were in operation, with a total capacity of 660 MW generating 777.7 GWh.

The energy supply portfolio of the country was dominated by petroleum until recently, but took a different turn owing to the fuel crisis in 2022. Accordingly, the share of biomass in the energy supply in 2022 was 36.4%, followed by petroleum 32.5%. Coal accounts for 12.6% in the energy supply portfolio, while hydro power accounts for 11.7% and new renewable energy accounts for 6.8%. The total amount of electricity generated during 2022 was 16,828.4 GWh out of which 49% was from thermal plants. The NRE generation was 12% in 2022. The contribution from micro power producers (solar rooftop systems) was 5%, while the three schemes, net-metering, net plus and net accounting generated approximately 777.7 GWh of electrical energy in 2022.

The CEB reported a poor financial performance with a negative (19.8)% return on assets for the fifth consecutive year. The LECO however, recorded a positive 5.0% return on assets. The electricity tariff which remained unchanged since 2014 was revised in 2022. Tariff revisions for different tariff categories were done three times in 2022, after eight years of stagnant prices eroded the resources of the utilities.

The petroleum distribution continued with two parties; CPC and Lanka Indian Oil Company (LIOC) operating a widespread distribution network around the country. The players came under pressure, when the markets quickly returned to normalcy after a year which reported negative commodity prices.

The largest share of energy use in 2022 was used by the household, commercial and other sectors, accounting for a share of 36.2% of the country's total energy demand. Transport sector share of energy use, which was mainly met through liquid petroleum, accounted for a share of 29.3%, reflecting on the demand reduction incurred by the fuel crisis. The share of the industrial use was closer to that of the household, commercial and other sector, remaining at 34.5%.

The Grid Emission Factors calculated for 2022 gives the Simple Operating Margin as 0.7123 kg-CO_2/kWh, the Build Margin as 0.5841 kg-CO_2/kWh and the Combined Margin as 0.6482 kg-CO_2/kWh. The Average Emission Factor for 2022 was estimated to be 0.4173 kg-CO_2/kWh.

Key Energy Statistics

Primary Energy (PJ)	2021	2022
Biomass	172.5	168.5
Petroleum	205.6	150.6
Coal	70.4	58.3
Major hydro	56.9	54.1
New Renewable Energy	30.8	31.4
Total	**536.1**	**463.0**

Imports (kt)	2021	2022
Crude Oil	**1,130.2**	**743.6**
Finished Products	**3,941.8**	**3,542.7**
LPG	422.0	290.0
Gasoline	1,186.5	1,106.2
Avtur	178.1	268.7
Auto Diesel	1,779.7	1,608.1
Fuel Oil	359.3	245.8
Avgas	0.2	0.1
Mineral Gas Oil	16.0	23.7
Coal	**2,543.6**	**2,204.4**

Refined Products (kt)	2021	2022
Crude Input	1,272.2	428.9
Naphtha	107.0	30.8
Petrol	124.1	38.7
Avtur	130.6	57.3
Kerosene	98.3	25.3
Diesel	370.6	128.2
Furnace Oil	359.0	194.2
Solvents	3.0	2.7
Total Output	**1,216.1**	**482.9**

Grid Capacity (MW)	2021	2022
Major Hydro	1,382.9	1,413.4
Thermal Power	2,098.0	2,098.0
New Renewable Energy	816.6	847.6
Micro Power Producers (µPP)	515.6	659.9
Total	**4,813.0**	**5,018.8**

Gross Generation (GWh)	2021	2022
Major Hydro	5,658.5	5,382.7
Thermal (Oil)	2,716.2	2,513.6
Thermal (Coal)	6,110.9	5,732.4
New Renewable Energy	2,540.4	2,422.0
Micro Power Producers (µPP)	592.4	777.7
Total	17,618.4	16,828.4

Average electricity price (LKR/kWh)	17.0	21.9
Net oil imports as % of non petroleum exports	29.7	36.4

Total Demand (PJ)	2021	2022
Biomass	169.9	167.2
Petroleum	177.9	143.2
Coal	2.1	2.3
Electricity	55.1	52.8
Total	**405.0**	**365.5**

Demand by Sector (PJ)	2021	2022
Industry	121.0	125.5
Transport	139.1	106.4
Household & Commercial	141.2	131.4
Total	**401.4**	**363.3**

Industry Demand (PJ)	2021	2022
Biomass	87.4	84.5
Petroleum	13.2	22.4
Coal	2.1	2.1
Electricity	18.4	16.5
Total	**121.2**	**125.7**

Transport Demand (PJ)	2021	2022
Petroleum	139.1	106.4
Total	**139.1**	**106.4**

HH, Comm, Other (PJ)	2021	2022
Biomass	82.5	82.7
Petroleum	22.0	12.4
Electricity	26.0	27.6
Total	**141.2**	**131.4**

Electricity Demand (GWh)	2021	2022
Domestic	6,007.9	5,791.9
Religious	92.1	92.2
Industrial	5,109.0	4,584.9
Commercial	3,970.2	4,078.1
Streetlighting	120.2	121.8
Total	**15,299.5**	**14,668.9**

Grid Emission Factors (kg-CO_2/kWh)	2021	2022
Operating Margin	0.7208	0.7123
Build Margin	0.6690	0.5841
Combined Margin	0.6949	0.6482

Average Emission Factor	2021	2022
(kg-CO_2/kWh)	0.4278	0.4062

GDP at 1982 factor cost prices (million LKR)	539,863	497,754
Commercial Energy Intensity (TJ/LKR million)	0.44	0.40
Electricity Sold (kWh/person)	705.4	682.2
Petroleum Sold (kg/person)	214.3	167.4

Acknowledgement

Sri Lanka Sustainable Energy Authority wishes to express its sincere thanks to the following institutions for their valuable cooperation in the compilation of the 'Sri Lanka Energy Balance 2022' and the Analysis of Energy Sector Performance.

Ministry of Power

Ministry of Energy

Ceylon Electricity Board

Lanka Electricity Company (Pvt) Ltd.

Ceylon Petroleum Corporation

Petroleum Resources Development Secretariat

Sri Lanka Railways

Department of Motor Traffic

Department of Census and Statistics

Central Bank of Sri Lanka

State Timber Corporation

All institutions, which responded positively to our request to provide relevant data

Sri Lanka Energy Balance 2022 was compiled by the
Sri Lanka Sustainable Energy Authority

List of Abbreviations

C&F	Cost and Freight
CEB	Ceylon Electricity Board
CHP	Combined Heat and Power
CPC	Ceylon Petroleum Corporation
DG	Distributed Generation
ECF	Energy Conservation Fund
ESCO	Energy Service Company
FOB	Free On Board
GCal	Giga calorie
GDP	Gross Domestic Product
GEF	Grid Emission Factor
GWh	Giga Watt hour
IPP	Independent Power Producer
kCal	kilo calorie
kg	kilo gram
kJ	kilo Joule
kVA	kilo Volt Ampere
LA	Local Authority
LECO	Lanka Electricity Company
LIOC	Lanka Indian Oil Company
LKR	Sri Lankan Rupees
LNG	Liquid Natural Gas
LPG	Liquid Petroleum Gas
µPP	Micro Power Producer
MT	Metric Tonnes
MW	Mega Watt
NERD Centre	National Engineering Research and Development Centre
NRE	New Renewable Energy
NREL	National Renewable Energy Laboratory of United States
PJ	Peta Joule
RDA	Road Development Authority
RERED Project	Renewable Energy for Rural Economic Development Project
SEA	Sri Lanka Sustainable Energy Authority
SCADA	Supervisory control and data acquisition
SLSI	Sri Lanka Standards Institute
SPP	Small Power Producer
SPPA	Standardised Power Purchase Agreement
toe	Tonnes of Oil Equivalent
ToU	Time of Use
TJ	Tera Joule
VET	Vehicle Emissions Testing

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1 Introduction to the Energy Sector

1.1 Highlights of 2022

The demand for petroleum products which recovered to a certain extent in 2021 was not met due to the severe economic crisis which engulfed the country in 2022. This caused a contraction of the petroleum fuel imports by a 11.3% margin in 2022, compared to 3,941.8 kt in 2022 to 3,542.7 kt in 2021.

Crude oil prices rose sharply in 2022, primarily driven by the geopolitical tensions in Eastern Europe and the tightened global oil supply conditions. The average Brent price stood at USD 99.06 per barrel in 2022, whereas the Brent price in 2021 was USD 70.80 per barrel, and rose by 39.9% in 2022. Crude oil prices were on a rising trend during the first half of 2022 with daily prices (Brent) briefly reaching USD 140 per barrel in March 2022 for the first time since July 2008, mainly due to the sanctions imposed on Russia by Western countries, one of the leading exporters of petroleum products in the world. In 2022, the average crude oil price (Brent) increased by 39.9% to USD dollars 99.06 per barrel, compared with the average price of USD 70.80 per barrel recorded in 2021.

The average global prices of major refined petroleum products, including gasoline 92 octane, gasoline 95 octane, auto diesel, super diesel, and kerosene, also increased within the range of 40 – 75%, year-on-year, in 2022. In line with rising trends in global crude oil prices, the average price of crude oil imported by the CPC increased by 45.4% to USD 100.11 per barrel in 2022, compared to the average of USD 68.86 per barrel recorded in 2021. The net petroleum import bill in 2022 was USD 5,131 million, a 21% increase from the USD 4,067 million in 2021. With the demand for petroleum increasing over the past years, expenditure on oil imports as a percentage of non-petroleum exports rose to a staggering 36.4% in 2022.

Resulting from the economic crisis and the foreign exchange scarcity, all fossil fuel imports got hampered and the country experienced long queues at fuel stations owing to firstly to panic buying by motorists who expected a crippling shortage and also an industrial unrest and proceeded to purchase and hoard fuel. Change of composition of LP gas in 2021 followed by a series of explosions at the points of use and an acute shortage of supply caused a major crisis in cooking energy supply. The series of LP gas related explosions which occurred in the latter part of 2021 caused immense hardships to users by way of destroyed homes and other assets, which continued into 2022 as well.

The year 2022 continued to witness comprehensive changes in the national upstream oil and gas sector. The Government, through the Petroleum Development Authority of Sri Lanka (PDASL), signed a Project Agreement with a subsidiary of a Norwegian firm, in February 2022, titled “Pilot Project on Green Hydrogen Generation” to conduct feasibility studies and thereby prepare a road map for Sri Lanka and collaborate on a pilot project to generate green hydrogen in Sri Lanka and assess the export potential of the same.

The suffering of the new renewable energy sector continued due to the non-payment of invoices since early 2021. The adverse conditions affecting the SPP projects started to spread to energy purchases from rooftop solar plants affecting this booming industry as well. However, on a positive note, the new renewable energy programme continued with the capacity additions resulting from the two rounds of competitive bidding for the procurement of solar and wind energy from various locations in the country. Twenty two 1 MW power plants and a 10 MW started commercial operations in 2022, bringing the total ground mounted capacity in operation to 132.36 MW. As the small power development continued to suffer due to a legal issue, marking the break of a fifteen year spell of capacity addition of small hydropower plants, reporting no capacity additions during 2022.

1.2 Sector Governance and Organisations

1.2.1 Energy Sector Governance

The two Ministries, the Ministry of Power, the Ministry of Energy and the State Ministry of Solar, Wind and Hydro Power Generation Projects Development governed the energy sector. Biomass sector continued to operate independently and informally, with very little interaction with the energy sector governing structure.

In addition to the involvement of the government, private organisations and the general public are also stakeholders of the energy sector. Public Utilities Commission of Sri Lanka (PUCSL) is responsible for regulatory oversight of sector operations, presently with powers to monitor and regulate the electricity industry operations.

1.2.2 Public Sector Institutions

Ministry of Power

The Ministry of Power and the State Ministry of Solar, Wind and Hydro Power Generation Projects Development are responsible for the power sector and sustainable energy. The Ministry of Energy is responsible for the petroleum sector.

The Ministry of Power is the main body responsible for the management of the power sector. The Ministry comprises several divisions, discharging its functions in planning, and in the supervision of sub-sectoral state institutions. From time to time, the subject of Energy has been combined with others such as Business Development, in the establishment of the Ministry. The following state-owned energy institutions presently operate under the supervision of Ministry of Power and the State Ministry of Solar, Wind and Hydro Power Generation Projects Development.

Sri Lanka Sustainable Energy Authority (SEA)

The Sri Lanka Sustainable Energy Authority (SEA) established in 2007 by enacting the Sri Lanka Sustainable Energy Authority Act No. 35 of 2007, comes under the purview of the State Ministry of Solar, Wind and Hydro Power Generation Projects Development. The SEA continued to consolidate gains realised in the sustainable energy sector, in both renewable energy and energy efficiency spheres in 2019. With the strong commitment of the Government, towards sustainable energy, the SEA undertook to develop two major thrusts on developing renewable energy and increasing energy efficiency.

Ceylon Electricity Board (CEB)

Established in 1969, the CEB is empowered to generate, transmit, distribute and supply electricity in the country. The Electricity Act of 2009 caused CEB's businesses of (i) generation, (ii) transmission and bulk supply operations and (iii) distribution and supply to be separately licensed. In 2022, CEB generated 76% of electrical energy supplied through the national grid, while the balance was generated by private power plants.

The entire 220 kV, 132 kV and 33 kV network is owned and operated by the CEB. CEB directly serves about 92% of gird connected electricity consumers in the country. It operated 3,253 km of transmission lines and 188,649 km of distribution lines at the end of 2022, serving a total of 6,933,967 customers.

Lanka Electricity Company (Pvt) Ltd (LECO)

The LECO is an institution established in 1983 to distribute electricity in areas previously served by Local Authorities (Municipal Councils etc.). LECO receives electricity from CEB at 11 kV and distributes in LECO franchise areas. LECO serves about 8% of the electricity customers in the country. LECO's franchise area steadily expanded from 1983 to 1990, and the company implemented a major rehabilitation program in the newly acquired distribution networks, which has reduced losses substantially. It served 618,516 customers by end-2022, through a 4,521 km of distribution lines.

Ministry of Energy

The following Departments and Statutory Institutions are presently operational under the supervision of the Ministry of Petroleum and Petroleum Resources Development.

- Ceylon Petroleum Corporation
- Ceylon Petroleum Storage Terminal Ltd.
- Petroleum Resources Development Secretariat

While the role of Ceylon Petroleum Corporation is quite significant in the present context, the other three institutions perform facilitating roles to the petroleum supply and exploration ventures recently initiated by the government.

Ceylon Petroleum Corporation (CPC)

Established in 1961, CPC imports, refines and distributes petroleum products in the country. CPC owns and operates the only refinery in Sri Lanka, with a daily throughput of 50,000 barrels. The demand for petroleum products has significantly increased, with the sale of all petroleum products for all sectors recording an increase from 4,747.6 kt in 2021 to 3,714.0 kt in 2022.

Lanka Coal Company (LCoC)

With the commissioning of the first coal plant in Puttalam in 2011, a new company was established under the Ministry of Power and Energy to streamline the supply of coal required for the plant. This new organisation continues supplying coal to the 900 MW power plant, with a supply of 2,143.2 kt in 2022.

Ceylon Petroleum Storage Terminals Limited (CPSTL)

With the liberalisation of the petroleum industry in 2002 and the entry of Lanka Indian Oil Company, a necessity was felt to share storage infrastructure among downstream vendors. At the time there was an expectation of a third player entering the downstream petroleum business. A company was incorporated with equal share holdings of CPC, LIOC and the Treasury. CPSTL is now managing a major part of storage, pipeline and distribution facilities including two major terminals in Kollonnwa and Muthurajawela.

Petroleum Development Authority of Sri Lanka (PDASL)

This new agency was established in 2003 as a secretariat to manage the petroleum exploitation activities of the country. PRDS has successfully attracted oil exploring company to explore the Petroleum resources in the Mannar offshore region. This Secretariat was assigned to the Ministry of Petroleum Resources Development on 2015 September 21 after the upstream development activities were placed within the purview of this Ministry. This new authority came into being in 2021 after the elevation of this secretariat to a fully fledged authority with the name Petroleum Development Authority of Sri Lanka.

1.2.3 Private Sector Organisations

There are numerous private sector organisations participating in the supply, distribution and sale of electricity, petroleum and biomass. The private sector organisations in the electricity sector include Independent Power Producers (IPPs) supplying electricity to the CEB for resale and Small Power Producers (SPPs) producing power using renewable technologies. *Annex 1* provides a list of all IPPs and SPPs operational by end 2022. With the launch of the national solar programme “Sooryabala Sangramaya” in 2016, there is a significant increase in the Renewable Energy Service Providers (RESCos) in the country.

In the petroleum sector, in addition to the CPC, several private companies distribute and sell petroleum products, lubricants and LP gas. Details of these companies are given in *Annex 1*.

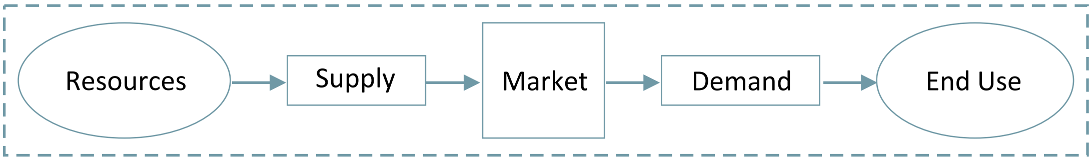
Stages in Energy Flow

Energy used in a country is found in different forms at different stages of its flow from the raw form found in nature to the actual end use form. Broadly, these stages can be categorised as;

- Energy Resources
- Energy Supply including conversion/production and distribution
- Energy Demand
- End Use

Energy sector is the combination of all the above stages of different energy forms which are interrelated, as illustrated below.

Energy Sector Composition



The above flow diagram explains that, owing to various end uses of energy, a demand exists in the market, which is fulfilled by the energy supply using the available resources. This follows the basic demand supply economic model valid for any scarce resource.

Energy Resources

A natural resource is considered an energy resource, if it can be converted to a usable form of energy. There are numerous forms of energy sources in the world and different countries use different resources, primarily selected on economic principles. However, environmental and political reasons also influence the selection of a country's energy portfolio.

Availability, either locally or globally, is not necessarily the only factor considered for using a particular resource as an energy supply source. More importantly, the use must be economical compared with other available sources. Hence, the technology available for converting the resource to a more usable form is important in the selection of an energy resource for energy supply. Change of technology and availability of resource over time can change the economics of using the resource for energy supply. Therefore, the resources used by a country for energy requirements also change with time.

Indigenous Resources

Attributed to geo-climatic settings, Sri Lanka is blessed with several types of renewable energy resources. Some of them are widely used and developed to supply the energy requirements of the country. Others have the potential for development when the technologies become mature and economically feasible for use. Following are the main renewable resources available in Sri Lanka.

- Biomass
- Hydro Power
- Solar
- Wind

In addition to the above indigenous renewable resources, the availability of petroleum within Sri Lankan territory is being investigated.

Global Resources

In the international market, many forms of energy sources are available for Sri Lanka to import and use for its energy needs. However, up to now, Sri Lanka has been largely using only petroleum fuels for this purpose. Increasing petroleum prices have prompted Sri Lanka to examine the feasibility of using other sources such as coal and Liquefied Natural Gas (LNG) to replace liquid petroleum in certain applications. Following are the most common energy sources globally available for energy supply on a commercial scale.

- Petroleum
- Coal
- Natural Gas
- Nuclear Energy

More recently, new energy supply technologies such as biofuels and energy carriers such as hydrogen and electricity storage have emerged as alternatives to the above conventional technologies and transfer options. However, use of these technologies for energy supply purposes is still limited in Sri Lanka.

Energy Supply

To understand the status of the energy sector of a country, what is more important is not the availability of different energy resources, but the extent of use of these resources. As explained earlier, mere availability of a resource within a country does not enable its utilisation. Therefore, it is more important to analyse the resources which are actually being used to meet the energy demand of the country. Following are the four main energy supply forms in Sri Lanka.

- Biomass
- Petroleum
- Coal
- Electricity

Energy supply is essentially the conversion of energy resources from one form to a more usable form. However, this conversion can vary from producing electricity from the potential energy in a hydro reservoir to refining crude oil into gasoline or diesel.

Transmission/Distribution

For each energy supply source, there must be a distribution mechanism through which it can be served to the points of end use. From the production or storage facilities of the energy supply system, the distribution system transports energy to the end user.

The biomass distribution network is quite simple, and in the case of most users, a formal network does not exist. The major use of biomass is in households, where the source and the point of use, both are within the same home garden. Even in industrial use, distribution is a one-to-one arrangement, which links the source to the user through a direct biomass transport. More recently, with large scale conversion of industrial thermal energy for petroleum fuels, to biomass, the emergence of a supplier is witnessed. Then suppliers are essentially middlemen, who felicitate the market by connecting the resource owners with uses.

In the case of petroleum, distribution is from the petroleum storage facilities up to end user points such as vehicles, power plants and industries, channelled through regional storage facilities and filling stations.

For electricity, distribution starts from the generating station (power plant) and ends at consumer points such as households and industries. The high voltage transmission network, medium voltage regional networks and low voltage local distribution networks are collectively considered as the energy distribution system of electricity. With the introduction of net-metering scheme in the country in 2010, some customers have installed small scale generators at the end-use point, changing this traditional supply architecture. With the broadening of on-site solar PV rooftop scheme in 2016, these micro power producers are becoming a formidable supply source as per the trends observed during the period up to end 2020.

Demand

For the energy sector, demand drives the market. Demand arises owing to energy needs of households, industries, commercial buildings, etc. According to the needs of the user, the supply of energy has to take different forms. For example, the energy demand for cooking is in the form of biomass in rural areas, while it is in the form of either LP gas or electricity in urban areas. Therefore, not only the quantity of energy, even the quality and the form it is delivered, is determined by the demand.

In this report, the demand is categorised in terms of end-use sectors and is not based on the actual usage or the application of energy at appliance level.

2 Energy Resources

2.1 Indigenous Energy Resources

2.1.1 Biomass

The Household Survey on the Usage of Electrical Equipment carried out in 2019, in collaboration with the Department of Census and Statistics, reveals that nearly half of the population depends on biomass to suffice the needs in domestic cooking energy. Although large quantities of firewood and other biomass resources are used for cooking in rural households, lesser quantities are used in the urban households. This situation changed drastically due to the crisis in the LP gas industry during the year, caused by the collapse of the supply. The consumers suffered days and months without a means to refill the gas cylinders with severe impact on their lifestyles. Many households started to reintroduce biomass as a cooking fuel, venturing into various cookstove types and cooking fuel ranging from saw dust to charcoal briquettes. Urban poor suffered the most, as the situation was compounded by the complete disruption of Kerosene supplies too.

Even though a large portion of energy needs of the rural population is fulfilled by firewood, there are possibilities to further increase the use of biomass for energy in the country, especially for thermal energy supply in the industrial sector. Furnace oil prices have been maintained without subsidies since 2012, and continue to be expensive at LKR 110.00 per litre, even after a downward revision at the beginning of 2015. Therefore, the business case for large industrial thermal plants to be operational on biomass continued in 2022, further consolidating the supply chains. With no sign of new fuel wood plantations, the biomass supply chain of industrial thermal plants continued to grow.

2.1.2 Hydro

Hydro power is a key energy source used for electricity generation in Sri Lanka. A large share of the major hydro potential has already been developed and delivers valuable low cost electricity to the country. Currently, hydro power stations are operated to supply both peaking and base electricity generation requirements. A substantial number of small hydro power plants which operate under the Standardised Power Purchase Agreement (SPPA) and many more are expected to join the fleet during the next few years. The momentum gained by the small hydropower industry from the streamlined approval process was somehow lost due to legal impediments to approve new projects. Figure 2.2 indicates SPP hydro cumulative capacities by district.

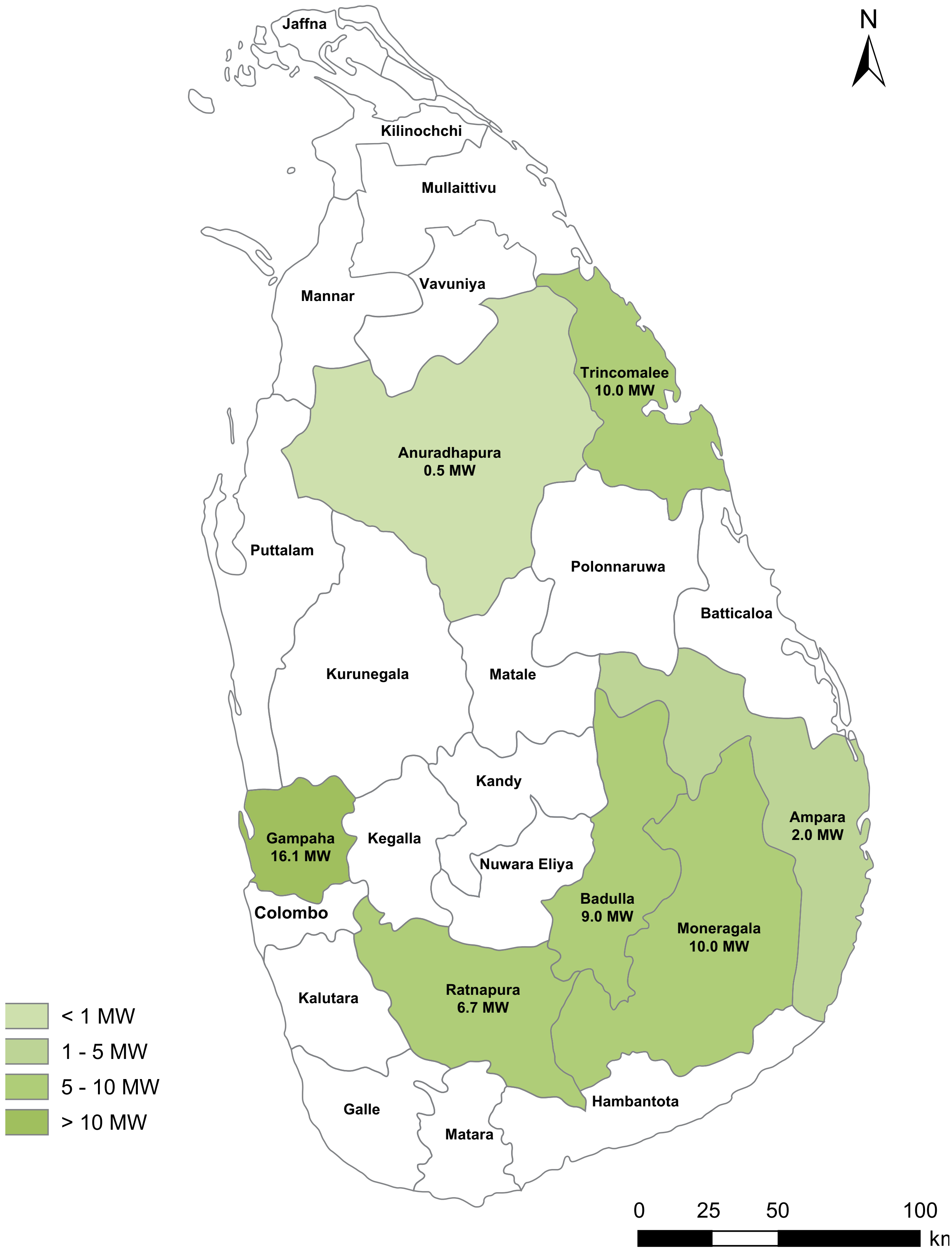


Figure 2.1 – Cumulative Capacity Additions of Biomass (2022)

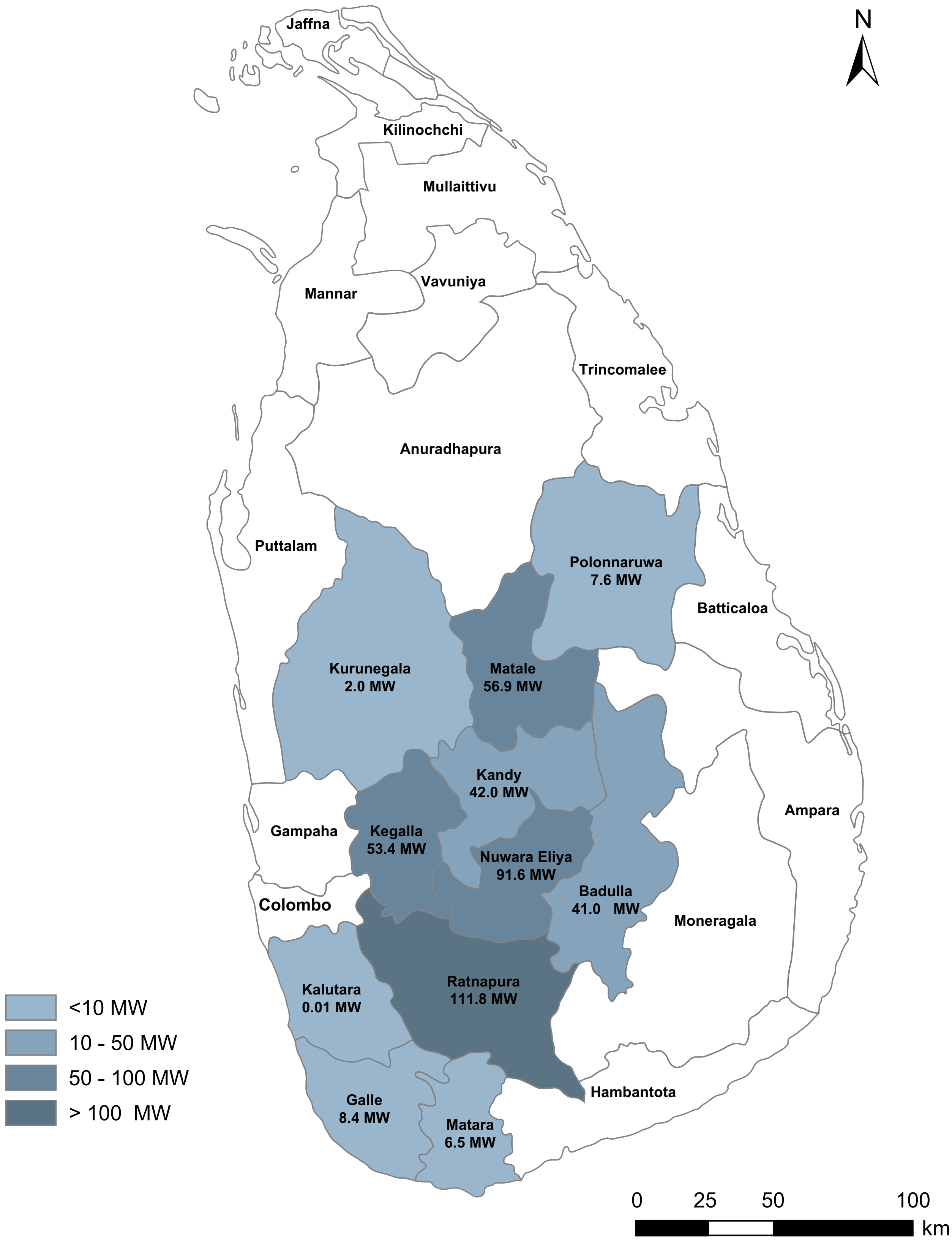


Figure 2.2 – Cumulative Capacity Additions of SPP Hydro (2022)

2.1.3 Solar

The two pilot projects operated by SEA realised annual plant factors of 14.57% for the 737 kW plant and 5.47% for the 500 kW plant. The lower than expected plant factors resulted from the failure of some key components in the power plant. In the commercial development sphere, 23 solar power plants resulting from the competitive bidding process commenced commercial operations in 2022. The capacity additions produced impressive results yielding an aggregate plant factor of 18.83%. 100.36 MW capacity available at the beginning of the year increased to 132.36 MW at the end of 2022. The capacity additions, energy yields and monthly plant factors are given in Figure 2.3 below.

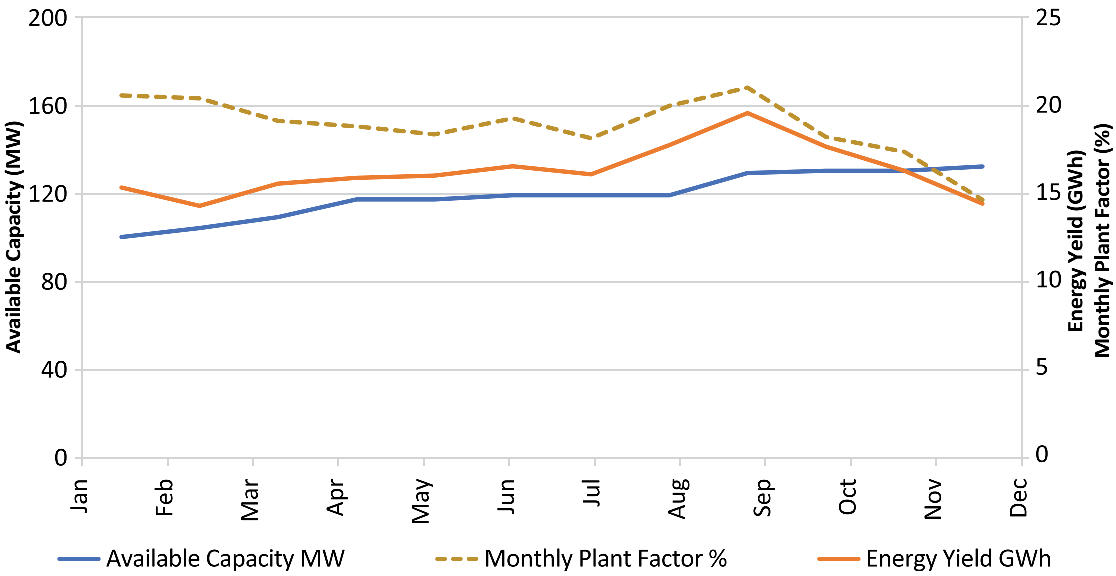


Figure 2.3 – Solar Power Generation

The installation of solar rooftop PV systems gathered momentum, and by end 2022, a total of 45,845 systems were in operation, with a total capacity of 660 MW generating 777.7 GWh. Generation statistics were estimated based on average energy yields expected in a Typical Meteorological Year (TMY), and will be derated by an end of lifecycle derating of 15% based on each project's age from 2022 to increase the accuracy of the estimate.

Figure 2.4 shows the SPP cumulative solar capacities by district.

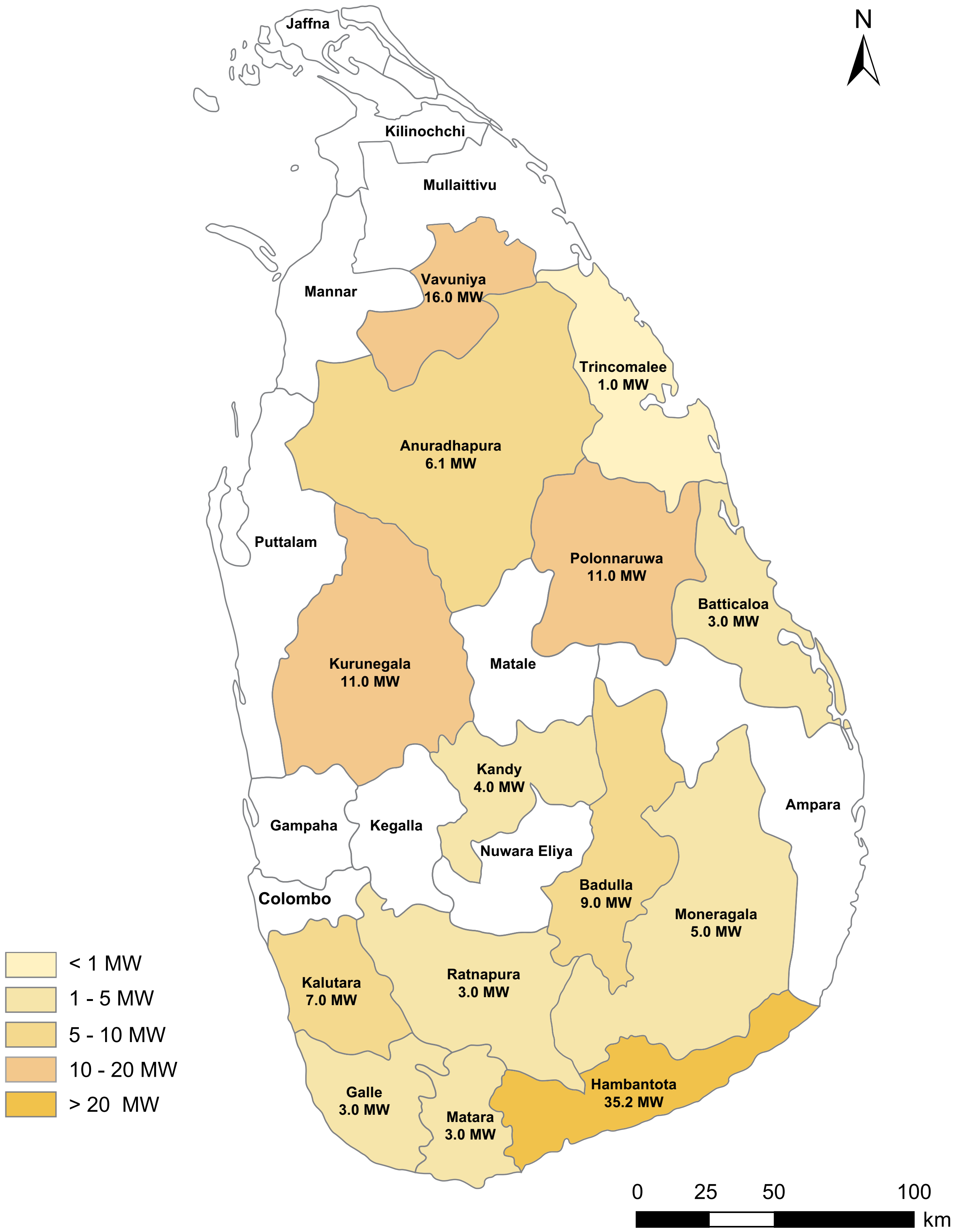


Figure 2.4 – Cumulative SPP Solar Capacity Additions (2022)

2.1.4 Wind

The ADB funded 100 MW Mannar Wind Project started full scale operations in May 2021, with the onset of the Southwestern monsoons and progressed to yield clean wind energy at its full capacity on 2021 September 11.

A capacity of 148.45 MW was available throughout the year 2022, yielding an aggregate plant factor of 28.62%. The energy yields and monthly plant factors are given in Figure 2-6 below. Performance of the newly commissioned Mannar wind power plant was not added to this calculation, and will be depicted separately with the next issue of this publication.

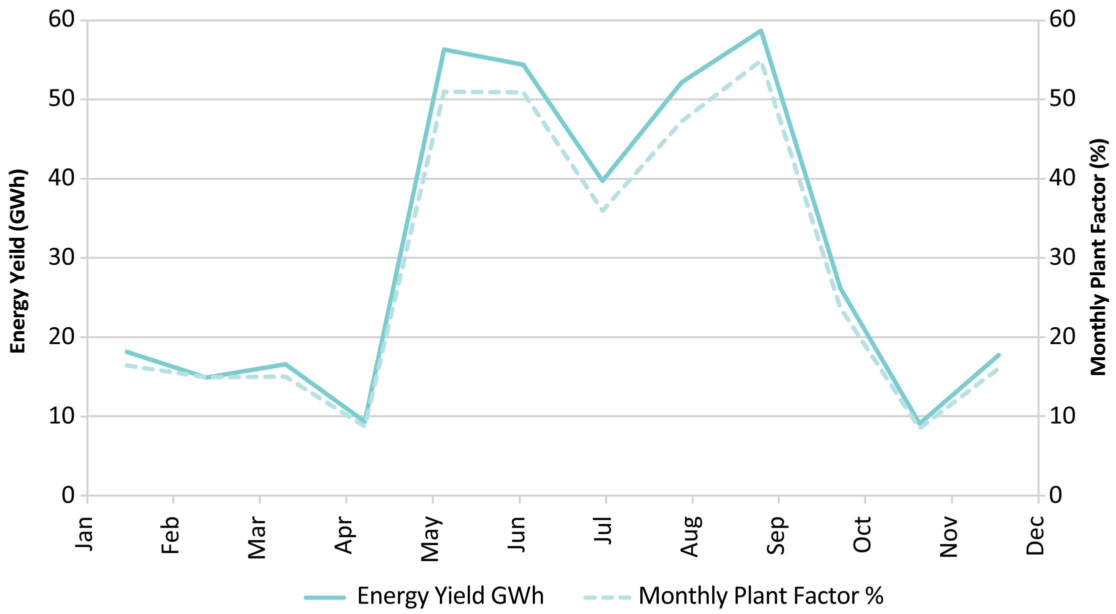


Figure 2.6 – Wind Power Generation

2.1.5 Oil/Gas Exploration

The new Petroleum Resources Act No: 21 of 2021 was enacted on the October 8, 2021, with the primary aim of establishing an independent, efficient and transparent upstream legislation, enabling the formulation of a clear national upstream policy, a regulatory and an operational framework to better govern and manage the Petroleum Resources and related operations. In order to fulfill the objectives of the new Act and for the proper functioning of the PDASL, steps were taken to frame regulations during 2022 to establish procedures in the areas specified in the Act. This series of regulations will strengthen Sri Lanka's oil and gas sector with much investor confidence. The PDASL team completed / drafting the following much needed regulations and in the pipeline for approval to be adopted soon.

I. Entering into Joint Study Agreements

II. Data generation for hydrocarbon exploration activities in Sri Lanka

III. Petroleum Data Viewing, Licensing and granting Rights to Use

IV. Service Provider Licensing

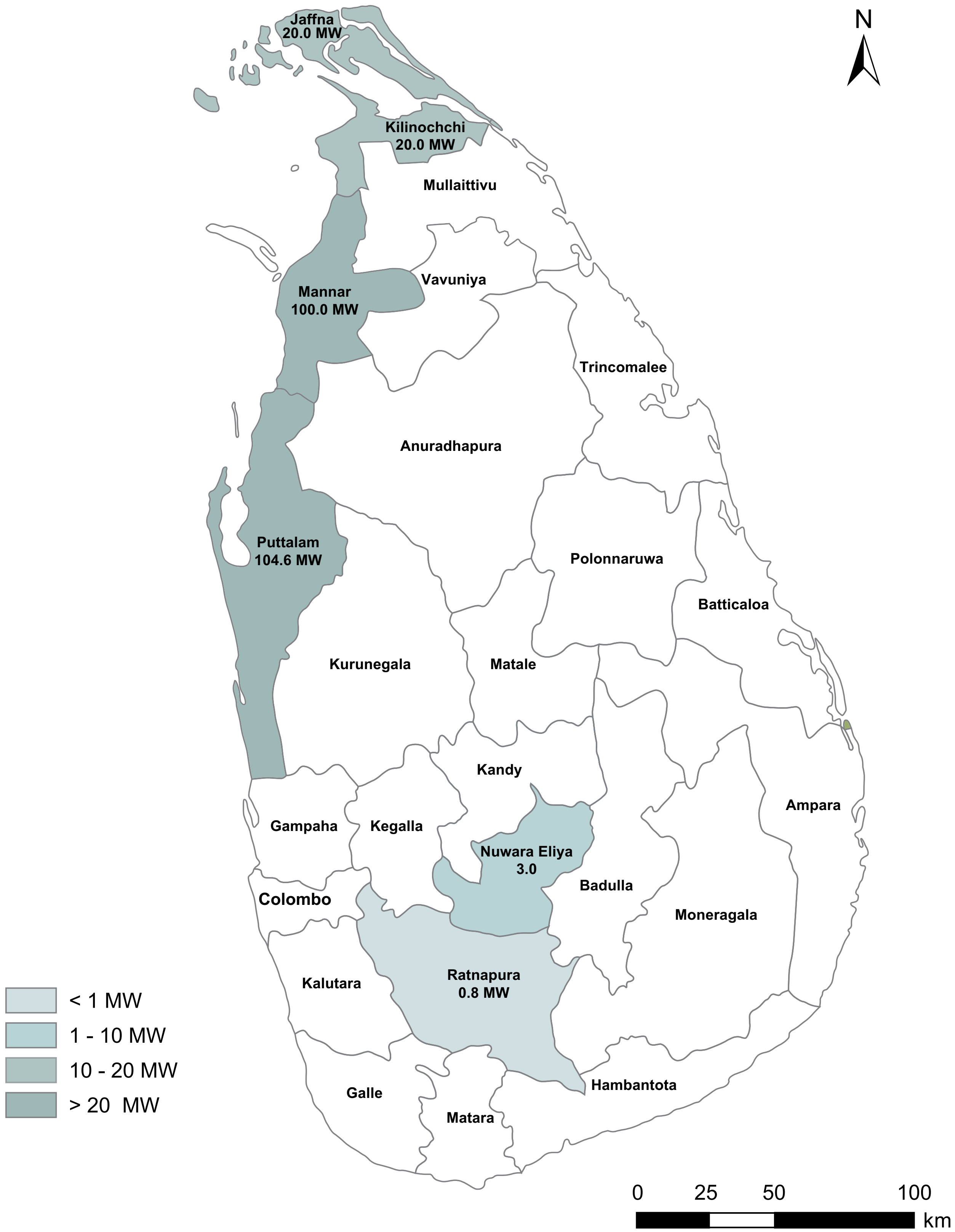


Figure 2.6 – Cumulative Capacity Additions of Wind (2022)

The formulation of Sri Lanka's National Policy on Natural Gas (NPNG) utilisation initiated by the PRDS in 2016 has been successfully completed in 2020, by obtaining the assistance of a special Committee appointed by the the Ministry of Power and Energy. The enforcement of this policy on October 17, 2020, is one of the notable achievements made towards the development of the natural gas resource in Sri Lanka. Discussions continued in 2021 and 2022 to prepare a gas utilisation master plan as a part fulfilment of the implementation strategy of the above NPNG.

In 2018, the largest-ever 2D seismic operations in Sri Lanka covering close to 5,000 line km off the northeastern coast and the western Mannar Basin were conduc ted, by entering into two Service Agreements. In addition, two more service agreements were executed in 2019 and 2020, in order to reprocess the legacy data. The reprocessing of legacy data continued during the period 2021 -2022. EasternEcho DMCC have spent close to USD 17 Million for the above service orders at no cost to the Government. To date they have produced 13,080 line km of 2D reprocessed data and have further acquired new data, part of which has already been shared with the Government. They have been successful in licensing data to several reputed oil and gas companies in 2021 and have assured a revenue share of those data sales proceeds to the government of Sri Lanka in 2022. In addition to that, the technical and marketing teams of Schlumberger have reached several potential investors identified through their international network, to promote the prospective offshore acreage for oil and gas upstream activities.

A study was initiated in September 2021 and concluded in May 2022 to identify strategic options, the implementation of which will help accelerate the development of the "Dorado" natural gas discovery made in 2011 in the Mannar Basin. Following the Cabinet Decision, dated January 31, 2022, on "Pilot Project on Green Hydrogen Generation", the GoSL, through the Petroleum Development Authority of Sri Lanka (PDASL), signed a Project Agreement with Greenstat India Ltd, a subsidiary of Greenstat AS of Norway, in February 2022 to conduct feasibility studies and thereby prepare a road map for Sri Lanka and collaborate on a pilot project to generate green hydrogen in Sri Lanka and assess export potential of the same. The Project office was established and the Project Director was nominated. Preliminary data collection for conducting feasibility studies were initiated. Locations for creating Hubs/Clusters were also collected. Project partners for pilot in Mobility (Bus conversion into fuel cell bus) and dispensation station (for charging/fueling Buses/trucks) were identified

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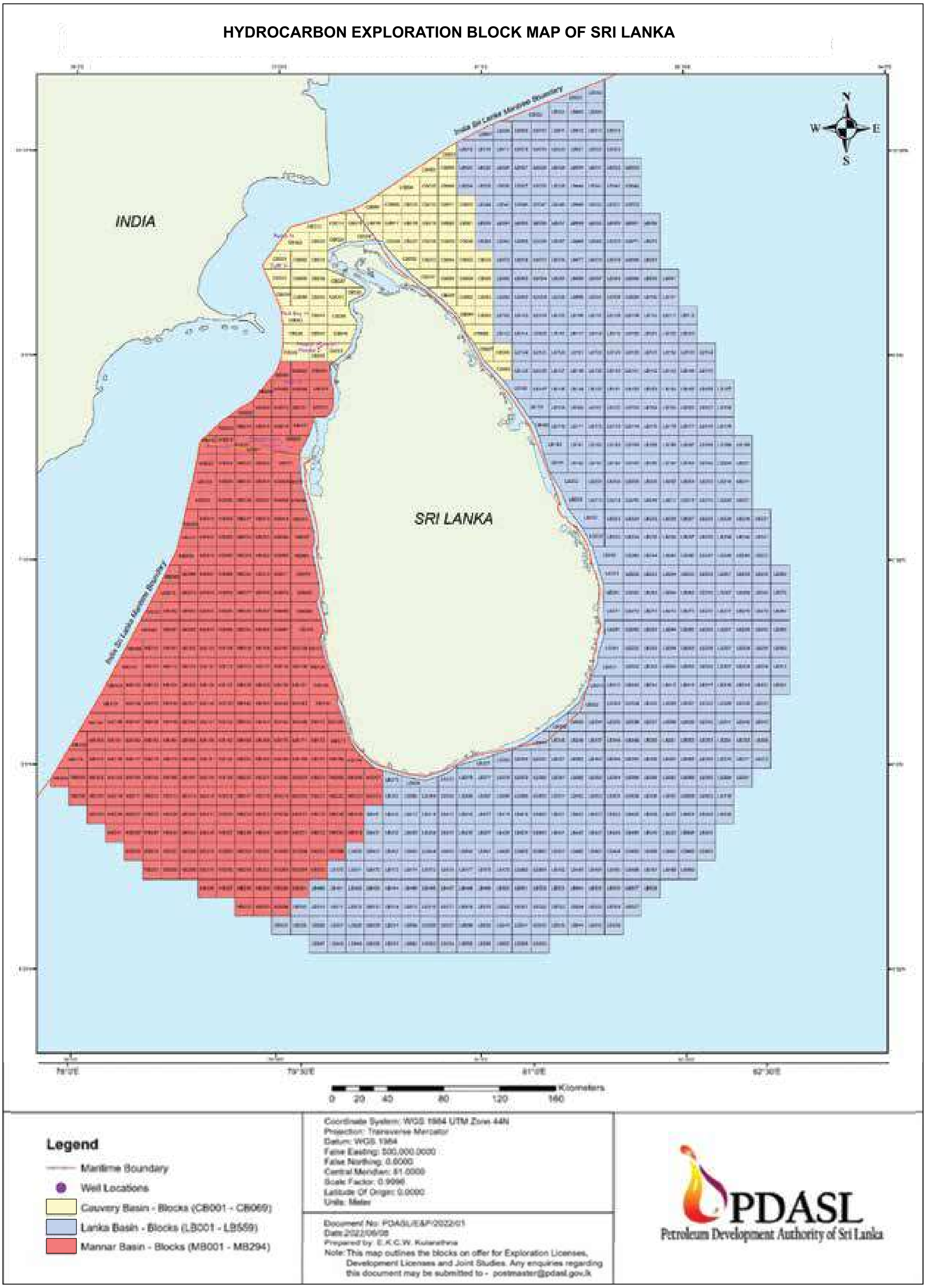

Figure 2.7 – Offshore Hydrocarbon Block Map - 2022

2.1.6 Indigenous Resources in Sri Lanka

Table 2.1 - Indigenous Primary Sources of Energy in Sri Lanka

Indigenous Energy Source	Typical User Groups	Typical Applications	Scale of Use by End 2022
Biomass	Household	Cooking	Widespread
	Commercial	Hotels, Bakeries	Widespread
	Industry	Tea drying, Brick and tile	Widespread
		Steam generation	Growing
	Private power plant	For sale to utility	14 power plants
		Own consumption	Several villages and factories
Hydro Power	Electricity utility owned large multipurpose systems	For retail to customers	Major power plants
	Commercial grid-connected	For sale to utility	217 power plants
	Village-level off-grid electricity	Household use	A few plants operating in the grid-connected mode, however, many now in disuse
	Industrial off-grid electricity	Tea industry	A few power plants
	Industrial mechanical drives	Tea Industry	Negligible, one or two remaining
Solar Power	Solar photovoltaic	Rooftop systems	45,845 installations
		Household lighting	No longer reported in large numbers.
	Grid connected PV	For sale to utility	83 power plants
	Solar Thermal	Hot water systems in commercial and domestic sectors	Widespread
	Informal use	Household and agricultural use	Widespread
Wind Power	Grid Connected Wind	For retail to customers	19 power plants
	Off-grid power plants	For residential use	A few dozens, most in disuse
	Water pumping	Agriculture	A few dozens, one or two in operation

2.2 Global Energy Resources

As explained previously, petroleum, coal, natural gas and nuclear energy are the four main energy sources used in other countries. However, in Sri Lanka, petroleum and coal are imported in large scale to the country as a source of energy while the use of other sources is still being at lower levels. The use of refined petroleum products and coal is described in Table 2.2.

Table 2.2 – Use of Global Energy Resources in Sri Lanka

Imported Energy Source	Typical User Groups	Typical Applications	Scale of use at Present
Crude Oil and refined products including LPG	Household	Lighting, cooking	Widespread
	Commercial	Hotels, bakeries	Widespread
	Industry	Furnaces, kilns, boilers	Widespread
	Power generation	Combined cycle, gas turbine, diesel engines, steam turbines	A number of thermal power plants
	Transport	Rail, road, air and sea	Widespread
Coal	Railways	Rail	Negligible
	Industry	Kilns	Cement industry and foundries
		Boiler	Two or more
	Power Generation	Boiler	3 units of 300 MW (900 MW)

3 Energy Supply

Energy needs of the country are fulfilled either directly by primary energy sources such as biomass and coal, or by secondary sources such as electricity produced using petroleum, biomass, hydro power and refined petroleum products.

3.1 Supply from Primary Energy Sources

3.1.1 Evolution of Energy Supply

The primary energy supply of Sri Lanka consists of biomass, petroleum, coal, major hydro and new renewable energy. Table 3.1 summarises the contribution of supply energy forms by source.

Table 3.1 – Primary Energy Supply by Source

PJ	2010	2015	2019	2020	2021	2022
Biomass	180.5	174.6	169.0	172.0	172.5	168.5
Petroleum	181.2	186.1	223.8	198.5	205.6	150.6
Coal	2.5	51.9	58.7	70.5	70.4	58.3
Major hydro	50.1	49.3	38.2	39.5	56.9	54.1
New Renewable Energy	7.5	15.3	18.9	20.7	30.8	31.4
Total	**421.9**	**477.2**	**508.6**	**501.2**	**536.1**	**463.0**
%						
Biomass	42.8	36.6	33.2	34.3	32.2	36.4
Petroleum	43.0	39.0	44.0	39.6	38.3	32.5
Coal	0.6	10.9	11.5	14.1	13.1	12.6
Major hydro	11.9	10.3	7.5	7.9	10.6	11.7
New Renewable Energy	1.8	3.2	3.7	4.1	5.7	6.8

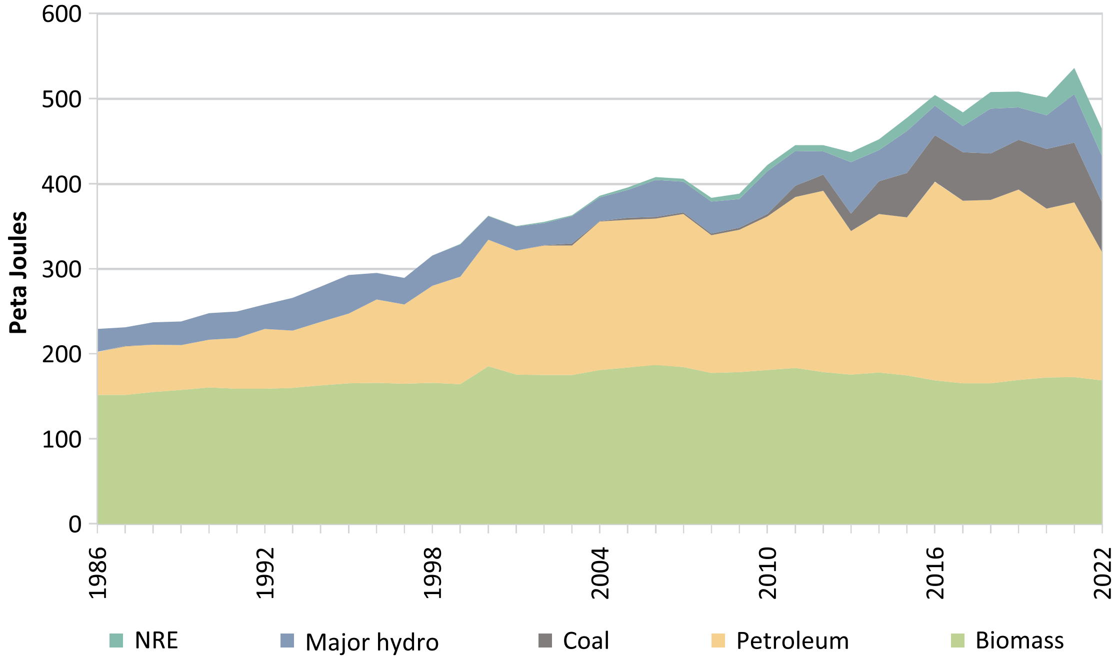

Figure 3.1 – Evolution of Energy Supply Forms

In early years (1970's, at which the earliest comprehensive energy accounts are available), the primary energy supply was dominated by biomass and petroleum. By end 2022, the share of biomass in the primary energy supply has increased marginally to 36.4%, compared to previous years, whilst the share of petroleum too has gradually decreased to 32.5%, over the years.

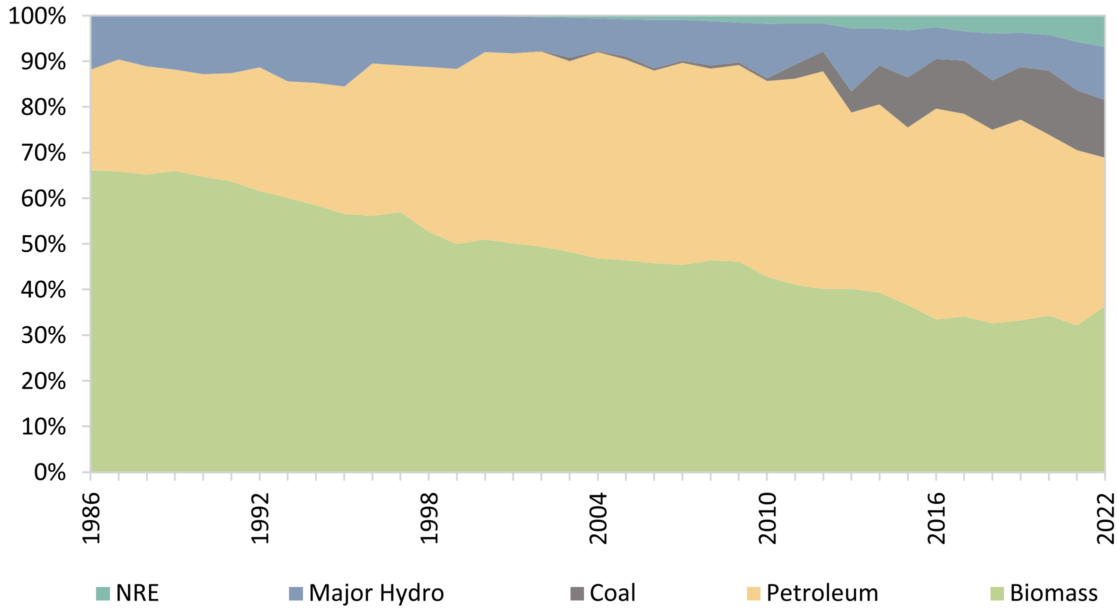

Figure 3.2 – Percentage Share of Primary Energy Supply

Biomass is the most widely available cooking fuel used by nearly half of the population in the domestic sector for cooking purposes. Due to the abundant availability, only a limited portion of the total biomass use is channelled through a commodity market and hence the value of the energy sourced by biomass is not properly accounted. However, this situation is fast changing with many industries switching fuel to reduce the cost of thermal energy. There is a growing demand from the users to regularise the biomass market by way of introducing quality traceability and sustainability assurance schemes. However, the growing industrial demand sans an appreciable expansion of the supply sector is already causing shortages, eroding the economic gains enjoyed by the industrial users immediately after conversion. The biomass industry can look forward to a better future only if the regulatory instruments now available for adoption in Sri Lanka are fully implemented to ensure a sustainable supply.

Sources of Production of Biomass

Biomass comes in different forms. Following are the most common forms of biomass available in Sri Lanka.

- Fuel wood (unprocessed logs)
- Fuel wood (processed chips)
- Municipal Waste
- Industrial Waste
- Agricultural Waste

General biomass conversions are given in Table 3.2

Table 3.2 – Biomass Conversions

Primary Source	Conversions
Firewood (natural yield, home gardens, dedicated woodlots)	Thermal energy for boilers to generate steam for industry uses and electricity generation and combustible gases to drive Internal Combustion engines for electricity generation
Coconut Shell	Charcoal, activated carbon; mostly for export as a non-energy product
Bagasse	Thermal energy to generate steam for boiler-turbine units used for electricity generation
Wood	Charcoal; mostly for the hotels and household markets
Municipal waste	A single 10 MW capacity plant in operation

3.1.2 Energy Supply from Petroleum

As a country with no proven indigenous petroleum resources yet, Sri Lanka totally depends on petroleum imports, both in the form of crude oil and as finished products. Table 3.3 summarises the imported petroleum products.

Table 3.3 – Importation of Petroleum Products

kt	2010	2015	2019	2020	2021	2022
Crude Oil Import	**1,819.4**	**1,676.8**	**1,842.7**	**1,666.8**	**1,130.2**	**743.6**
Product Imports	**2,495.8**	**2,995.3**	**4,099.4**	**3,294.1**	**3,941.8**	**3,542.7**
LPG	137.1	277.0	430.0	437.0	422.0	290.0
Gasoline	451.8	899.0	1,159.9	1,057.0	1,186.5	1,106.2
Avtur	222.8	270.8	397.3	101.1	178.1	268.7
Auto Diesel	1,199.2	1,288.8	1,587.3	1,192.0	1,779.7	1,608.1
Fuel Oil	423.0	203.3	504.0	487.0	359.3	245.8
Avgas	0.3	0.1	-	0.1	0.2	0.1
Bitumen	44.7	32.2	3.0	-	-	-
Mineral Gas Oil	16.9	24.1	17.9	19.9	16.0	23.7

Both the importation of crude oil and finished products have decreased in 2022 compared to 2021, while the decrease in crude oil is substantial. The importation of crude oil had decreased by 52.0%, whereas the importation of finished products had decreased by 11.3% in 2022.

3.1.3 Energy Supply from Coal

The demand for coal decreased in 2022 as the primary demand for coal is from the power generation sector (Figure 3.3 and Table 3.4).

Table 3.4 – Importation of Coal

kt	2010	2015	2019	2020	2021	2022
Coal Imports	108.1	1,881.5	2,388.6	2,543.6	2,204.4	1,707.0

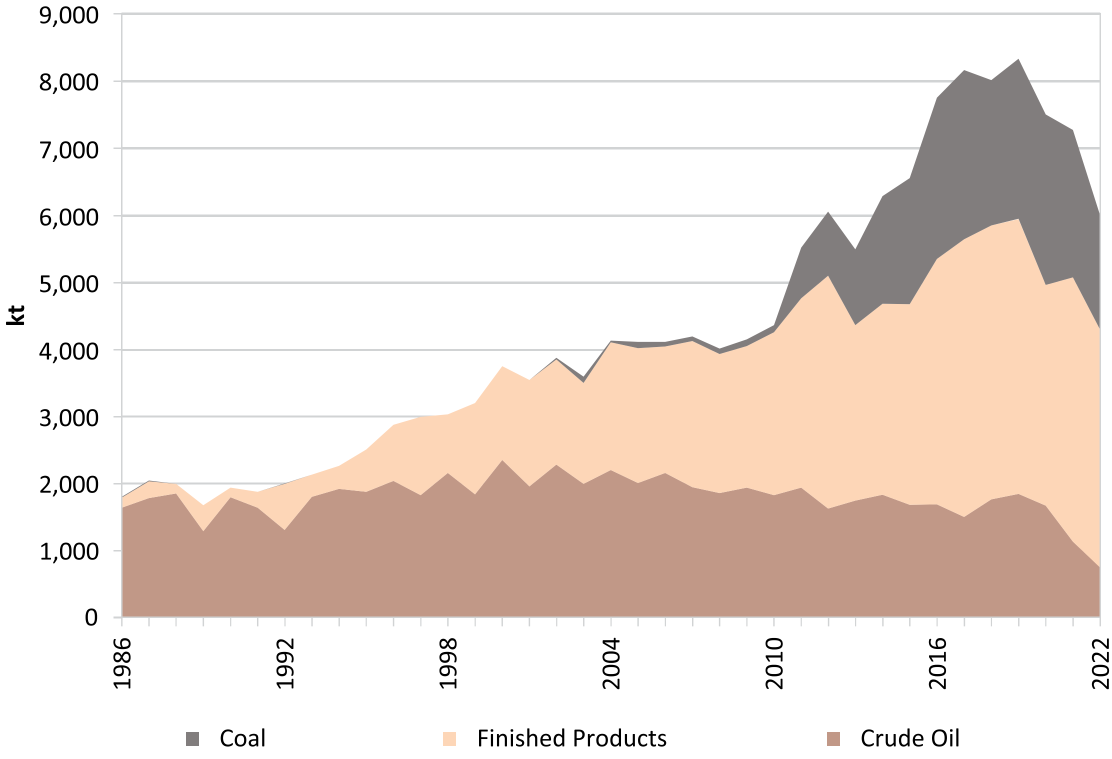

Figure 3.3 – Importation of Petroleum Products

3.1.4 Supply from Major Hydro

The topography of the country provides an excellent opportunity to harness the energy stored in river water which flows from the central hills of the country to the Indian Ocean surrounding the island. The contribution of hydro as an energy supply source is always through its secondary form, which is electricity. Having an early start in the hydro electricity generation, Sri Lanka has nearly exhausted the hydro power potential in its river systems. With the commissioning of the remaining four projects under construction the era of major hydropower development will come to an end. The other key hydropower project, namely, the Uma Oya (120 MW) was nearing completion as at end 2022 and is expected to be commissioned in 2023. Work of the other projects like the Moragolla, Gin Ganga, and Thalpitigala, were in progress in 2022.

3.1.5 Supply from New Renewable Energy

The New Renewable Energy (NRE) is seen in many forms such as small hydro, solar, wind and biomass power plants. Only 21 new solar power plants were commissioned in 2022. No other renewable energy projects were commissioned in 2022. Apart from the large scale orthodox use of solar energy in drying and crop processing, large scale deployment of solar hot water systems are seen in new home construction. Also, the interest in solar roof top systems is seen to be increasing at a rapid rate. By end 2022, there were 651 service providers engaged in this trade.

The contribution of major hydro and NRE to the primary energy supply is depicted in Table 3.1, Figures 3.1 and 3.2 above.

3.2 Petroleum Refinery Operations

3.2.1 Refinery Product Output

The country's petroleum product requirements are met partly by direct import of finished products and partly by processing imported crude oil. The only refinery in Sri Lanka, located in Sapugaskanda, converts imported crude oil to refined products to supply approximately half of the petroleum demand of the country. The refinery produces its output at a rate of 2.3 million tonnes per year (50,000 bbl/stream day) and the refinery process flow is illustrated in Figure 3.4.

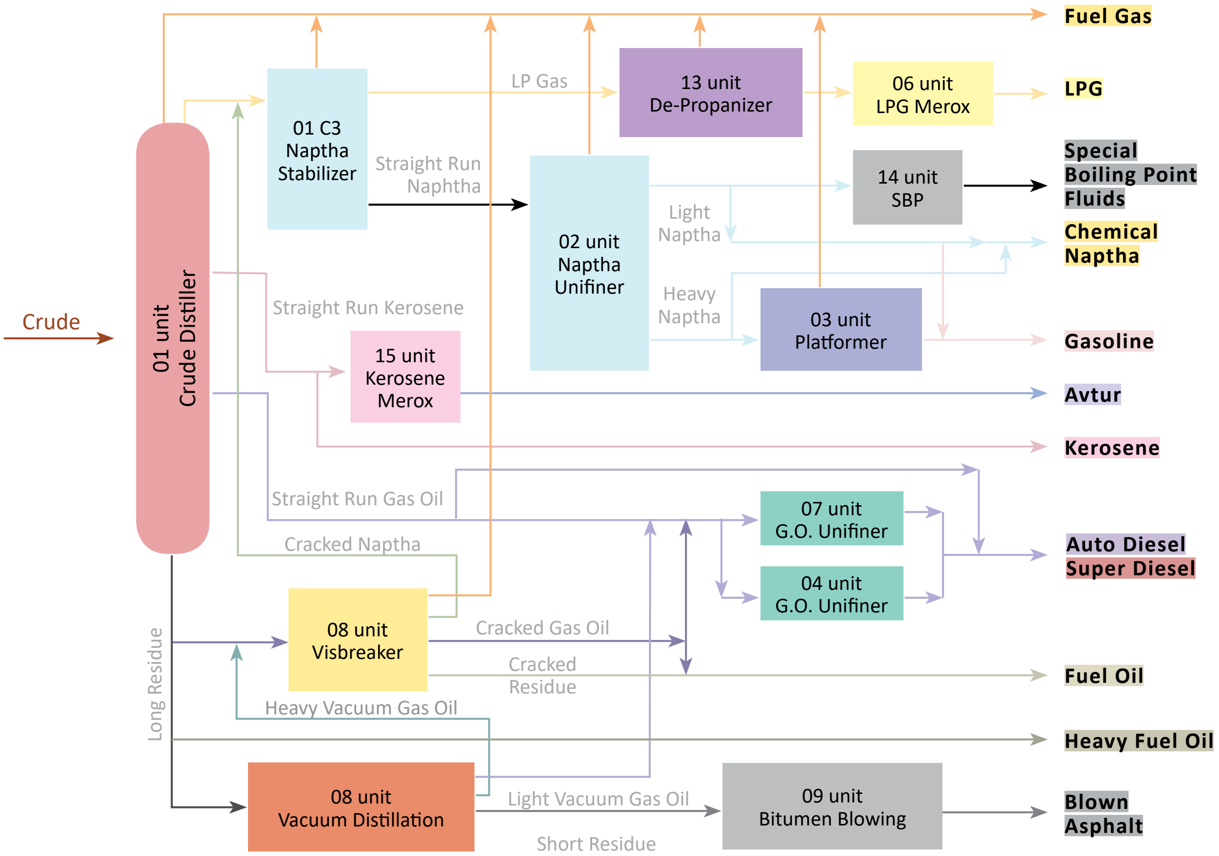

Figure 3.4 – Sapugaskanda Refinery Process Flow Diagram

Murban Crude oil, Siberian Light, URAL and ESPO were processed in the Sapugaskanda refinery in 2022. Details of crude refined are given in Table 3 5. The CPC had to look for new sources of crude, owing to the on-going embargo which prevented any Iranian Light crude from reaching the refinery. This affected the throughput and process efficiency of the refinery.

Table 3.5 - Types of Crude Oil Refined at Sapugaskanda Refinery

kt	2010	2015	2019	2020	2021	2022
Arabian light	134.61	-	-	-	-	-
Iranian light	1,618.10	-	-	-	-	-
Miri Light	-	-	-	-	-	-
Upper zakum	-	-	-	-	-	-
Oman Crude	-	304.30	-	-	-	-
Dubai Crude	-	-	-	-	-	-
Murban Crude	-	1,387.77	1,861.30	1,752.36	1,272.21	282.86
DAS	-	-	-	-	-	-
Saharan Blend Crude	-	-	3.52	-	-	-
Siberian Light	-	-	-	-	-	74.96
URAL	-	-	-	-	-	165.94
ESPO	-	-	-	-	-	6.02
Total	**1,752.72**	**1,692.07**	**1,864.82**	**1,752.36**	**1,272.21**	**529.77**

The refinery maximum throughput is far less than the country requirement for petroleum products. Besides, its production slate differs from the mix of product demand. Although the refinery is operated at maximum design capacity to meet the demand for middle distillates, petrol, kerosene, Jet A-1 and diesel are still in deficit with a need for supplementary imports. All petroleum products had to be imported to supplement refinery production in 2022. Details of refinery output are given in Table 3.6 and Figure 3.5.

Table 3.6 - Refined Products from the Refinery

kt	2010	2015	2019	2020	2021	2022
Crude Input	**1,752.72**	**1,692.07**	**1,864.82**	**1,752.36**	**1,272.21**	**529.77**
LPG	22.93	9.65	26.99	25.25	16.65	5.69
Chemical Naphtha	84.29	136.56	162.02	156.95	106.96	30.84
Naphtha Total	**84.29**	**136.56**	**162.02**	**156.95**	**106.96**	**30.84**
Super Petrol	-	-	-	-	-	-
Regular Petrol	157.97	154.24	185.92	164.42	124.09	38.67
Petrol Total	**157.97**	**154.24**	**185.92**	**164.42**	**124.09**	**38.67**
Avtur	126.41	154.57	258.99	157.28	130.57	57.35
Kerosene	92.78	75.23	38.35	109.17	98.28	25.29
Auto Diesel	441.55	516.65	624.46	537.65	370.59	128.17
Super Diesel	-	-	-	-	-	-
Diesel Total	**441.55**	**516.65**	**624.46**	**537.65**	**370.59**	**128.17**
Furnace Oil 500'	-	-	-	-	-	-
Furnace Oil 800'	47.92	336.28	303.43	465.42	359.02	87.20
Furnace Oil 1000'	-	-	-	-	-	-
Furnace Oil 1500'	396.03	204.85	179.81	-	-	-
Furnace Oil 3500'	241.93	11.37	-	-	-	-
Furnace Oil Total	**685.88**	**552.50**	**483.24**	**465.42**	**359.02**	**194.20**
S.B.P.	2.73	1.51	1.66	0.90	3.04	2.69
Solvents Total	**2.73**	**1.51**	**1.66**	**0.90**	**3.04**	**2.69**
Bitumen	34.94	-	-	-	-	-
Total Output	**1,649.47**	**1,600.91**	**1,781.62**	**1,630.59**	**1,216.09**	**482.88**
Crude Input	1,753	1,692	1,865	1,752	1,272	529.77
Own Use and Losses (kt)	101	92	102	86	71	34
Own Use & loss as Percentage of Input	5.8%	5.5%	5.5%	4.9%	5.6%	6.4%

In 2022, the total refinery output decreased substantially to 482.88 kt from 1,216.09 kt in 2021.

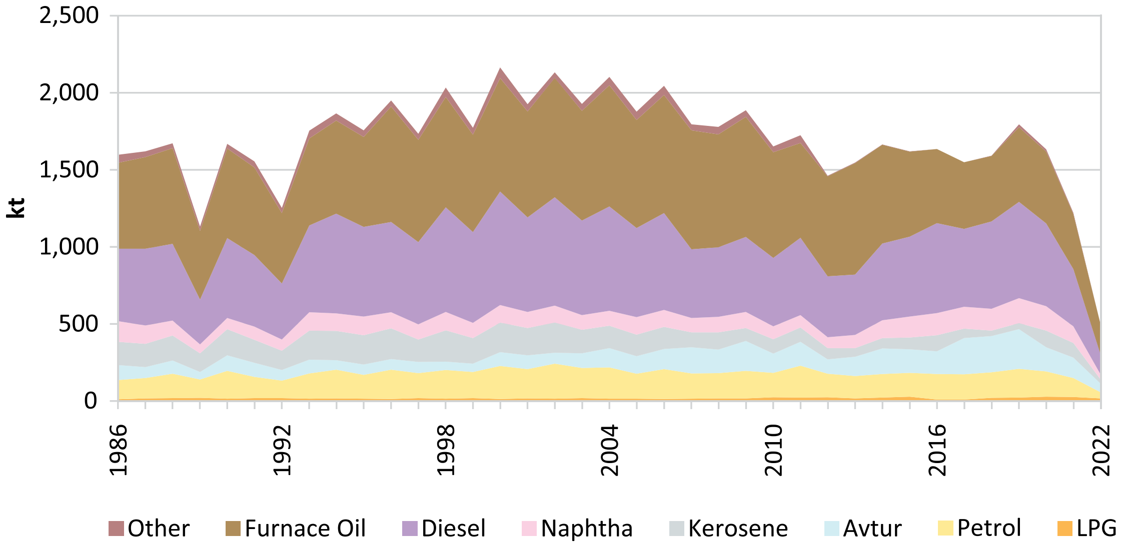

Figure 3.5 - Refined Product Output

3.2.2 Export of Surplus Products

Surplus production of the refinery is exported by the CPC, but the exported quantities are not significant in comparison with the imports. Table 3-7 summarises re-exported products, where naphtha and fuel oil were re-exported in 2022.

Table 3.7- Surplus Exports of Petroleum Products

kt	2010	2015	2019	2020	2021	2022
Naphtha	26.69	22.39	-	164.65	114.41	-
Fuel Oil	-	184.56	-	-	31.39	-
Bitumen	-	-	-	10.50	-	4.88
Total re-exported	**26.69**	**206.95**	**-**	**175.15**	**145.80**	**4.88**

4 Energy Conversion

4.1 Grid Electricity Generation

As far as the supply from secondary energy sources is concerned, conversion of primary energy in the form of hydro potential or petroleum to electricity is the most prominent. However, the conversion of petroleum fuel to steam which is used as an energy source in industries for their thermal application can also be considered a secondary form of energy. Though widely used, the quantum of steam generated, the quality and the end use is not recorded properly, which causes the discussion on supply from secondary energy sources to be limited to electricity.

Electricity generation in the country which was broadly divided into two parts based on whether they are connected to the national grid or whether they run isolated. Sri Lanka has a national grid, which now covers the whole country. It is very unlikely that further development of the off-grid sector will take place in the near term. However, the scope for the off-grid sector remains open in areas where grid electricity cannot be provided, such as the few inhabited islands.

Grid connected generation comprises of the following genre.

(i) CEB hydro power plants

(ii) CEB non-conventional power plants (only wind power at present)

(iii) CEB thermal power plants (oil fired and coal powered)

(iv) Independent Power Producers (IPPs) (presently oil-fired thermal power plants)

(v) Small Power Producers (SPPs) (presently mini hydro, one CHP plant, one solar power plant, wind power plants and biomass based power plants, all embedded in the distribution network)

(vi) Emergency Power Plants

(vii) Micro power producers (μPP), small scale power generators connected at the customer location, through one of the three schemes on offer.

Due to the significance of the grid supply compared with the diminishing role of off-grid supply, most of the analyses presented in the report will be for grid connected electricity supply.

4.1.1 Grid Connected Power Plants

As explained above, the electricity supply in Sri Lanka flows through the national grid and a brief description of the national grid is given in this section. Off-grid electricity generation is described in the next section.

Both CEB and private power producers generate electricity and supply to the national grid. All the large-scale hydro power plants in the country are owned by the CEB. Oil-fired thermal power plants and the coal power plant as well are owned by CEB. In addition to its own power plants, CEB as the single buyer of electricity, purchases electricity to the national grid from private Independent Power Producers (IPPs) who have entered into contracts with the CEB. All large IPPs are oil fired, while the mechanism to purchase electricity from renewable based power plants has enabled many Small Power Producers (SPPs) to generate and sell hydro power to the national grid. With the increase of electricity demand and delays in construction of CEB's own power plants, the contribution from private power plants has increased significantly in the recent years.

Different Categories of Power Plants in the National Grid

CEB Power Plants

As the sole operator of the Sri Lankan power system, until 1997, the CEB owned and operated almost all the power plants in the national grid.

Independent Power Producers

Starting from 1997, many IPPs entered the electricity market, supplying electricity to the national grid. IPPs operate by entering into long term agreements with CEB. These contracts are individually executed under different terms and conditions. By 2022, five IPPs were in operation.

Small Power Producers

The number of small power producers increased rapidly over the period, under the enabling environment created by the Government, and implemented by the SEA through its facilitation of the project development through the newly introduced transparent resource allocation process. These power plants are operated by private sector investors and the installed capacity is limited to 10 MW since the plants are non dispatchable. Attractive tariffs offered through the cost-based, technology-specific tariff scheme, a policy intervention of the Ministry of Power and Renewable Energy and the flow of commercial financing provided by commercial banks contributed to the development of the industry.

However, the great strides made by the industry caused several issues, which in turn re-affected the industry. Most of the small hydropower developers were cautioned by activists opposing these projects on environmental and social grounds. This caused the environmental approval processes to become stricter, resulting in considerable delays. These delays affected the projects as most other time-restricted approvals realised by them expired before gaining the environmental approval. Lobbying against renewable energy projects escalated to legal action in 2018, causing more delays in project approval cycle.

On the regulatory front, suspension of purchase of electricity from producers at pre-determined feed-in-tariffs by CEB continued. Accordingly, no Standardised Power Purchase Agreements were signed in 2022 for pre-determined tariffs. However, the CEB carried on with the projects developed from the tendering process and executed 23 PPAs adding 32 MW of capacity to the national grid. The Government is making strenuous efforts to resolve these issues and it is expected that a new regulatory mechanism will be designed and operated in the near future.

Emergency Power Producers

These are power plants connected to the national grid on temporary basis to avoid electrical energy shortages for brief periods, especially during prolonged droughts. Sometimes, these generators are connected to bridge the capacity deficits resulting from dwindled hydropower resources.

Net-metered Projects or micro power producers (µPP)

The net-metering scheme, which was introduced in 2010 continued to serve the solar PV rooftop industry with large scale implementation across the country. However, it failed to encourage other renewable energy projects as envisaged. By end 2022, 45,845 systems were connected to the national grid, adding 660 MW of capacity.

Rooftop Solar PV Proramme under the theme 'Sooryabala Sangramaya' launched in 2016 progressed as expected. In this scheme, excess energy exported to the grid can either be carried forward (as originally done in the net-metering scheme) or encashed (this scheme is identified as net-accounting), at a tariff of LKR 22.00 per kWh during the first seven years and LKR 15.50 per kWh during the remaining thirteen years. The programme attempts to encourage institutional users through a third scheme, known as the micro power producers scheme, where all generation is exported through a separate export meter without making any change to the electricity users metering method.

With the significant reduction of cost of solar PV components, the service providers have quickly moved to tap large industrial customers who own large buildings with good roofs for solar PV systems.

Table 4.1 summarises the total grid connected capacity by type of power plant

Table 4.1 - Total Installed Capacity

MW	2010	2015	2019	2020	2021	2022
Major Hydro	1,207.45	1,376.95	1,398.85	1,382.85	1,382.85	1,413.40
Thermal Power Producers (CEB+IPP+Hired)	1,389.50	1,128.00	2,198.00	2,098.00	2,098.00	2,098.00
CEB Wind	3.00	3.00	-	31.05	103.50	103.50
New Renewable Energy	217.63	451.98	628.03	676.75	713.05	744.05
Micro Power Producers	-	27.71	283.84	353.61	515.57	659.88
Total Installed Capacity	**2,817.58**	**2,987.64**	**4,508.72**	**4,542.26**	**4,812.97**	**5,018.84**
%						
Major Hydro	42.9	46.1	30.9	30.4	28.7	28.2
Thermal Power Producers (CEB+IPP+Hired)	49.3	37.8	48.5	46.2	43.6	41.8
CEB Wind	0.1	0.1	-	0.7	2.2	2.1
New Renewable Energy	7.7	15.1	14.4	14.9	14.8	14.8
Micro Power Producers	-	0.9	6.3	7.8	10.7	13.1

Figure 4.1 depicts the total installed capacities serving the grid by type of power plant.

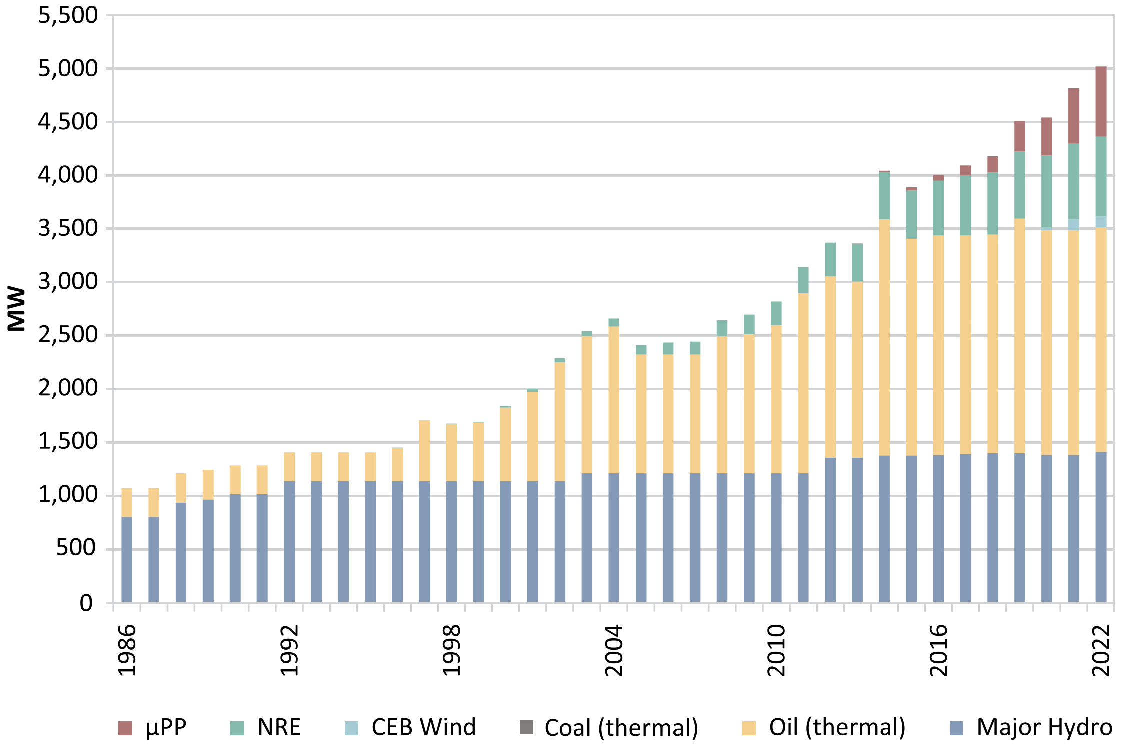

Figure 4.1 - Total Installed Capacity by Type of Power Plant

In the early stages, major hydro played a dominant role in power generation and continued until about 1996. Once the economically feasible major hydro schemes reached their saturation, the share of thermal plants in power generation increased. At present, 49% of power generation is from thermal power.

4.1.1.1 Major Hydro

Sri Lanka has two main hydro power complexes; namely Laxapana and Mahaweli, each consisting of several power plants. Laxapana complex is based on Kelani River while Mahaweli complex is based on Mahaweli River. Other than these major schemes, there are two independent large scale hydro power stations, namely Samanalawewa and Kukule Ganga while small scale power plants such as Inginiyagala and Uda Walawa are also generating hydropower using their respective reservoir storages. For administrative purposes, these smaller hydropower plants are grouped together as a single complex identified by the CEB as the 'Other Hydro' Complex, although these plants are located in different river systems.

Table 4.2 provides a list of major hydro power plants and their corresponding water storage capacities.

Table 4.2 - Storage Capacities and Generation of Major Hydro Power Stations

Name of Hydro Power Station	Plant Capacity (MW)	Name of the Reservoir	Reservoir Live Storage (million m^3)	Generation in 2022 (GWh)	Share in Generation (%)
Laxapana Complex					
Wimalasurendra	50	Castlereigh Reservoir	44.8	138.4	2.6
Canyon	60	Maussakelle Reservoir	123.4	147.9	2.7
Laxapana	53.8	Norton Pond	0.4	330.9	6.1
Samanala	75	Laxapana Pond	0.4	514.4	9.6
New Laxapana	100	Canyon Pond	1.2	609.9	11.3
Broadlands	35	Canyon Pond	0.2	98.6	1.8
Mahaweli Complex					
Kotmale	201	Kotmale Reservoir	172.6	528.6	9.8
Nilambe	3.2	-	-	12.3	0.2
Ukuwela	40	Polgolla Barrage	-	170.3	3.2
Bowatenna	40	Bowatenna Reservoir	49.9	59.5	1.1
Victoria	210	Victoria Reservoir	721.2	908.9	16.9
Randenigala	122.6	Randenigala Reservoir	875	421.3	7.8
Rantembe	49	Rantembe Pond	21	199.2	3.7
Upper Kotmale	150	Upper Kotmale	0.8	507.1	9.4
Other Hydro Complex					
Inginiyagala	11.25	Inginiyagala Reservoir	-	17.6	0.3
Uda Walawa	6	Uda Walawa	-	16.4	0.3
Samanalawewa	120	Samanalawewa Reservoir	278	327.9	6.1
Kukule Ganga	70	-	-	373.5	6.9
Total	**1,397**	**-**	-	**5,382.7**	**100.0**

By the end of 2022, a total of eighteen hydro power plants were in operation under the ownership of CEB.

4.1.1.2 Thermal Power

There are seven oil-fired thermal power plants and three coal-fired plants that operate under the CEB, whereas five IPPs operate in private capacity.

Table 4.3 summarises thermal power generation in 2022.

Table 4.3 - Installed Capacities and Generation of Thermal Power Plants

Name of Power Station	Technology Type	Fuel Type	Capacity (MW)	Gross Generation (GWh)	Share in Generation (%)
CEB					
Kelanitissa Power Station	Gas Turbine (stg 2)	Auti Diesel	115	77.5	0.9
Kelanitissa Power Station	Gas Turbine (stg 3)	Auto Diesel	80	10.9	0.1
Sapugaskanda Power Station	Diesel Engine	Auto Diesel	80	3.1	-
		HSFO 380 cst (FO 3500)		171.8	2.1
Sapugaskanda Power Station Extension	Diesel Engine	Auto Diesel	80	3.8	-
		HSFO 380 cst (FO 3500)		303.2	3.7
Small islands	Diesel Engine, RE	Auto Diesel, solar, wind	-	2.5	-
Kelanitissa Power Station	Combined Cycle	Auto Diesel	165	262.0	3.2
		Naphtha		171.8	2.1
Uthuru Janani	Diesel Engine	HSFO 180 cst (FO 1500)	24	85.4	1.0
Barge Mounted Power Plant	Diesel Engine	HSFO 180 cst (FO 1500)	60	247.4	3.0
Emergency Power	Diesel Engine	Auto Diesel	50	44.7	0.5
Puttalam Coal Power Station	Steam	Auto Diesel	900	2.7	-
		Coal		5,729.7	69.5
IPP					
Asia Power	Diesel Engine	HSFO 380 cst (FO 3500)	51	12.5	0.2
Ace Power Matara	Diesel Engine	HSFO 180 cst (FO 1500)	20	12.3	0.1
AES - Kelanitissa	Combined Cycle	Auto Diesel	163	281.6	3.4
Ace Power Embilipitiya	Diesel Engine	HSFO 180 cst (FO 1500)	100	37.5	0.5
Yugadhanavi-Kerawalapitiya	Combined Cycle	LSFO 180 cst	270	785.6	12.5
Total			**2,046**	**8,246.0**	**100.0**

The oil-fired CEB power plants generated 1,339.3 GWh, while the coal-fired power plant generated 5,732.4 GWh. The contribution of the coal power plant to thermal generation is 69.5%. The five IPPs generated 1,129.6 GWh in total.

4.1.1.3 CEB Wind Power

The Thambapavani Mannar wind power plant was in operation in 2022 as indicated in Table 4.4. It is owned and operated by the CEB.

Table 4.4 - Installed Capacity and Generation of the Mannar Wind Power Plant

Name of the Power Station	Plant Capacity (MW)	Generation in 2022 (GWh)
Wind Power - Mannar	103.5	361.9

4.1.1.4 New Renewable Energy

New Renewable Energy power plants are operated by private sector investors and the installed capacity is limited to 10 MW since the plants are non-dispatchable. At present, the number and variety of SPPs have increased by several folds, and is scattered countrywide. Table 4.5 summarises the installed capacities and generation of SPPs contributing to the NRE industry.

Table 4.5 - Installed Capacities and Generation of NRE Power Plants by end 2022

Type of Power Station	Number of Plants	Total Installed Capacity (MW)	Generation in 2022 (GWh)	Share in Generation (%)
Hydro	213	414.2	1,376.7	66.8
Combined heat and power	1	10.0	69.9	3.4
Biomass	13	40.1	47.2	2.3
Solar	78	130.4	190.3	9.2
Wind	17	148.5	375.9	18.2
Total	**322**	**743.1**	**2,060.1**	**100.0**

No SPP hydro power plants were commissioned in 2022. Only 21 SPP solar plants were commissioned in 2022, with an installed capacity of 30 MW. There were no other capacity additions from other types of NRE plants in 2022. Figure 4.2 depicts the cumulative capacity additions and number of SPPs up to end 2022.

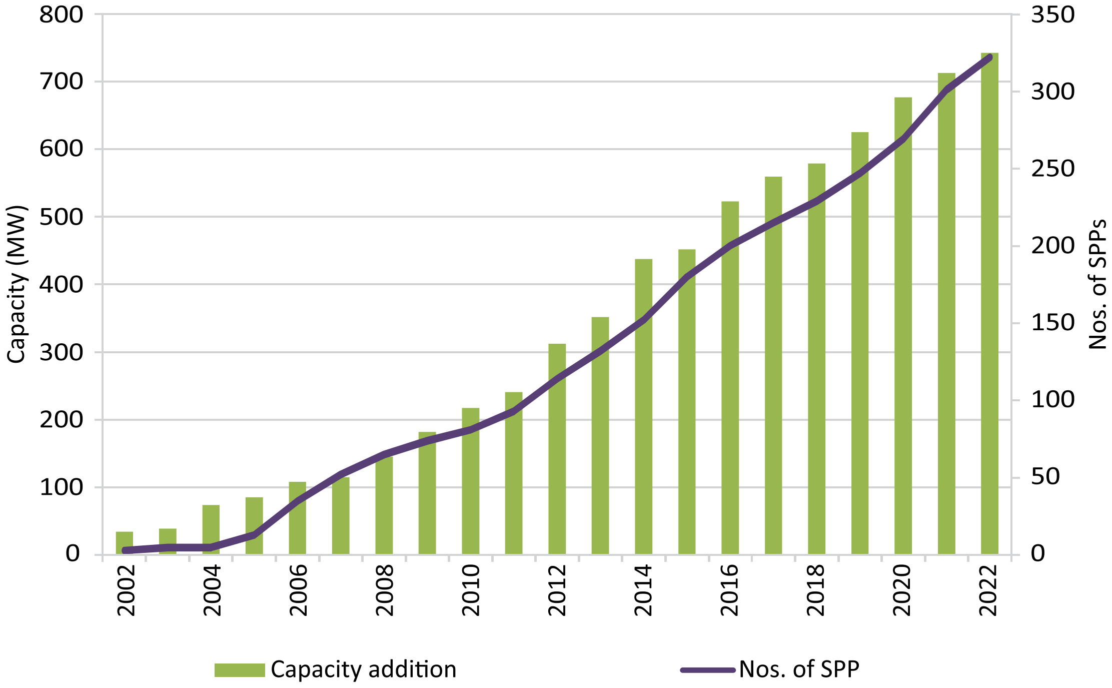

Figure 4.2 - Cumulative Capacity Additions and Number of SPPs

4.1.1.5 Micro Power Producers

By end 2022, 660 MW of µPP were in operation, generating approximately 777.7 GWh.

Table 4.6 - Cumulative Capacities and Generation of Net-metered Projects

Type of Net-metered Project	Number of Projects	Cumulative Capacity (MW)	Generation in 2022 (GWh)
Solar	45,845	660	777.7

4.1.2 Gross Generation of Grid Connected Power Plants

TThe total generation from major hydro plants, thermal plants, new renewable energy plants and net-metered project in 2022 was 16,828.5 GWh. Compared with the gross generation of 2021, which was 17,621.9 GWh, the generation in 2022 decreased as indicated in Table 4.7.

Table 4.7 - Gross Generation to the CEB Grid

GWh	2010	2015	2019	2020	2021	2022
Major Hydro	4,988.5	4,904.4	3,800.9	3,929.4	5,658.5	5,382.7
Thermal (Oil)	5,063.3	2,343.5	5,067.4	4,306.4	2,716.2	2,513.6
Thermal (Coal)	-	4,457.2	5,916.9	6,364.9	6,110.9	5,732.4
CEB Wind	3.0	1.1	-	7.7	325.9	361.9
New Renewable Energy	728.5	1,466.0	1,579.3	1,607.2	2,214.5	2,060.1
Micro Power Producers	-	38.8	305.2	445.9	592.4	777.7
Gross Generation to CEB Grid	**10,783.2**	**13,211.1**	**16,669.6**	**16,661.5**	**17,618.4**	**16,828.4**
Year-on-year growth rate	8.2%	2.9%	3.4%	(0.5%)	5.8%	(4.5%)

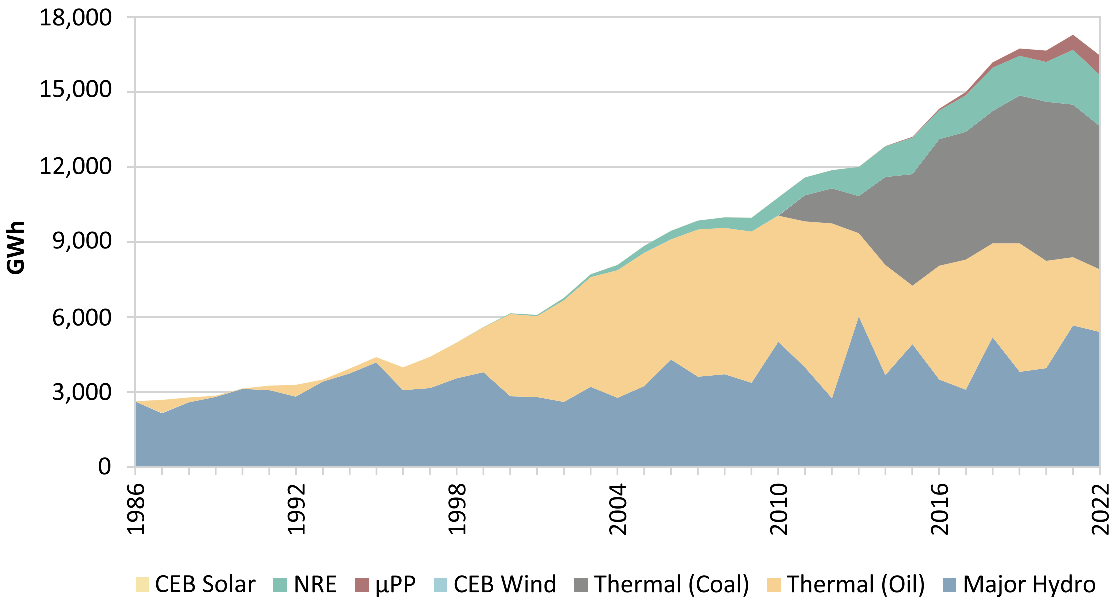

Figure 4.3 - Gross Generation to CEB Grid

In early stages, the energy mix included only major hydro plants and oil-fired thermal plants. The generation mix started diversifying from 1996 and the trend continues to date. At present however, the thermal share is dominant and it would continue to remain with the entry of coal power plants as base load generators.

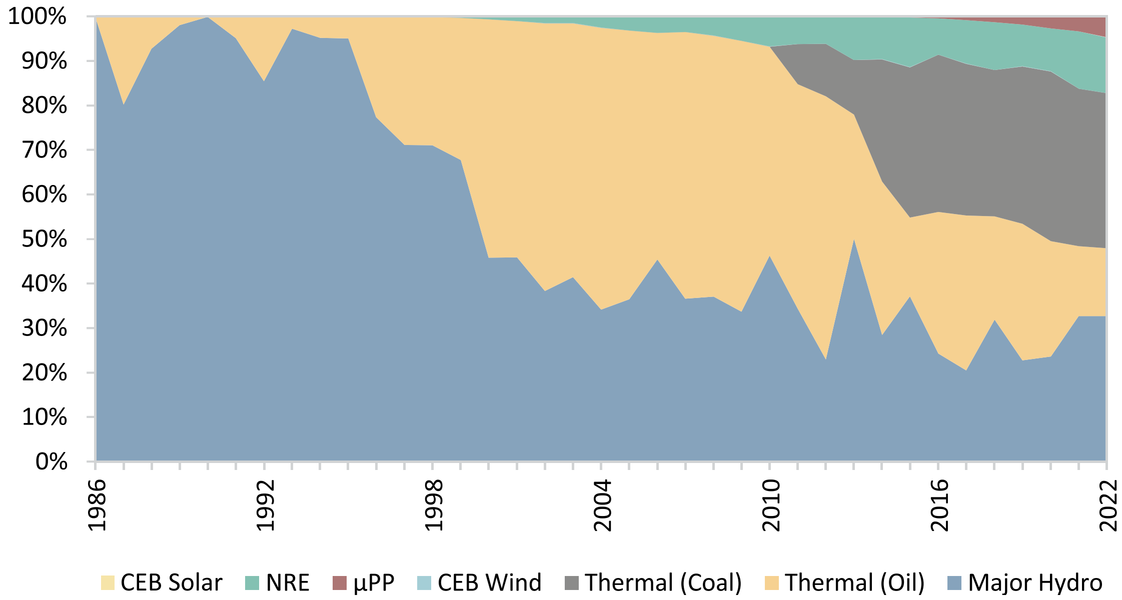

Figure 4.4 - Evolution of Generation Mix: 1985 to 2022

The NRE industry, which commenced in 1996 has progressed expeditiously, increasing in capacity each year. Figure 4.5 depicts the growth of the industry since inception to date.

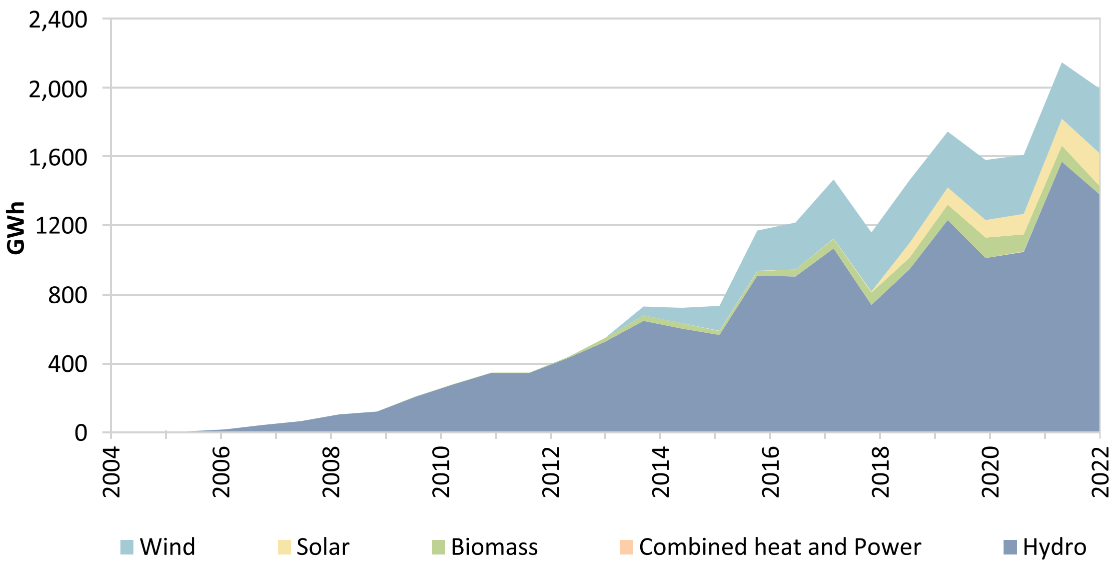

Figure 4.5 - Gross Generation of New Renewable Energy Power Plants

The share of NRE generation was 12.2% in the total gross generation to the CEB grid in 2022. The share of hydro power was low from 2018 – 2020, increased in 2021 but decreased again in 2022, as indicated in Figure 4.5.

4.1.3 Different Technologies used by Power Plants in the National Grid

Table 4.8 - Grid Connected Power Plant Capacities (MW) by Technology Type

Technology	2010	2015	2019	2020	2021	2022
CEB Power Plants						
Major Hydro	1,207	1,377	1,399	1,383	1,383	1,413
Conventional Wind	3	3	-	31	104	104
Steam, Fuel Oil	-	-	-	-	-	-
Steam, Coal	-	900	900	900	900	900
Sub total, Steam	**-**	**900**	**900**	**900**	**900**	**900**
Diesel Engine, Residual Oil	160	160	160	160	160	160
Diesel Engine, Fuel Oil	-	24	24	24	24	24
Diesel Engine, Diesel Oil	8	-	150	50	50	50
Sub total, Diesel Engines	**168**	**184**	**334**	**234**	**234**	**234**
Gas Turbines, Diesel Oil	215	195	195	195	195	195
Sub total, Gas Turbines	**215**	**195**	**195**	**195**	**195**	**195**
Combined Cycle, Naphtha, Diesel	165	165	165	165	165	165
Sub total, Combined Cycle	**165**	**165**	**165**	**165**	**165**	**165**
IPP						
Diesel Engine, Residual Oil	51	51	51	51	51	51
Diesel Engine, Fuel Oil	343	100	120	120	120	120
Diesel Engine, Diesel Oil	15	-	-	-	-	-
Combined Cycle, Diesel, Fuel Oil	433	433	433	433	433	433
Sub total IPP	**842**	**584**	**604**	**604**	**604**	**604**
SPP						
Hydro	175.4	306.7	399.6	402.9	414	414
Combined heat and power	-	-	-	10.0	10	10
Solar	-	1.4	57.4	75.4	100	130
Biomass	12.0	20.1	40.1	40.1	40	40
Wind	30	123.9	128.5	148.5	148	148
Sub total SPP	**218**	**452**	**626**	**677**	**713**	**743**
µPP						
Solar	-	27.7	283.8	353.6	516	660
Sub total µPP	**-**	**28**	**284**	**354**	**516**	**660**

Table 4.9 - Fuel Usage and Generation by Technology Type

Technology Type	2010	2015	2019	2020	2021	2022
CEB Gross Generation (GWh)						
Steam, Coal	-	4,447.2	5,910.2	6,358.9	6,107.4	5,729.7
Steam, Diesel	-	10.0	6.7	6.0	3.6	2.7
Diesel Engine, Residual Oil	830.9	271.9	630.3	759.9	585.3	475.0
Diesel Engine, Fuel Oil	-	228.4	473.3	525.0	410.6	332.8
Diesel Engine, Diesel	16.8	22.5	212.6	174.4	60.1	54.0
Gas Turbines, Diesel Oil	53.3	25.1	326.5	133.9	90.7	88.4
Combined Cycle, Diesel Oil	255.7	119.5	103.5	-	63.3	262.0
Combined Cycle, Naphtha	237.6	540.3	590.7	-	73.0	171.8
CEB Fuel Use (million litres)						
Steam, Coal (million kg)	-	1,880.0	2,208.9	2,349.3	2,301.3	2,143.2
Steam, Diesel	-	3.0	3.4	2.9	2.7	2.0
Diesel Engine, Residual Oil	184.9	60.6	140.7	169.4	130.5	105.2
Diesel Engine, Fuel Oil	-	19.3	102.5	113.2	88.5	71.2
Diesel Engine, Diesel	5.3	6.7	62.0	50.9	21.3	15.6
Gas Turbines, Diesel Oil	21.6	9.2	119.3	50.1	33.8	32.0
Combined Cycle, Diesel Oil	59.3	26.7	24.0	-	16.6	58.8
Combined Cycle, Naphtha	78.0	144.7	174.4	-	22.5	45.9
IPP Gross Generation (GWh)						
Diesel Engine, Residual Oil	325.0	101.1	74.0	169.8	65.0	12.5
Diesel Engine, Fuel Oil	2,245.1	235.5	534.9	587.1	205.9	49.8
Diesel Engine, Fuel Oil (LSFO 180 cst)	87.8	-	-	-	-	-
Diesel Engine, Diesel Oil	-	-	-	-	-	-
Combined Cycle, Diesel Oil	464.1	264.0	814.8	441.9	275.2	576.3
Combined Cycle, Fuel Oil (LSFO 180 cst)	547.1	671.4	1,385.9	1,514.5	890.7	491.0
Combined Cycle, Fuel Oil (HSFO 180 cst)	-	-	-	-	-	-
IPP Gross Fuel Use (million litres)						
Diesel Engine, Residual Oil	72.6	23.0	18.4	38.8	14.2	2.7
Diesel Engine, Fuel Oil	490.7	51.5	119.8	130.5	42.8	11.6
Diesel Engine, Diesel Oil	24.9	-	-	-	0.2	-
Combined Cycle, Diesel Oil	99.1	56.0	181.8	92.9	69.5	115.0
Combined Cycle, Fuel Oil (LSFO 180 cst)	120.5	152.3	291.7	328.9	199.8	109.1

4.1.4 Fuel Usage and Conversion Efficiency in Thermal Power Generation

Thermal power plants operating in Sri Lanka primarily use petroleum fuels such as diesel, fuel oil, residual oil and naphtha. Table 4.10 details the total quantities of common fuels used in power generation by thermal power plants.

Table 4.10 - Total Petroleum Fuels Used in Power Generation

	2010	2015	2019	2020	2021	2022
Fuel Oil (HSFO 180 CST, FO 1500) (million litres)	490.7	70.8	222.4	243.8	131.3	82.8
Coal (million kg)	-	1,880.0	2,208.9	2,349.3	2,301.3	2,143.2
Residual Oil (HSFO 380 CST, FO 3500) (million litres)	257.5	83.6	159.1	208.2	144.7	107.9
Diesel (million litres)	210.2	98.6	387.1	193.8	141.4	221.3
LSFO 180 CST (million litres)	120.5	152.3	291.7	328.9	199.8	109.1
Naphtha (million litres)	78.0	144.7	174.4	-	22.5	45.9

The consumption of liquid petroleum fuels for all fuels, but diesel and naphtha, had decreased in 2022. The major share of thermal power generation was borne by coal power. At present, the types of fuel used in power generation have increased in variety, owing to the large share of thermal power, as shown in Figure 4.6. Liquid fuels have been converted into corresponding weights at 30^0C (ambient temperature).

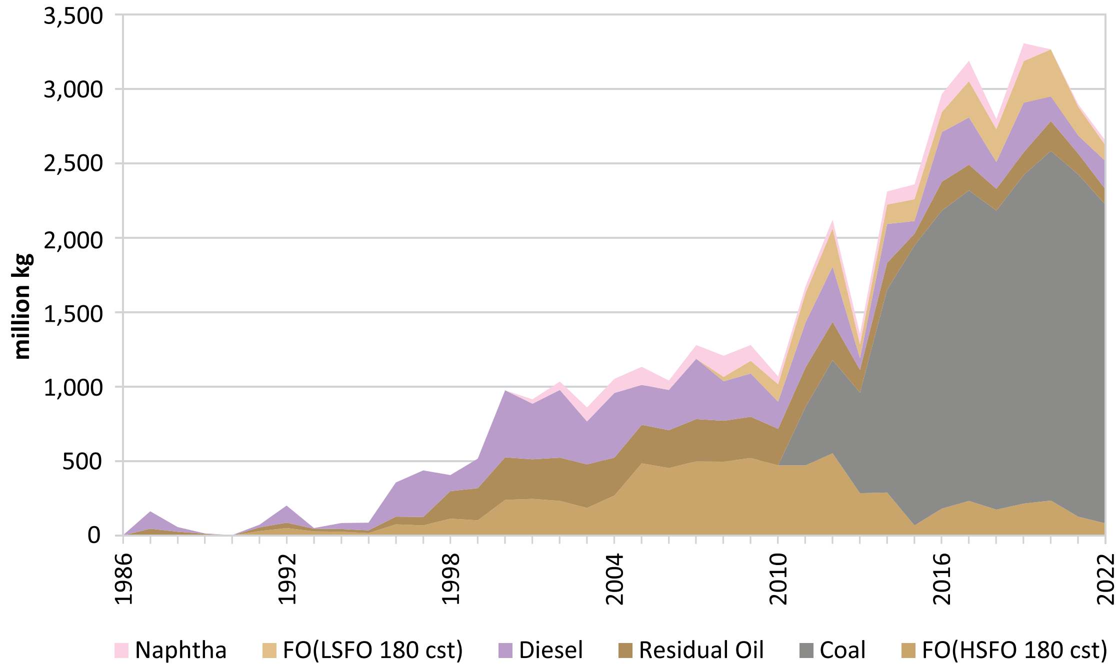

Figure 4.6 - Fuel Consumption in Thermal Power Generation by Type

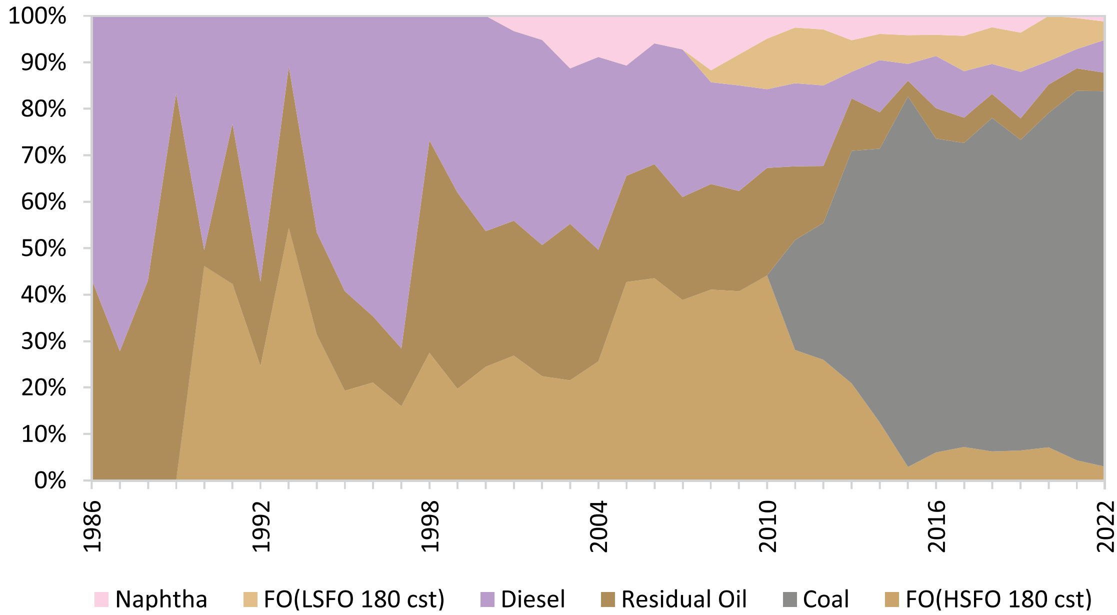

Figure 4.7 - Percentages of Fuel Mix in Thermal Power Generation

Table 4.11 summarises the efficiencies of thermal power plants by technology type.

Table 4.11 – Thermal Power Plant Efficiencies

Power Plant Efficiencies	2010	2015	2019	2020	2021	2022
CEB						
Steam, Coal	-	35.5%	40.1%	40.6%	39.8%	40.1%
Steam, Diesel	-	31.4%	18.5%	19.5%	12.4%	12.6%
Diesel Engine, Residual Oil	39.5%	39.4%	39.3%	39.4%	39.4%	39.7%
Diesel Engine, Fuel Oil	-	40.5%	40.5%	40.7%	40.8%	41.1%
Diesel Engine, Diesel	29.8%	31.9%	32.5%	32.5%	26.7%	32.9%
Gas Turbines, Diesel Oil	23.4%	25.8%	26.0%	25.4%	25.4%	26.2%
Combined Cycle, Diesel Oil	40.9%	42.5%	40.8%	-	36.2%	42.3%
Combined Cycle, Naphtha	33.7%	41.3%	37.5%	-	35.9%	41.5%
CEB Gross Thermal Generation (Gcal)	1,199,040	4,871,737	7,098,249	6,843,975	6,358,741	6,120,109
CEB Fuel Energy Input (Gcal)	3,198,724	13,370,308	18,266,560	17,156,043	16,166,862	15,338,988
CEB Power Plant Efficiency	**37.5%**	**36.4%**	**38.9%**	**39.9%**	**39.3%**	**39.9%**
IPP						
Diesel Engine, Residual Oil	39.3%	38.6%	35.3%	38.4%	40.1%	40.3%
Diesel Engine, Fuel Oil	40.2%	40.2%	39.2%	39.5%	42.2%	37.8%
Diesel Engine, Diesel Oil	33.4%	-	-	-	-	-
Combined Cycle, Diesel Oil	44.4%	44.7%	42.5%	45.1%	37.5%	47.5%
Combined Cycle, Fuel Oil (LSFO 180 cst)	0.40	38.4%	41.3%	40.1%	38.8%	39.1%
Combined Cycle, Fuel Oil (HSFO 180 cst)	-	-	-	-	-	-
IPP Net Thermal Generation (Gcal)	2,684,904	516,533	1,224,343	1,030,934	469,631	549,212
IPP Fuel Energy Input (Gcal)	6,639,385	1,237,795	3,002,410	2,500,356	1,191,159	1,183,717
IPP Power Plant Efficiency	**40.4%**	**41.7%**	**40.8%**	**41.2%**	**39.4%**	**46.4%**

4.2 Off-Grid Electricity Generation

Isolated power generating facilities are available in some locations owing mainly to the unavailability of the national grid. In addition, standby power supplies are also available in most industries and commercial facilities, although their generation is very minimal due to the short-term nature of operation. The capacities and energy converted at these standby generators are not accounted for in this report.

Three main contexts in which off-grid electricity is used are as follows.

(i) Diesel generators are maintained only as a standby option and run only for short durations during grid failures, periodic testing and during generator servicing.

(ii) Renewable energy systems, such as small hydro (for industries and households), wind and solar photovoltaic systems for households are also operated off-grid due to unavailability of grid and technical reasons.

(iii) Four Northern islands which were provided with diesel generators, received utility level services from the CEB, were considered for hybrid solutions and the first island the Eluvaithivu Island operated successfully in 2022. The ADB funded project to electrify the three remaining islands with hybrid power was cancelled due to an administrative issue and the island continued with diesel plants in 2022.

The non-conventional off grid energy systems such as village and estate hydro plants and household solar photovoltaic systems are discussed separately in this report. Off-Grid generation broadly comprises the following genre.

(i) Self-Generation: Using own generating plants, even if the grid is available. Only a few locations, and they too are used sparingly.

(ii) Off-grid (Industrial): Industries using their own generation either as a matter of policy, keeping the grid supply only as backup or owing to non-availability of the grid in close proximity. Only a few locations, and they too are used sparingly.

(iii) Off-grid (non-industrial): Mostly rural systems of small micro hydro, wind, solar and other renewable energy based systems.

With the rapid expansion of the national grid, the role of off-grid electrification ceased in the country, except in certain inaccessible locations. The advent of energy storage solutions coupled with solar PV power generation now offers cost effective solutions to electrify far corners of the country. In time to come, rooftop solar PV/ESS solutions may become a serious contender for electrifying not only remote villages but also urban dwellings.

4.3 Total Generation

The bulk of electricity generation in Sri Lanka is from grid-connected power plants. Table 4 11 gives the summary of electricity generation from grid-based and off-grid, conventional and non-conventional sources.

Table 4.12 – Total Gross Generation in Sri Lanka

GWh	2010	2015	2019	2020	2021	2022
Major Hydro Power	4,988.5	4,904.4	3,800.9	3,929.4	5,658.5	5,382.7
Thermal Power	5,063.3	6,796.4	11,063.4	10,671.4	8,830.7	8,246.0
CEB Wind Power	3.0	1.1	-	7.7	325.9	362.0
New Renewable Energy	728.5	1,466.0	1,579.3	1,607.2	2,214.5	2,060.1
Micro Power Producers	-	38.8	305.2	445.9	592.4	777.7
Off-grid Non-Conventional (Off-grid Renewables)	17.5	18.8	-	-	-	-
Gross Generation	**10,800.7**	**13,225.5**	**16,748.7**	**16,663.6**	**17,621.9**	**16,828.5**
%						
Major Hydro Power	46.2	37.1	22.7	23.6	32.1	32.0
Thermal Power	46.9	51.4	66.1	64.1	50.1	49.0
CEB Wind Power	-	0.01	-	0.05	1.8	2.2
New Renewable Energy	6.7	11.1	9.4	9.6	12.6	12.2
Micro Power Producers	-	0.3	1.8	2.7	3.4	4.6
Off-grid Non-Conventional (Off-grid Renewables)	0.2	0.1	-	-	-	-

5 Energy Distribution and Pricing

Energy sources and energy demand are separated by vast swaths of time and space. Therefore, to provide a sound energy supply, vast transport/transmission network, storage and transaction elements are required. The supply of energy includes generation/conversion and distribution to end users. Distribution is the process of delivering energy from its source to the ultimate end use. For convenience, the terminal points of distribution are considered to be from the measuring point at generation/conversion to the measuring point at the end user.

5.1 Electricity Distribution and Prices

Distribution of electrical energy is through the transmission and distribution network, the main difference between the two being the voltage at which the power is delivered. Transmission is at voltages 132 kV and 220 kV, whereas distribution is done at 33 kV, 11 kV and 400V.

5.1.1 Transmission and Distribution Networks

5.1.1.1 Electricity Transmission Network

Sri Lanka has a single transmission network spanning the whole country with the exception of four small inhabited islands in the Northern Province. The national grid consists of overhead transmission lines interconnecting large scale power plants scattered mostly in the central region and the Western province, and grid substations where the distribution networks spread from. Apart from the most common transmission lines carrying power at 132 kV, a limited number of 220 kV transmission lines are also available in the network. These 220 kV transmission lines strengthen the network, especially between nodes having heavy power flows, such as Kotmale-Biyagama and Kotmale-Anuradhapura.

5.1.1.2 Electricity Distribution Network

Electricity distribution and sales in Sri Lanka is the responsibility of the following organisations;

- Ceylon Electricity Board (CEB)
- Lanka Electricity Company (Pvt) Ltd. (LECO)

At grid substations, the high voltage electricity in the transmission network is converted to 33 kV to be distributed within the locality. In some instances, the electricity at 33 kV is again converted to 11 kV at primary substations and then distributed to consumers. Distribution networks operated by LECO use 11 kV as the distribution voltage. However, both CEB and LECO step down the distribution voltage again to 400 V prior to delivering power to small scale consumers such as households and commercial buildings. For a limited number of industrial and commercial establishments, electricity is provided and metered at the distribution voltage itself. The distribution responsibility ends at the consumer metering point up to which the maintenance work is carried out by the corresponding service provider (*i.e.* CEB or LECO).

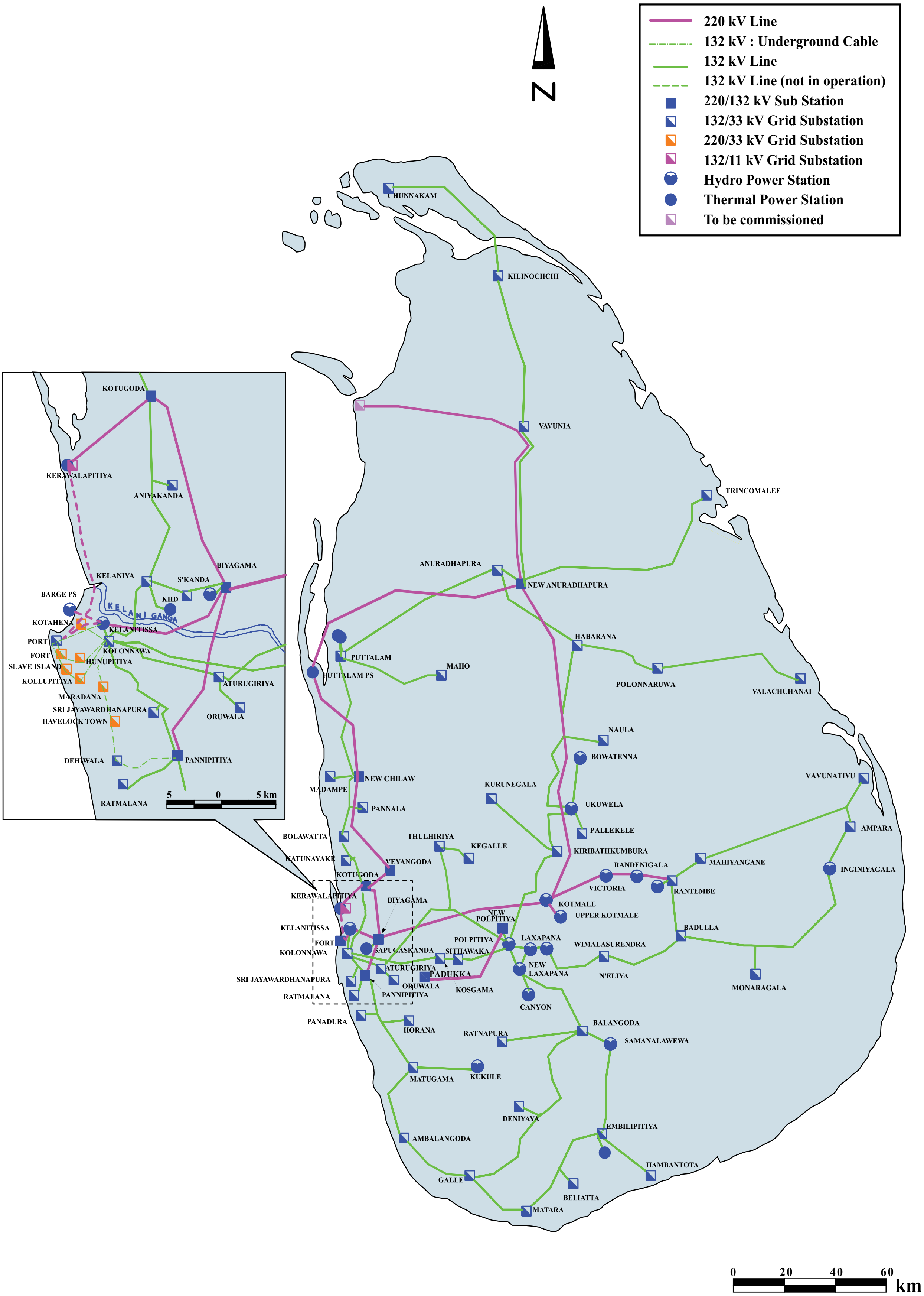

Figure 5.1 – Electricity Transmission Network (2022)

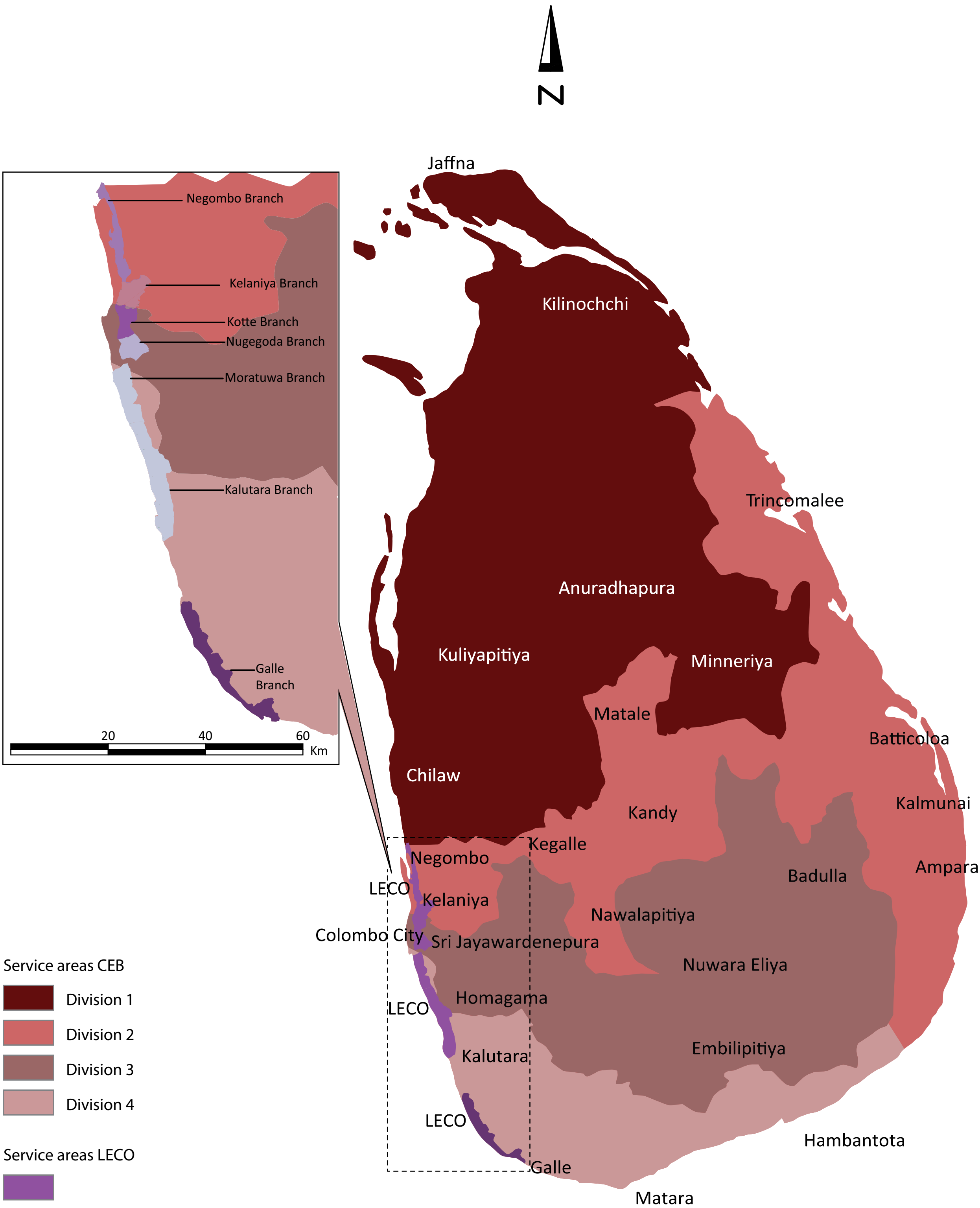

Figure 5.2 – Service Areas of the CEB and LECO

5.1.2 Electrification

All the categories of grid electricity consumers increased in number in 2022. Although a new category was introduced for Agriculture in 2019, no consumers were reported for 2020 and 2022. While Table 5.1 shows the number of electricity consumers in the grid, Table 5.2 shows the share of electricity consumers of CEB and LECO separately.

Table 5.1 – Electricity Consumers Served by the Grid

Total Number of Consumer Accounts	2010	2015	2019	2020	2021	2022
Domestic	4,363,324	5,407,644	6,123,875	6,243,246	6,374,253	6,477,322
Religious	29,050	37,201	43,335	44,491	45,325	45,922
Industrial	48,461	59,820	67,327	70,250	73,013	72,250
Commercial	514,292	666,475	831,304	875,343	921,695	953,201
Agriculture	-	-	56	-	-	-
Streetlighting	2,931	3,065	2,993	3,664	3,676	3,788
Total	**4,958,058**	**6,174,205**	**7,068,890**	**7,236,994**	**7,417,962**	**7,552,483**

The number of total accounts served by the grid has increased by 2% in 2022 compared with 2021.

Table 5.2 – Electricity Consumers in the Grid, CEB and LECO

Total Number of Consumer Accounts	2010	2015	2019	2020	2021	2022
CEB						
Domestic	3,958,829	4,966,395	5,651,452	5,750,281	5,875,558	5,970,326
Religious	26,763	34,710	40,724	41,805	42,638	43,199
Industrial	45,059	56,681	64,241	66,831	69,600	68,815
Commercial	449,733	590,344	744,166	777,347	821,730	851,626
Agriculture	-	-	56	-	-	-
Streetlighting	1	1	1	1	1	1
Sub total CEB	**4,480,385**	**5,648,131**	**6,500,640**	**6,636,265**	**6,809,527**	**6,933,967**
LECO						
Domestic	404,495	441,249	472,423	492,965	498,695	506,996
Religious	2,287	2,491	2,611	2,686	2,687	2,723
Industrial	3,402	3,139	3,086	3,419	3,413	3,435
Commercial	64,559	76,131	87,138	97,996	99,965	101,575

Total Number of Consumer Accounts	2010	2015	2019	2020	2021	2022
Streetlighting	2,930	3,064	2,992	3,663	3,675	3,787
Sub total LECO	**477,673**	**526,074**	**568,250**	**600,729**	**608,435**	**618,516**

Note: CEB considers street lighting as one account, while LECO counts the street lighting systems individually as separate accounts.

The total number of accounts of the CEB increased by 3%, while the number of accounts of the LECO increased by 1% in 2022.

5.1.3 Electricity prices

A major role in electricity generation is played by the CEB while the IPPs and the SPPs play supportive roles. Unlike generation, CEB has a monopoly over electricity transmission. The distribution business is shared by CEB and LECO. Hence, the role of the CEB in the electricity industry in Sri Lanka is significant. As a result, analysis of the electricity sector financial performance is dominated by its main player; the CEB. Being a subsidiary of CEB and having a key presence in electricity sales, LECO financial performance is also important. Table 5.3 shows the sales and revenue of the two electricity utilities CEB and LECO, their annual revenue and average selling prices.

Table 5.3 – Average Electricity Sales, Selling Prices and Revenue of CEB and LECO

	2010	2015	2019	2020	2021	2022
CEB						
Sales (GWh)	8,067	10,340	12,927	12,682	13,581	12,968
Revenue from sales (LKRM)	105,710	165,741	215,231	213,194	226,172	278,360
Other Revenue (LKRM)	3,063	9,679	12,058	10,155	12,975	12,975
Total revenue (LKRM)	108,773	175,420	227,289	223,349	239,147	291,335
Average Selling price (LKR/kWh)	13.10	16.03	16.65	16.81	16.65	21.47
LECO						
Sales (GWh)	1,124.00	1,382.15	1,646.66	1,607.04	1,598.93	1,565.70
Revenue from sales (LKRM)	14,035.00	26,193.59	32,459.00	32,369.77	36,664.62	39,252.20
Total revenue (LKRM)	14,035.00	26,193.59	32,459.00	32,369.77	36,664.62	39,252.20
Average Selling price (LKR/kWh)	12.49	18.95	19.71	20.14	22.93	25.07

The national average selling price of electricity is given in Table 5.4 and the growth of the price is depicted in Figure 5.3.

Table 5.4 – National Average Selling Price of Electricity

	2010	2015	2019	2020	2021	2022
Average Selling price (LKR/kWh)	13.03	16.37	17.00	17.19	17.03	21.85

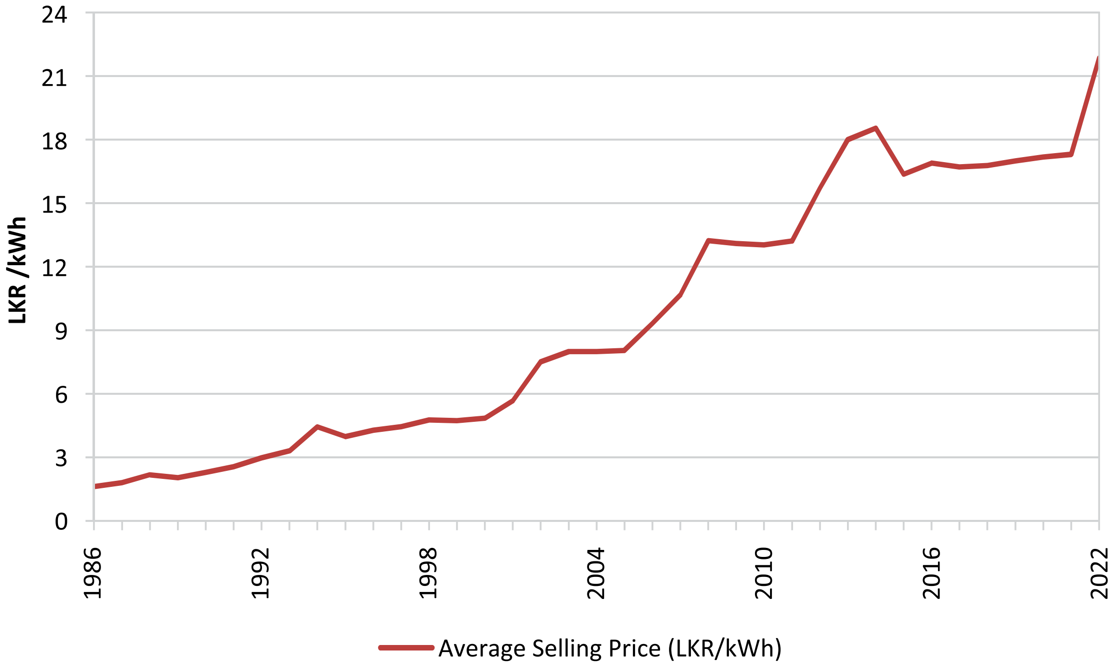

Figure 5.3 – National Average Selling Price of Electricity

The average selling price of electricity per kWh depends on the tariff structure and the sales to different consumer categories.

5.1.4 Electricity Tariff

As illustrated in Figure 5.3, the average selling price of an electricity unit in Sri Lanka increased over the time. The utilities reported that a total of 529 customers migrated to the Time of Use (ToU) tariff offered to encourage at specific electricity use, as the peak time tariff was quite high. Nevertheless, this offer will continue to benefit electric vehicle users in future.

Table 5.5 – Electricity Prices in Year 2022

Effective dates: August 10, 2022 – all categories except Hotel/EV Charging category

August 10, 2022 – 50% of increase for Hotel category

November 10, 2022 – Remaining 50% increase for Hotels

October 1, 2022 – EV Charging at CEB Charging Stations

Domestic

Consumption 0 - 60 kWh per month			Energy charge (LKR/kWh)	Fixed charge (LKR/kWh)
Block 1	-	0 - 30	8.00	120.00
Block 2	-	31 - 60	10.00	240.00
Consumption above 60 kWh per month				
Block 1	-	0 - 60	16.00	N/A
Block 2	-	61 - 90	16.00	360.00
Block 3	-	91 - 120	50.00	960.00
Block 4	-	121 - 180		
Block 5	-	above 180	75.00	1500.00
Optional Time of Use (ToU) Electricity Tariff for Domestic Consumers				
Day (05.30 - 18.30 hrs)			70.00	1500.00
Peak (18.30 - 22.30 hrs)			90.00	
Off peak (22.30 - 05.30 hrs)			30.00	
Religious and charitable institutions				
Consumption 0 - 180 kWh per month				
Block 1	-	0 - 30	8.00	90.00
Block 2	-	31 - 90	15.00	120.00
Block 3	-	91 - 120	20.00	120.00
Block 4	-	121 - 180	30.00	450.00
Consumption above 180 kWh per month				
For the whole consumption			32.00	1500.00

Other Customer Categories			Industrial		General purpose / hotel / Government	
Volume differentiated monthly consumption			IP 1 - 1	IP 1 -2	GP 1-1/ H 1-1/ GV 1-1	GP 1-1/ H 1-1/ GV 1-2
Rate 1 Supply at 400/230 V Contract demand less than or equal to 42 kVA			**For <=300 kWh/month**	**For >300 kWh/month**	**For <=180 kWh/month**	**For >180 kWh/month**
	Energy charge (LKR/kWh)		20.00	20.00	25.00	32.00
	Fixed charge (LKR/month)		960.00	1,500.00	360.00	1,500.00
Rate 2 Supply at 400/230 V Contract demand above 42 kVA	Energy charge (LKR/kWh)	Day (05.30 - 18.30 hrs)	29.00			
		Peak (18.30 - 22.30 hrs)	34.50			
		Off peak (22.30 - 05.30 hrs)	15.00			
	Demand charge (LKR/kVA)		1,500.00			
	Fixed charge (LKR/month)		4,000.00			
Rate 3 Supply at 11 kV and above	Energy charge (LKR/kWh)	Day (05.30 - 18.30 hrs)	28.00			
		Peak (18.30 - 22.30 hrs)	34.00			
		Off peak (22.30 - 05.30 hrs)	14.00			
	Demand charge (LKR/kVA)		1,400.00			
	Fixed charge (LKR/month)		4,000.00			
Street lighting (LKR/kWh)			22.00			

Electric vehicle charging rates at CEB charging stations

Time of Use (ToU)	DC Fast Charging (LKR/kWh)	Level 2 AC Charging (LKR/kWh)
Day (05.30 - 18.30 hrs)	81.00	70.00
Peak (18.30 - 22.30 hrs)	105.00	90.00
Off peak (22.30 - 05.30 hrs)	50.00	30.00

Agriculture - Optional Time of Use Electricity Tariff		Energy charge (LKR/kWh)	Fixed Charge (LKR/month)
Rate 1 Supply at 400/230 V Contract demand less than or equal to 42 kVA	Day (05.30 - 18.30 hrs)	20.00	1,500.00
	Peak (18.30 - 22.30 hrs)	35.00	
	Off peak (22.30 - 05.30 hrs)	15.00	

Note: 1. No Fuel adjustment charge is applicable for the above Tariff Structure.
2. Tariff for Religious & Charitable Institutions is not revised.

5.2 Petroleum Distribution and Prices

As described previously, Sri Lanka meets the country petroleum demand entirely by imported petroleum brought in as either crude oil or refined products. Since the processing capacity of the CPC-owned refinery is not sufficient to meet the country demand, considerable amounts of petroleum products have to be imported and directly sold in the local market.

5.2.1 Distribution Structure

Until 2002, CPC was responsible for all aspects of petroleum supply, with the exception of retail marketing of LPG. By 2002, CPC owned and operated the refinery, all the import, storage and distribution terminals, and about 350 filling stations. In addition, there were about 700 privately-owned filling stations.

The refinery located in Sapugaskanda consists of 50,000 barrels/day processing plant and a 540,000 tonne crude oil tank farm. The refinery gets crude oil either directly from the Single Point Buoy Mooring (SPBM) facility installed about 10 km offshore or from the four crude oil storage tanks of 40,000 tonnes (each), located in Orugodawatta. Part of the refinery output is stored at Sapugaskanda storage facility for distribution and the balance is pumped to the Kolonnawa storage facility. The Sapugaskanda tank farm (mini-distribution facility) receives products only from the refinery. This has a total storage capacity of 60,000 tonnes in twelve tanks for diesel, kerosene and fuel oil.

Refined products from the refinery as well as imported products are received via a 5.5 km long pipeline to tanks at Kolonnawa. This aging pipeline transport system will be improved through a new pipeline installation by 2018. The Kolonnawa installation has a total capacity of 250,000 tonnes in 40 tanks for finished products and product loading facilities for loading railway bogies, which transport products to most of the bulk depots and to road tankers. Construction of a new tank with a capacity of 15,000 m^3 to cater to the increased gasoline demand commenced in late 2017, adding more capacity to Kolonnawa facility. Aviation fuel to the Katunayake airport is supplied from the Kolonnawa terminal through rail and road tankers.

The Muthurajawela tank farm commenced operations in 2004. With the construction of this tank farm, Sri Lanka's storage capacity for finished petroleum products increased by 250,000 tonnes. Muthurajawela tank farm consists of 21 tanks of 10,000 m^3 capacity and 8 tanks of 5,000 m^3 capacity. These tanks store and distribute diesel and kerosene. Along with the tanks, CPC installed a new SPBM system, where 60,000 DWT (deadweight tonnage) ships could use the buoy for discharging imported finished products direct from sea to tanks via a submarine pipeline. This terminal includes a loading facility to distribute products by road tankers. However, rail transportation of petroleum products stored in the Muthurajawela tank farm is constrained due to the absence of a railway line. A dual pipeline transport systems named the 'cross country pipeline' with a length of 6.5 km is expected to link Muthurajawela tank farm with the Supugaskanda facility in the near future.

Petroleum supply for retail sale is done at the following storage/distribution facilities

1. Muthurajawela
2. Kolonnawa
3. Sapugaskanda mini distribution facility
4. China Bay storage facility
5. 13 regional depots.

Of the thirteen regional depots, Kurunagala depot added a new fire pump house and a distribution gantry to its assets in 2017, expanding its capabilities further.

Lanka Marine Services (LMS) located at Bloemandhal in Colombo receives imported products directly as well as from the Kolonnawa terminal via pipelines, and provides bunker fuel to ships via pipelines connected to Dolphin pier and also from South jetty. LMS terminal has a storage capacity of 23,000 tonnes of fuel oil and 6,800 tonnes of diesel.

Some amount of LPG is produced at the CPC refinery for local consumption. However, most of the country's LPG requirement is met through direct imports. LPG is imported through the Colombo Port, and also via a conventional buoy mooring system (CBM) for Litro Gas Lanka Limited facilities at Muthurajawela.

Residual oil (heavy furnace oil) is transferred directly from the refinery to the 160 MW Sapugaskanda power plant owned by the CEB and to the 51 MW residual oil power plant owned by Asia Power to produce electricity for the national grid. The refinery LPG production is delivered to the private distributor by means of road tankers and then filled into bottles for onward distribution to consumers.

As previously explained in this report, Sri Lanka meets all its petroleum demand by imported petroleum brought in as crude oil or refined products. Since the refining capacity of the CPC-owned refinery is not sufficient to meet the country demand, considerable amounts of petroleum products have to be imported and directly sold in the local market. Whether locally refined or directly imported, petroleum is channelled through the same distribution network which consists of several tank farms located in Kolonnawa, Sapugaskanda and Trincomalee and the local depots and the distribution stations (filling stations) spread all around the country.

5.2.2 Petroleum Prices

5.2.2.1 Prices of Crude Oil and Imported Finished Products

Crude oil imports decreased further in 2022 compared with 2020 as shown in Table 5.6.

Table 5.6 – Costs of Crude Oil Imports

Crude Oil Import Price Movements (F.O.B, Freight and C&F)	2010	2015	2019	2020	2021	2022
Quantity (kt)	1,819.43	1,676.76	1,842.74	1,667.00	1,130.00	743.60
Quantity (million bbl)	13.38	13.00	14.11	12.77	8.66	5.70
Crude Oil Import Unit Price (USD/bbl)						
F.O.B. Price	78.27	-	-	-	-	-
Freight Rate	0.97	-	-	-	-	-
C&F Price	79.24	105.38	68.80	45.66	62.06	100.08
Crude Oil Import Unit Price (LKR/bbl)						
F.O.B. Price	8,910.69	-	-	-	-	-
Freight	109.99	-	-	-	-	-
C & F Price	9,020.68	13,779.16	-	-	-	-

The import prices of finished petroleum products are shown in Table 5.7.

Table 5.7 – Finished Product Import Price Variation

Product Import Price Variation (F.O.B)	2010	2015	2019	2020	2021	2022
Mogas 92 Unl (USD/bbl)	86.23	71.147	73.93	50.91	80.05	106.30
Mogas 95 Unl (USD/bbl)	88.4	74.356	76.34	53.05	83.30	108.84
Naphtha (USD/bbl)	-	44.354	-	-	-	-
Kerosene (USD/bbl)	90.18	-	-	-	-	-
Gas Oil 0.05% S (USD/bbl)	90.35	68.491	80.64	50.49	76.86	131.60
Gas Oil 0.25% S (USD/bbl)	89.97	-	-	-	-	-
Gas Oil 0.5% S (USD/bbl)	89.55	68.269	-	-	-	-
Gas Oil 1.0% S (USD/bbl)	-	-	-	-	-	-
Gas Oil 0.001% S (USD/bbl)	-	-	82.85	56.06	78.37	132.32
FO 180Cst (USD/t)	470.28	-	-	-	-	624.69
FO 380Cst (USD/t)	462.59	-	-	-	-	-
LSFO (US$/t)	-	-	505.64	351.77	504.85	-
HSFO (US$/t)	-	-	483.86	408.41	509.56	-
LPG (USD/t)	714.46	-	-	-	-	-
Jet A-1 (USD/bbl)	-	69.66	80.29	63.12	83.45	124.09

5.2.2.2 Petroleum Product Prices in the Local Market

Table 5.8 summarises the price variations of locally sold petroleum products.

Table 5.8 – Price Variation of Locally Sold Petroleum Products (Colombo Spot)

Month	Petrol (LKR/l)		Kerosene (LKR/l)		Diesel (LKR/l)		Furnace Oil (LKR/l)		LPG LKR/kg	
	90 Oct	95 Oct	Industrial	Domestic	Super	Auto	800 sec	1500 sec	Litro	Laugfs
2021-end Price	140.19	164.65	102.81	70.03	133.86	105.04	83.65	82.35	140.10	125.90
2022 prices										
February 11										235.20
March 4										280.80
March 10										335.92
March 11	254.00	283.00		87.00	254.00	176.00	214.00	214.00		
March 22			160.00							
April 1									388.80	428.00
April 18	338.00	373.00			329.00	289.00				
April 22			305.00				289.00	289.00		
May 5										462.40
May 24	420.00	450.00	399.00		445.00	400.00	369.00	369.00		
Jun 3										548.00
Jun 26	470.00	550.00	464.00		520.00	460.00	419.00	419.00		
Jul 1									392.80	
Jul 17	450.00	540.00			510.00	440.00				
August 1						430.00				
August 17									373.12	464.00
August 21				340.00						
September 1									364.08	
October 2	410.00	510.00								
October 10									342.40	424.00
October 17	370.00					415.00	320.00	320.00		
November 1									348.80	
November 12				365.00		430.00	419.00	419.00		
December 1									368.80	
December 6						420.00	320.00	320.00		

Figure 5.4 depicts the historical price changes of common petroleum products. The price indicated in the graph is the weighted average of monthly price revisions for a given year. The price of LPG is the average price of both Litro and LAUGFS.

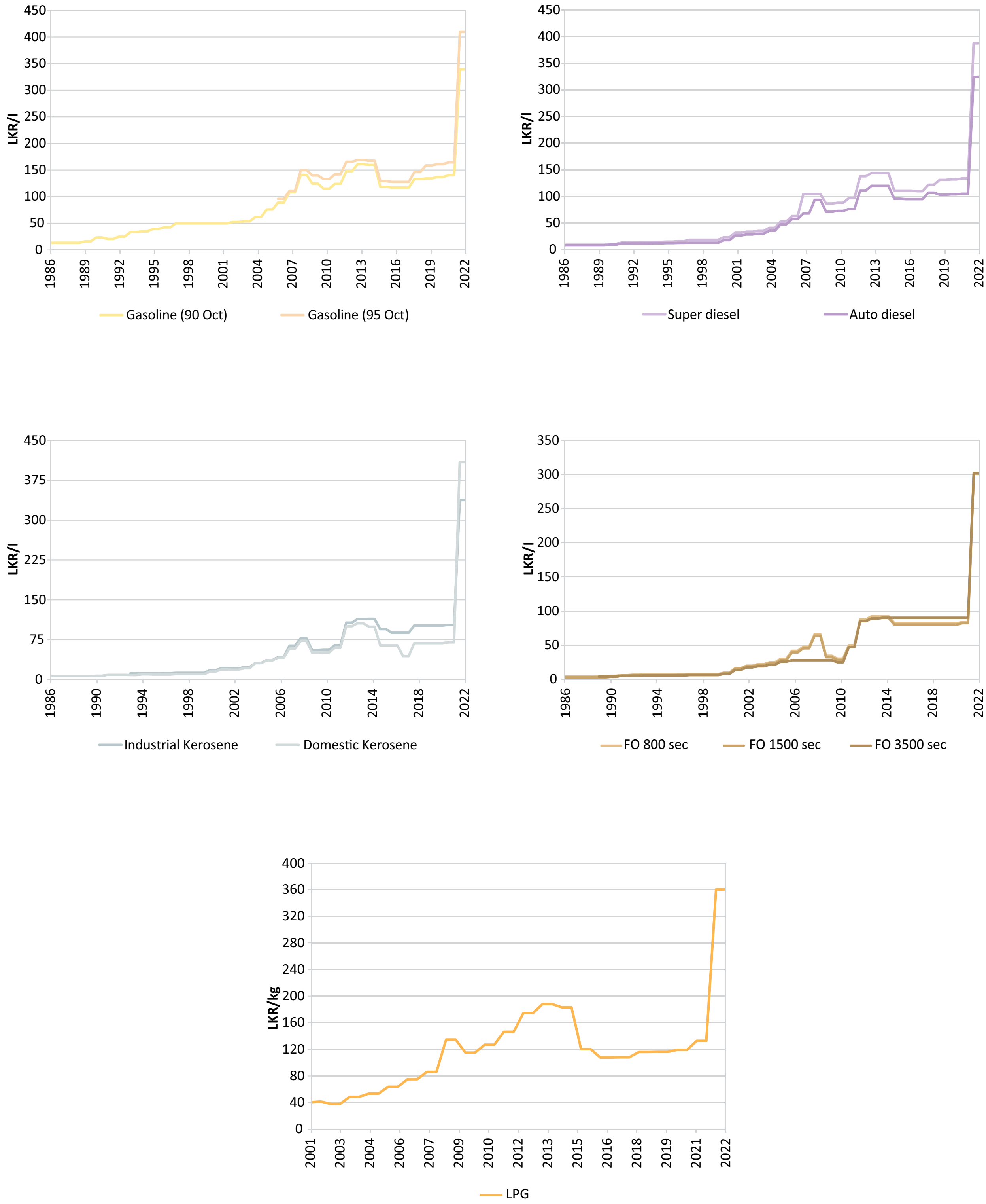

Figure 5.4 – Historical Price Variations of Petroleum Products

5.3 Coal Imports and Prices

The total quantities of coal imported are given in Table 5.9. Coal consumption has increased over time, with the commissioning of new coal power plants in 2014.

Table 5.9 – Coal Imports and Prices

	2015	2019	2020	2021	2022
Imported Qty (t)	1,881,462	2,388,617	2,543,582	2,204,413	1,707,000
Imported price (LKRM)	21,542	38,635	39,253	54,971	99,949
Price (LKR/kg)	11.45	16.17	15.43	24.94	58.55

5.4 Biomass Distribution and Prices

Biomass meets more than a third of the energy demand of the country. Abundant availability, especially in rural areas where the usage is most common, has simplified the distribution of biomass. The actual value of biomass is often misrepresented by its discounted price due to the simplified sourcing options. In terms of the cost of alternate fuels avoided, biomass has a significantly higher value to the economy.

With the increased household income levels, fuelwood used in cooking is reducing in volume. However, without a survey of the residential sector, the actual trends remain unreported. In contrast, with the advent of formal supply chains, biomass use in industrial thermal energy use is gaining rapid grounds, due to cost benefits. Table 5.10 gives the quantity of firewood produced and sold for industries.

Table 5.10 – Firewood Production and Sale for Industries

Firewood (m^3)	2010	2015	2019	2020	2021	2022
Quantity Produced	118,544	87,159	107,914	82,856	86,971	93,785
Quantity Sold	129,502	83,041	91,957	60,671	70,075	75,710

6 Energy Demand

Energy is a vital building block for economic growth, and energy demand provides vital signs for better management of an economy. Supply of energy discussed up to now is a direct consequence of the demand for energy, which is analysed in detail in this chapter. This chapter presents the analyses of energy demand from electricity, petroleum and biomass.

6.1 Electricity Demand

6.1.1 The System Demand

Electricity demand has two aspects. The first being the energy demand where the cumulative electrical energy requirement is met by the supply system. The peak demand is the other criterion to be fulfilled in meeting the national electricity demand. The generating system needs to be able to meet the peak demand of the national grid. Since the national demand profile has an evening peak, the capability of the supply system in meeting the demand during the evenings (*i.e.* peak period) is important. Figure 6-1 shows the hourly demand profiles of January 31, 2022, the day the system recorded the maximum peak.

In spite of being equipped with state of the art supervisory control and data acquisition (SCADA) systems, some of the newly connected wind and solar power plants are not reporting real time data to the system control centre. Accordingly, the demand estimates are continued to be based on monthly energy data provided by the small power producers.

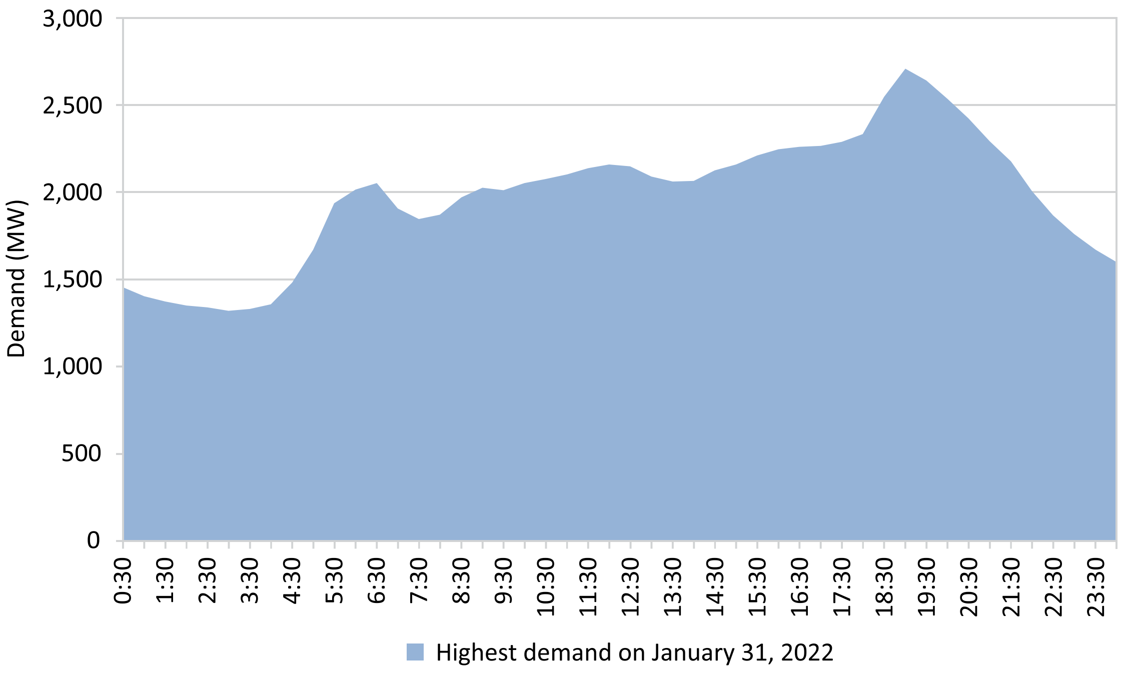

Figure 6.1 – System Demand Profile of 2022

Table 6.1 shows the development of the system peak demand over the years.

Table 6.1 - The Growth in System Capacity and Demand

System Parameters	2010	2015	2019	2020	2021	2022
Total Gross Generation (GWh)	10,800.7	13,226.6	16,905.8	16,918.9	17,951.3	17,291.9
Total Grid Connected Capacity (MW)	2,817.6	3,888.4	4,506.2	4,542.3	4,814.8	5,017.8
Maximum Demand (MW)	1,954.7	2,283.4	2,662.3	2,707.2	2,801.6	2,708.1
Reserve Capacity	862.9	1,605.0	1,843.9	1,835.1	2,013.2	2,309.7
System Load Factor	63.0%	66.0%	72.2%	70.5%	73.1%	72.9%
System Reserve Margin	44.1%	70.3%	69.3%	67.8%	71.9%	85.3%

System load factors in the range 60% - 70% are typical of a customer mix dominated by households with a high demand for electricity used for lighting in the evening. The peak demand in 2022 was 2,708.1 MW. The system reserve margin increased by 13.4% in 2022. Figure 6.2 depicts the development of the system load factor, reserve margin and peak demand from 1979 to presentt.

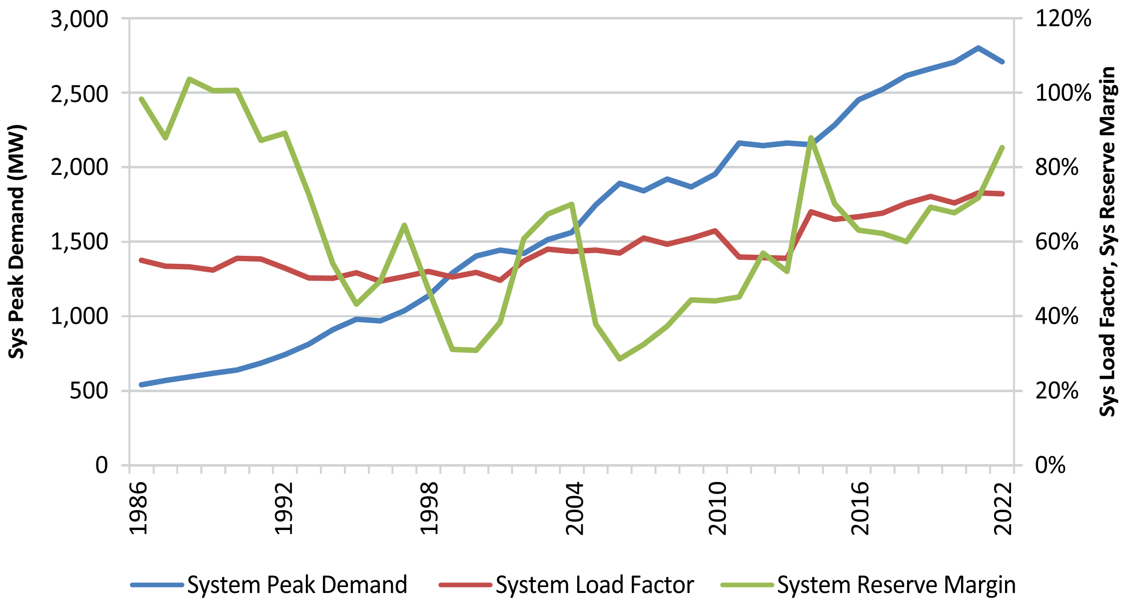

Figure 6.2 – Development of System Load Factor, Reserve Margin and Peak Demand

Figure 6.3 depicts the historic growth of the load curve.

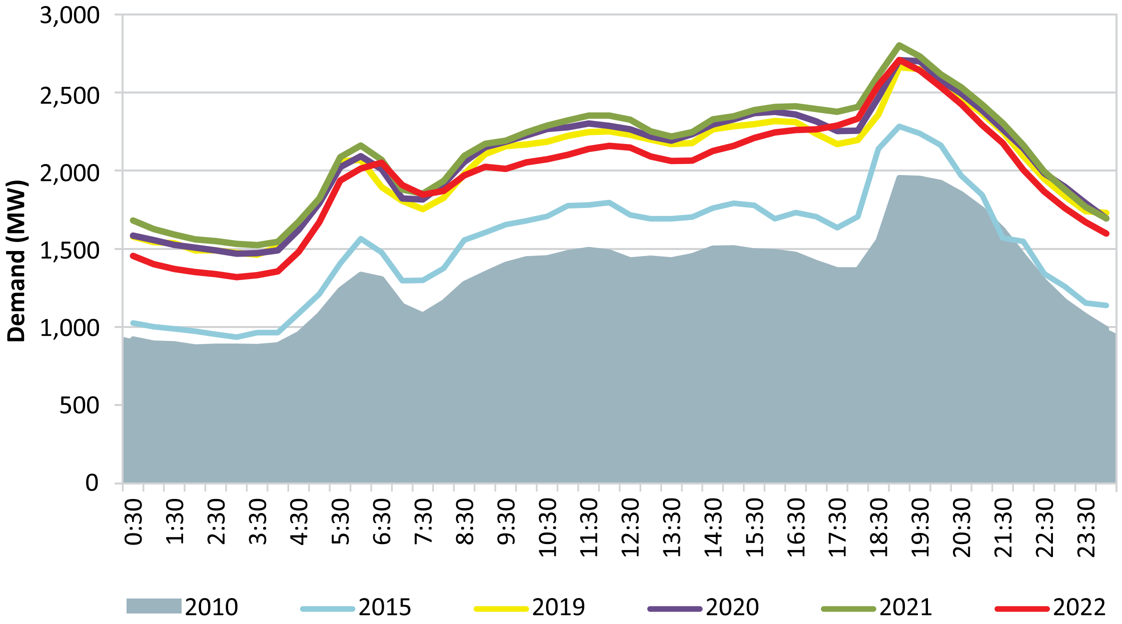

Figure 6.3 – The Growth in System Peak Demand

6.2 Petroleum Demand

6.2.1 Demand for Different Petroleum Products

The demand for different petroleum products varies primarily on their potential usage. For instance, auto diesel is widely used for transportation and power generation; in contrast to kerosene, which is used only for rural household energy needs, some industrial applications, agriculture and fisheries. Therefore, the demand for auto diesel is substantially higher than for kerosene. The refinery production process is adjusted to produce more of the high demand products while some products are directly imported to bridge the gap between refinery output and the demand.

The demand for all petroleum products decreased in 2022 compared with the demand of 2021. The CEB-owned combined cycle power plant did function fully in 2021, therefore, there was no effective demand for naphtha in 2021. Table 6-2 summarises the demand for different petroleum products.

Table 6.2 – Demand for Different Petroleum Products

kt	2010	2015	2019	2020	2021	2022
LPG	187.5	293.4	430.0	437.0	422.0	294.1
Naphtha	54.1	97.2	124.6	-	10.6	32.3
Gasoline	616.5	1,009.0	1,421.5	1,250.6	1,353.6	1,176.1
Kerosene	165.1	130.2	206.1	176.7	188.2	101.8
Auto Diesel	1,696.8	1,996.0	1,979.9	1,576.8	1,875.0	1,693.3
Super Diesel	12.2	46.4	81.7	68.9	74.6	59.2
Furnace Oil	994.5	956.4	743.7	825.8	823.7	357.2
Total	**3,726.7**	**4,528.4**	**4,987.5**	**4,335.7**	**4,747.7**	**3,714.0**

Figure 6-4 depicts the evolution of the demand for different petroleum products through time. The demand for transport fuels like auto diesel, gasoline which was on the rise and power generation fuels like auto diesel and furnace oil which were increasing over time experienced a sudden decline due to the reduced economic activities and transport demand. The demand for LP gas also decreased, owing to the complete collapse of supply. Although at least a marginal increase of kerosene demand was expected following the LP gas demand increase from the residential sector, the kerosene demand followed the trend of transport fuels under pandemic conditions.

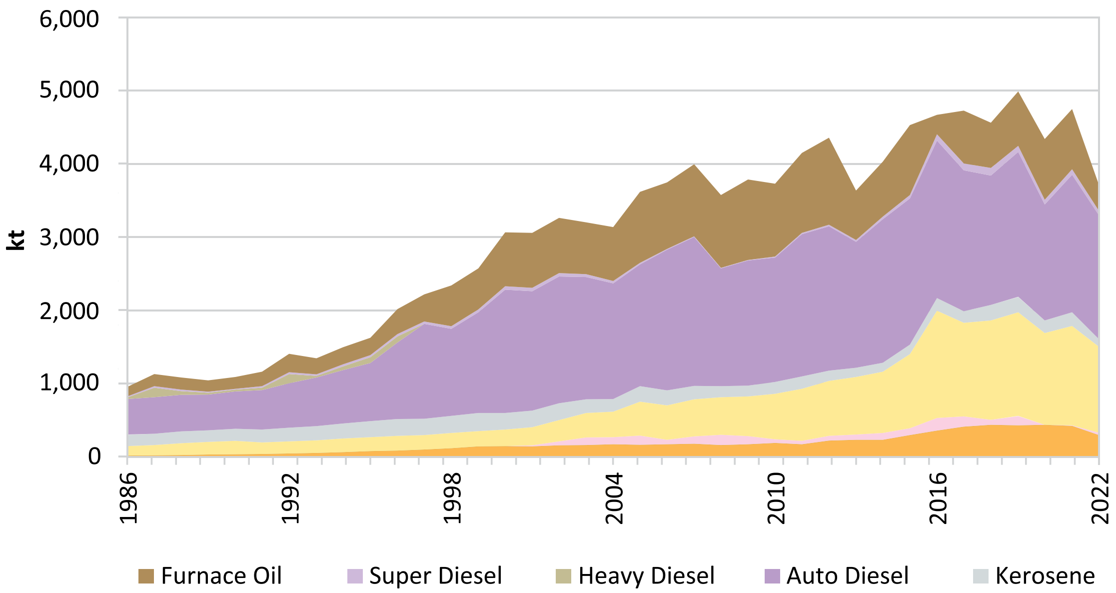

Figure 6.4 – Evolution in the Demand for Different Petroleum Products

6.2.2 Demand for Petroleum by District

Table 6-3 details the district-wise retail and consumer sales of petroleum products, of the CPC and LIOC in 2022. Figure 6-5 depicts the distribution of the petroleum demand by district in TJ.

Table 6.3 – Demand for Petroleum by District

District Sales (kl)	Petrol (90 Octane)	Auto diesel	Super diesel	Kerosene	Industrial kerosene	Petrol (95 Octane)	Fuel oil 1500 sec (HS)	Fuel oil 1500 sec (LS)	Fuel oil super
Kandy	82,510,700	81,993,200	4,253,700	3,451,800	56,800	5,131,500	554,400	-	264,000
Matale	30,987,000	36,504,600	1,006,500	1,947,000	85,800	933,900	-	-	-
Nuwara Eliya	20,806,920	33,038,580	620,400	2,283,600	-	448,800	929,790	-	39,600
Batticaloa	53,428,400	56,323,830	1,656,600	6,230,400	-	976,800	-	-	-
Ampara	39,174,300	46,572,900	1,009,800	5,517,600	-	755,700	237,600	-	264,000
Trincomalee	24,750,000	44,797,500	405,900	8,124,600	-	306,900	475,200	-	277,200
Anuradhapura	122,285,350	87,306,450	4,392,300	3,659,700	19,800	3,451,800	-	-	13,200
Polonnaruwa	28,109,400	41,405,100	1,458,600	1,821,600	6,600	785,400	316,800	-	105,600
Jaffna	35,575,260	41,913,340	1,207,800	10,969,200	184,800	594,000	18,506,400	-	-
Mannar	6,540,600	10,312,500	237,600	5,695,800	158,400	99,000	-	-	-
Mulalativu	7,078,500	10,533,600	39,600	2,369,400	-	66,000	-	-	-
Vavuniya	12,850,200	22,558,700	481,800	1,910,700	-	224,400	118,800	-	13,200
Killinochchi	7,857,300	12,365,100	488,400	2,547,600	-	323,400	-	-	52,800
Kurunegala	143,374,060	130,524,900	6,656,100	5,441,910	264,000	4,491,300	2,521,200	-	1,366,200
Puttalam	59,228,400	68,966,700	3,290,100	15,483,600	145,200	2,445,300	-	-	679,800
Ratnapura	57,864,170	70,864,200	2,678,910	2,145,000	1,393,000	2,026,200	-	-	13,200
Kegalle	43,850,400	44,134,200	1,498,200	1,653,300	34,000	1,485,000	-	-	290,400
Galle	71,972,635	76,184,000	2,785,200	5,606,700	107,600	3,339,600	-	-	521,400
Matara	47,611,964	65,902,610	1,676,400	4,910,400	277,200	1,537,800	-	-	39,600
Hambantota	40,821,440	56,380,180	1,801,800	4,715,700	6,600	1,089,000	79,200	-	-
Badulla	71,245,640	86,278,390	2,567,400	1,904,100	-	2,145,000	19,800	-	-
Moneragala	27,000,270	39,342,930	1,306,800	1,943,700	-	587,400	-	317,000	264,000
Colombo	285,017,900	559,651,390	39,478,670	8,467,710	-	40,413,880	-	20,000	7,604,110
Gampaha	213,961,800	254,317,150	11,497,200	10,560,000	-	15,288,900	-	120,000	46,002,420
Kalutara	87,674,400	94,040,100	4,352,700	5,847,600	-	5,557,200	-	-	178,200
Total	**1,621,577,009**	**2,072,212,150**	**96,848,480**	**125,208,720**	**2,739,800**	**94,504,180**	**23,759,190**	**457,000**	**57,988,930**

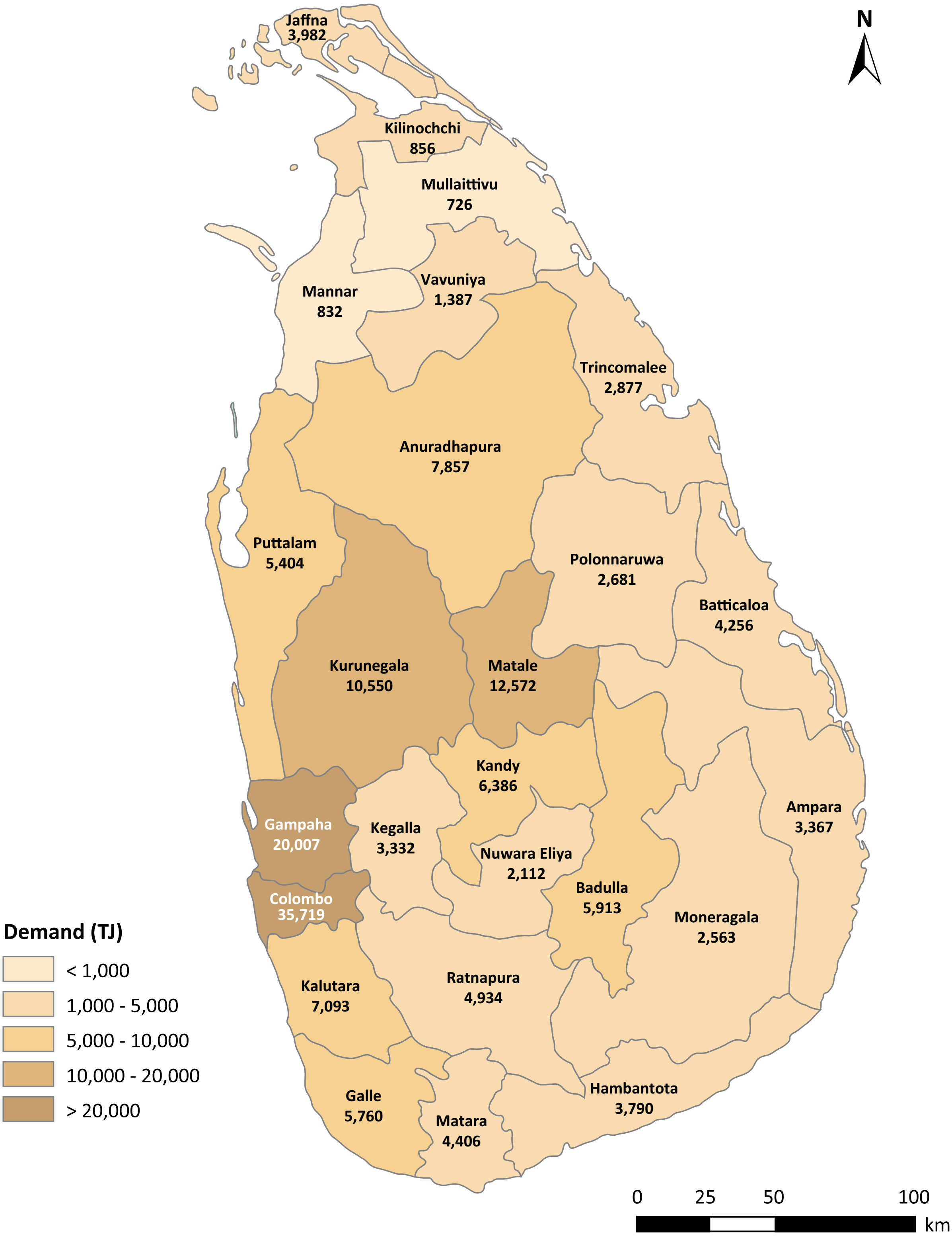

Figure 6.5 – Districtwise Demand for Petroleum (TJ) - 2022

The highest demand for petroleum fuels in 2022 was in the Colombo district, whereas the least demand was from the Mullaitivu district.

6.3 Coal

Coal is an energy resource used in industries and power generation. With the commissioning of two new coal power plants in 2014, the demand for coal was on the rise (Table 6.4).

Table 6.4 – Demand for Coal

Coal Consumption (kt)	2010	2015	2019	2020	2021	2022
Industries	86.6	86.6	87.6	79.3	80.1	88.5
Power Generation	1,880.0	1,880.0	2,208.9	2,349.3	2,301.3	2,143.2
Total Consumption	1,966.6	1,966.6	2,296.5	2,428.7	2,381.4	2,231.7
%						
Industries	4.4	4.4	3.8	3.3	3.4	4.0
Power Generation	95.6	95.6	96.2	96.7	96.6	96.0

6.4 Biomass

As the most significant primary energy supply source in the country, biomass has a widespread demand for both commercial and non-commercial applications. However, the informal nature of supply, mainly through users' own supply chains, has prevented accurate and comprehensive usage data being compiled for biomass. Therefore, estimation methods are used to develop reasonable information based on available data. Mid-year population data and LPG consumption are used to estimate household firewood consumption. Meanwhile, industrial biomass consumption is estimated based on the industrial production data and surveys. Most of the information on biomass presented in this report is based on estimates and sample surveys. The sample survey carried out in 2019 on the energy aspects of households will shed more light into the biomass energy supply and demand in the country. Table 6-5 summarises the total usage of sources biomass.

Table 6.5 – Demand for Biomass

kt	2010	2015	2019	2020	2021	2022
Firewood	3,788.5	4,532.7	5,012.0	5,191.2	5,343.0	5,052.4
Bagasse	137.8	196.4	199.5	300.5	358.8	320.6

Bagasse is the waste form of sugar cane, which is used in sugar factories for combined heat and power generation. By 2022, the bagasse production was 320.6 kt, generated from the Pelawatta, Hingurana, Ethimale and Sevanagala sugar factories. Charcoal is produced mainly from coconut shell and wood. A major portion of the production of coconut shell charcoal is exported as a non-energy product.

6.5 Sectoral Demand

6.5.1 Electricity Demand by Different End Use Categories

Based on the usage type, electricity consumers are separated into the following categories.

- Domestic
- Religious purpose
- Industrial
- Commercial
- Street Lighting

Amounts of electricity used by different customer categories are given in Table 6-6, which also includes off-grid electricity generation using conventional and non-conventional sources. Although the electrical energy demand of different end users is established using electricity sales data, individual power demand of different categories cannot be established due to the lack of a monitoring system or regular load research. Nevertheless, by analysing the typical load profiles of different user categories, it is visible that the domestic category is most influential in the morning and evening peaks and the consequent low load factor of the system.

Table 6.6 – Electricity Sales by End Use Category

GWh	2010	2015	2019	2020	2021	2022
Domestic	3,651.4	4,444.7	5,479.4	5,856.9	6,007.9	5,791.9
Religious	55.0	76.4	99.4	93.3	92.1	92.2
Industrial	3,148.1	3,880.1	4,696.5	4,443.4	5,109.0	4,584.9
Commercial	2,224.0	3,178.9	4,270.2	3,875.3	3,970.2	4,078.1
Streetlighting	130.0	160.7	131.4	131.2	120.2	121.8
Total	**9,208.5**	**11,740.9**	**14,676.9**	**14,400.1**	**15,299.5**	**14,668.9**
%						
Domestic	39.7	37.9	37.3	40.7	39.3	39.5
Religious	0.6	0.7	0.7	0.6	0.6	0.6
Industrial	34.2	33.0	32.0	30.9	33.4	31.3
Commercial	24.2	27.1	29.1	26.9	26.0	27.8
Streetlighting	1.4	1.4	0.9	0.9	0.8	0.8

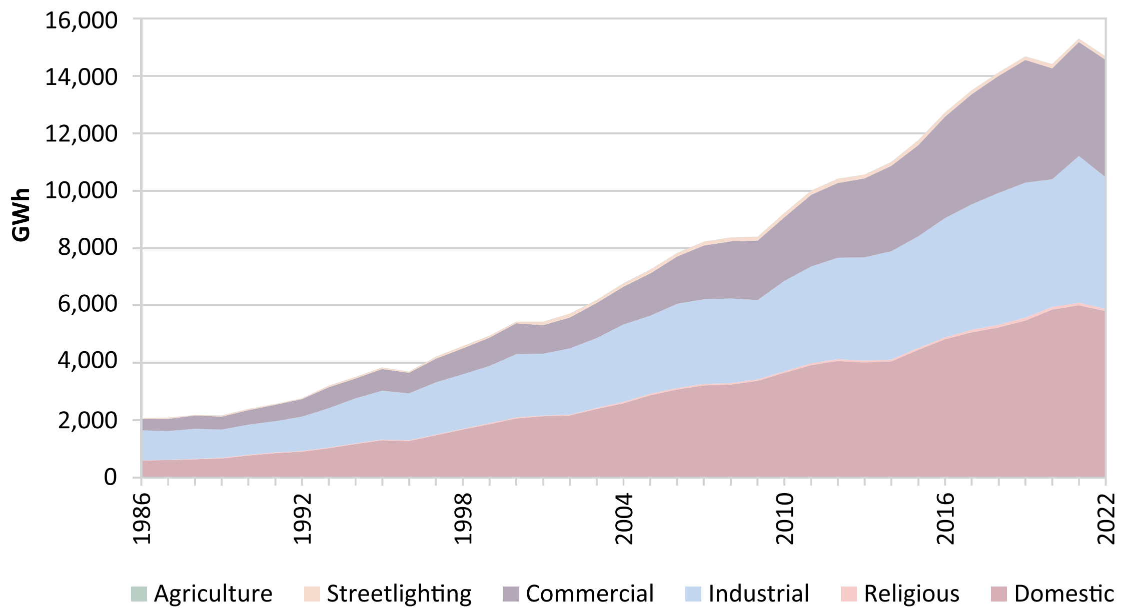

Figure 6.6 - Electricity Sales by Consumer Category

Table 6.6 indicates that the sales to the domestic and commercial customers have increased marginally, while the sales to the industrial customers have decreased, as expected under the pandemic conditions.

6.5.2 Petroleum Demand in Different Sectors

Petroleum has a wide range of applications as a convenient energy source. Transport, power generation, industrial thermal applications, domestic lighting and cooking are the most common uses of petroleum in Sri Lanka. In addition, due to the strategically important geographic location of Sri Lanka in terms of maritime and aviation movements, foreign bunkering and aviation fuel sales also create a demand for petroleum in the country. Petroleum demand to meet the non-domestic needs such as bunkering and aviation fuel is discussed separately in this report.

6.5.2.1 Transport Sector

Transport is the most important sector as far as petroleum is concerned. The majority of vehicles in Sri Lanka are powered by either diesel or gasoline. Both, road and rail transport are entirely fuelled by liquid petroleum fuels. In the distant past, rail transport was fuelled by coal, and today, only a single coal powered rail is operated as a tourist attraction. The Internal Combustion (IC) engines in all these vehicles intrinsically introduce considerable energy wastage in terms of conversion efficiency from petroleum energy to motive power. Use of electricity to at least energise the train transportation can be an efficient and economical alternative to burning petroleum fuels in the transport sector. Table 6.7 summarises the demand for fuels in the transport sector.

Table 6.7 – Transport Fuel Demand by Type

kt	2010	2015	2019	2020	2021	2022
Gasoline	616.5	1,009.0	1,421.5	1,250.6	1,353.6	1,176.1
Auto Diesel	1,433.8	1,815.1	1,606.5	1,388.5	1,658.4	1,139.9
Super Diesel	11.5	46.1	81.6	67.8	74.6	59.2

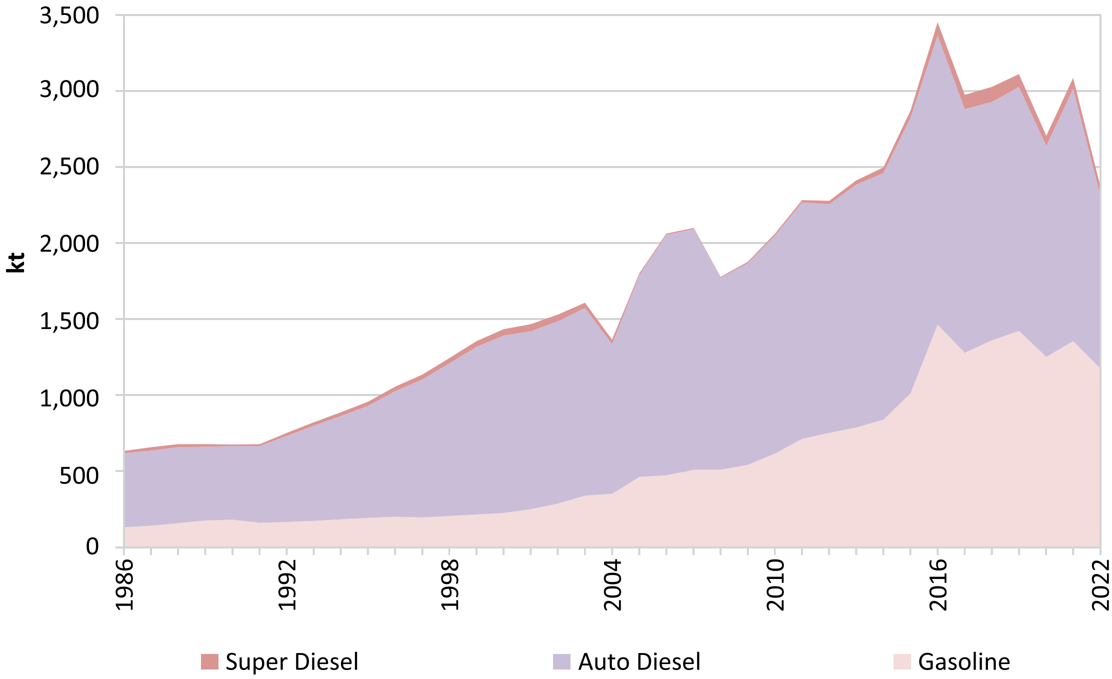

Figure 6.7 – Transport Demand by Fuel Type

Table 6.8 summarises the auto diesel demand in road transport and rail transport.

Table 6.8 – Auto Diesel Demand in Road and Rail Transport

kt	2010	2015	2019	2020	2021	2022
Road Transport	1,419.7	1,815.1	1,653.8	1,430.5	1,713.7	1,163.7
Rail Transport	26.2	38.4	34.2	25.8	19.3	35.3
Total	**1,445.9**	**1,853.5**	**1,688.1**	**1,456.3**	**1,733.0**	**1,199.0**
%						
Road Transport	98.2	97.9	98.0	98.2	98.9	97.1
Rail Transport	1.8	2.1	2.0	1.8	1.1	2.9

Only a marginal share of 2.9% of the total transport diesel demand is consumed by rail transport. The transport fuel mix is dominated by auto diesel. The demand for transport fuels has decreased in 2022 compared with 2021. These reductions can be attributed to the travel restrictions which prevailed under the COVID-19 lockdowns.

Figure 6.8 gives a snapshot of the cumulative vehicle fleet. Importation of vehicles show a declining trend in 2022, while this decline is significant in three wheelers, where only 36 were registered in 2022. Motor cycles still account for the highest number of registrations each year.

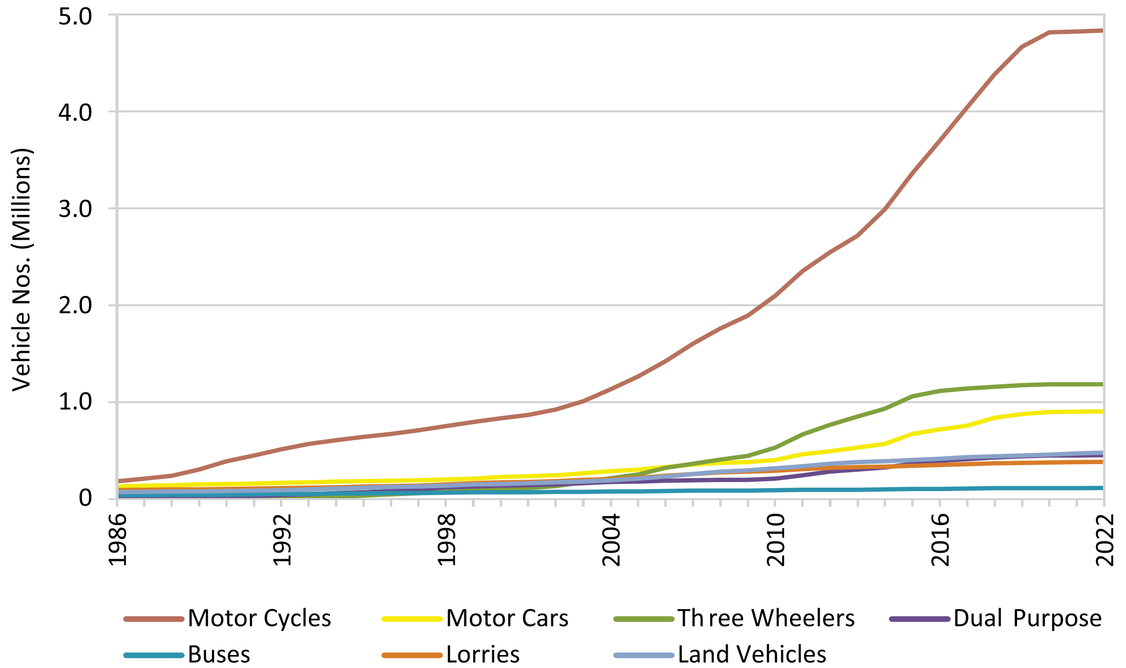

Figure 6.8 – Growth Pattern of Road Vehicle Fleet

Data on the active vehicle fleet was extracted from the publication 'Economic and Social Statistics 2023' of the Central Bank of Sri Lanka. Motor vehicles with valid revenue licences were considered to build the active fleet. The active fleets are illustrated below (Figure 6.9).

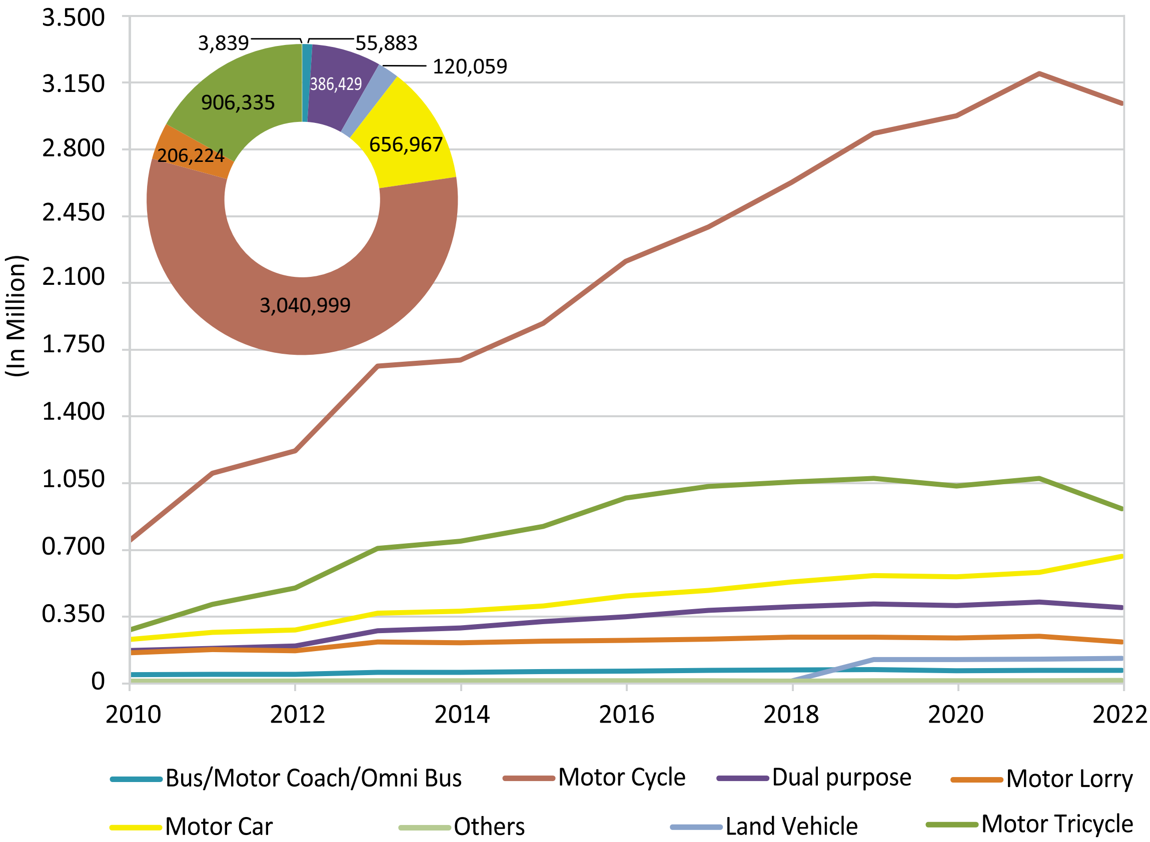

Figure 6.9 – Active Vehicle Fleet

Sri Lanka's active fleet in 2022 was 5,376,735 vehicles. It is characterised by an increased population of motor cycles (57%) and motor tricycles (17%). The share of public transport is very low (1%). Undoubtedly, this is a clear sign of worsening public transport services in the country, which must be arrested early, to avoid a severe transport crisis in the medium term.

6.5.2.2 Petroleum Usage in Other Sectors

Transport and power sector are the largest petroleum consuming sectors. Fuel consumption of the power sector by type, technologies and quantities has been detailed in Chapter 4, under energy conversions in thermal power plants.

Domestic sector petroleum consumption is limited to kerosene and LPG. However, with the increased use of LPG, especially in urban households for cooking purposes, the demand for petroleum by the domestic sector has also become significant. Industrial sector petroleum usage is mostly for thermal applications where diesel and fuel oil is used to fire industrial steam boilers and air heaters. LP gas usage is also increasing in industrial thermal applications where the quality and control of heat generation is important for the industry operation. LP gas fired kilns in the ceramic industry is one such example. The commercial sector including the service sector organisations such as hotels also contribute to the national petroleum demand, but to a lesser degree than the above-mentioned high-volume petroleum consumers.

Table 6.9 details LP gas demand by sector. Although total LP gas demand was on an increasing trend in the past, but it decreased in 2021 owing to reduced economic activity warranted by COVID – 19, and decreased substantially in 2022 owing to the supply shortages in LP gas. Sector wise, the demand in the household, commercial and other sectors has decreased, while it had marginally increased in the industries sector in 2022.

Table 6.9 – Demand for LPG by Sector

kt	2010	2015	2019	2020	2021	2022
Household, Commercial and Other	159.8	234.5	378.8	413.0	394.6	227.5
Industries	24.8	57.6	86.5	59.7	62.4	66.6
Transport	0.1	1.2	0.3	0.1	0.1	0.1
Total	**184.8**	**293.4**	**465.6**	**472.8**	**457.0**	**294.1**

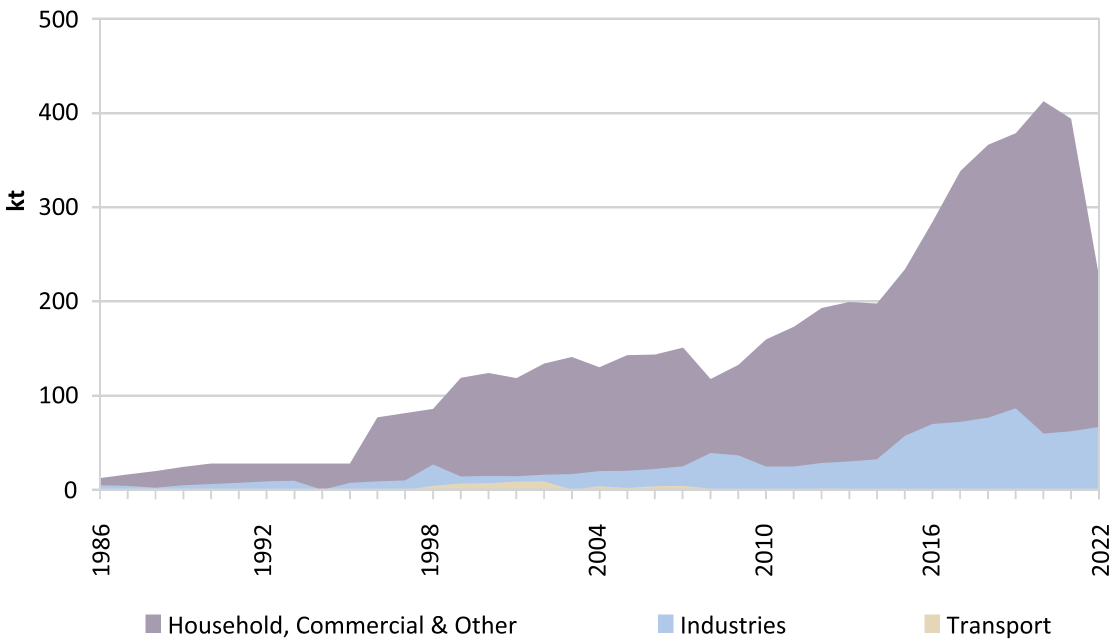

Figure 6.10 - LPG Demand by Sector

The domestic demand for LPG is increasing rapidly. This is often attributed to the improved per capita income levels. If the prices of LP gas remain at low levels, many high temperature industries might switch back to LP gas, to better control their processes.

Agriculture based petroleum demand in Sri Lanka is reported as considerably low, despite the fact that it is broadly an agricultural economy. This is also attributed to the difficulty in separating fuel dispersed for agricultural purposes and transport, as they are done through the same fuel station. Estate sector is one division which shows a fair usage of petroleum for drying purposes, but its energy consumption is accounted under industrial usage.

Kerosene used in fisheries is another substantial consumer category with regard to the petroleum demand. Engine powered boats commonly used in the fishing industry are fuelled by either diesel or kerosene. It is therefore, important to understand that kerosene, which is a subsidised petroleum product in Sri Lanka, is not entirely used by the poorest segment of the society as envisaged in petroleum pricing policies. Table 6.10 summarises the kerosene consumption.

Table 6.10 – Demand for Kerosene by Sector

kt	2010	2015	2019	2020	2021	2022
Industrial	20.2	8.0	3.7	3.5	2.9	2.9
Household, Commercial and Other	-	122.2	202.4	173.2	102.1	51.6

Figure 6.11 indicates that the household kerosene consumption generally follows a declining trend, mainly owing to the deeper penetration of the national grid. Kerosene in the domestic sector is mainly used as a lighting fuel. Although a marginal increase in the residential use could have resulted from a population under a lockdown, the kerosene demand followed a sharp decline resembling the industry or the transport demand trend.

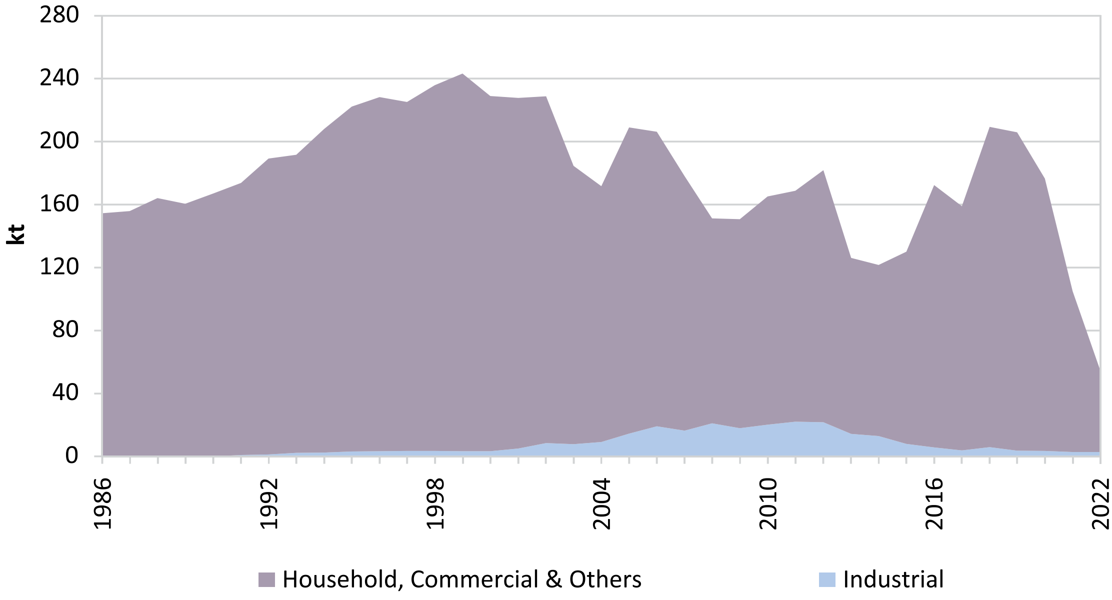

Figure 6.11 – Demand for Kerosene by Sector

In the early stages, the demand for kerosene has been only in the household and commercial sector. However, since the 2000s, the demand for kerosene in the industrial sector has gradually increased, but is in a decreasing trend at present.

6.5.2.3 Bunkering and Aviation Sales

Table 6.11 – Bunkering and Aviation Sales

kt	2010	2015	2019	2020	2021	2022
Domestic Bunkers						
Furnace Oil	22.1	40.1	61.2	38.8	52.4	50.4
Marine Lubricants	0.2	0.1	-	-	-	-
Sub total	28.5	40.2	61.2	38.8	52.4	50.4
Foreign Bunkers						
Marine Gas Oil	55.3	46.7	78.5	75.7	63.5	106.9
Furnace Oil	199.0	360.6	551.1	349.0	471.4	453.3
Marine Lubricants	1.8	0.9	-	-	0.1	-
Sub total	**256.1**	**408.1**	**629.6**	**424.7**	**534.9**	**560.2**
Domestic Aviation						
Jet A1	169.5	2.4	5.4	4.3	26.1	1.1
Avgas	0.2	0.1	0.2	0.2	0.1	0.1
Sub total	**169.7**	**2.6**	**5.6**	**4.4**	**26.2**	**1.2**
Foreign Aviation						
Avtur	111.0	370.5	473.4	186.7	222.4	248.3
Naphtha	26.7	-	-	-	-	-
Sub total	**137.7**	**370.5**	**473.4**	**186.7**	**222.4**	**248.3**

6.5.3 Coal Demand in Different Sectors

In the past, the total demand for coal had been in the transport sector or industries. But with the commissioning of coal power plants, there has been an increased demand for coal in power generation. In 2022, the demand for coal in power generation alone was 97%.

The total coal demand is given in Table 6.12.

Table 6.12 – Demand for Coal by Sector

kt	2010	2015	2019	2020	2021	2022
Industries	95.13	86.58	87.61	79.34	80.12	88.50
Power Generation	-	1,880.01	2,208.87	2,349.34	2,301.32	2,143.22
Total Consumption	**95.13**	**1,966.59**	**2,296.48**	**2,428.68**	**2,381.44**	**2,231.72**
%						
Industries	100.0	4.4	3.8	3.3	3.4	4.0
Power Generation	-	95.6	96.2	96.7	96.6	96.0

6.5.3.1 Coal Demand in Industries

The coal demand in industries declined marginally as given in Table 6.13.

Table 6.13 – Coal Demand in Industries

kt	2010	2015	2019	2020	2021	2022
Industries	95.1	86.6	87.6	79.3	80.1	88.5

6.5.3.2 Coal Demand in Power Generation

The demand for coal in the power generation in 2022 was 2,143.22 thousand tonnes.

6.5.4 Biomass Demand in Different Sectors

6.5.4.1 Biomass Demand in Industries

The demand bagasse has increased, whereas the demand for firewood has remained more or less the same.

Table 6.14 – Biomass Demand in Industries

kt	2010	2015	2019	2020	2021	2022
Firewood	3,788.5	4,532.7	5,012.0	5,191.2	5,343.0	5,052.4
Bagasse	137.8	196.4	199.5	300.5	358.8	320.6

6.5.4.2 Biomass Demand in Household, Commercial and Other Sector

Firewood is a main source of cooking fuel in many parts of the country. Table 6.14 gives the total firewood requirement in the household and commercial sector. Energy demand data from the residential and commercial sector were hitherto estimated using formulae derived a long time ago, which reflected the socioeconomic context of that era. With improved living standards and higher household income levels, however, these parameters have undergone a considerable change. In 2019, the SEA, in association with the Department of Census and Statistics conducted a survey on residential energy use involving a representative sample of more than 6,000 households. Using the preliminary results of this survey, the biomass usage estimates were calculated for the year 2019, and was found to be substantially lower than the previously estimated value. Using a reducing weighting factor, the past data on biomass demand from the year 2000 were recalculated and the respective data series was updated.

The total bagasse generated by the sugar plants was 320.6 kt in 2022, which was used in a captive generation plant for industrial purposes, amounting to a capacity of 8.0 MW generating 9,000 GWh.

Table 6.15 – Demand for Firewood in Household, Commercial and Other Sector

kt	2010	2015	2019	2020	2021	2022
Firewood	7,349.4	6,130.1	5,198.2	5,239.2	5,187.6	5,197.6

6.6 Total Energy Demand

Table 6.16 summarises the total energy demand by source.

Table 6.16 – Total Energy Demand by Energy Source

PJ	2010	2015	2019	2020	2021	2022
Biomass	179.6	173.0	165.8	169.3	169.9	167.2
Petroleum	126.0	158.1	174.3	154.8	177.9	143.2
Coal	2.5	2.3	2.3	2.1	2.1	2.3
Electricity	33.2	42.3	52.8	51.8	55.1	52.8
Total	**368.1**	**375.6**	**395.3**	**378.1**	**405.0**	**365.5**
%						
Biomass	48.8	46.0	41.9	44.8	41.9	45.7
Petroleum	34.2	42.1	44.1	41.0	43.9	39.2
Coal	0.7	0.6	0.6	0.6	0.5	0.6
Electricity	9.0	11.3	13.4	13.7	13.6	14.4

The petroleum demand figures presented are only in terms of final energy use and this does not include the fuels consumed in electricity generation. The share of biomass consumption in the total energy demand had marginally increased 45.7% in 2022, compared with 2021. The share of petroleum had decreased upto 39.2%, whereas the share of electricity had increased to 14.4% in 2022.

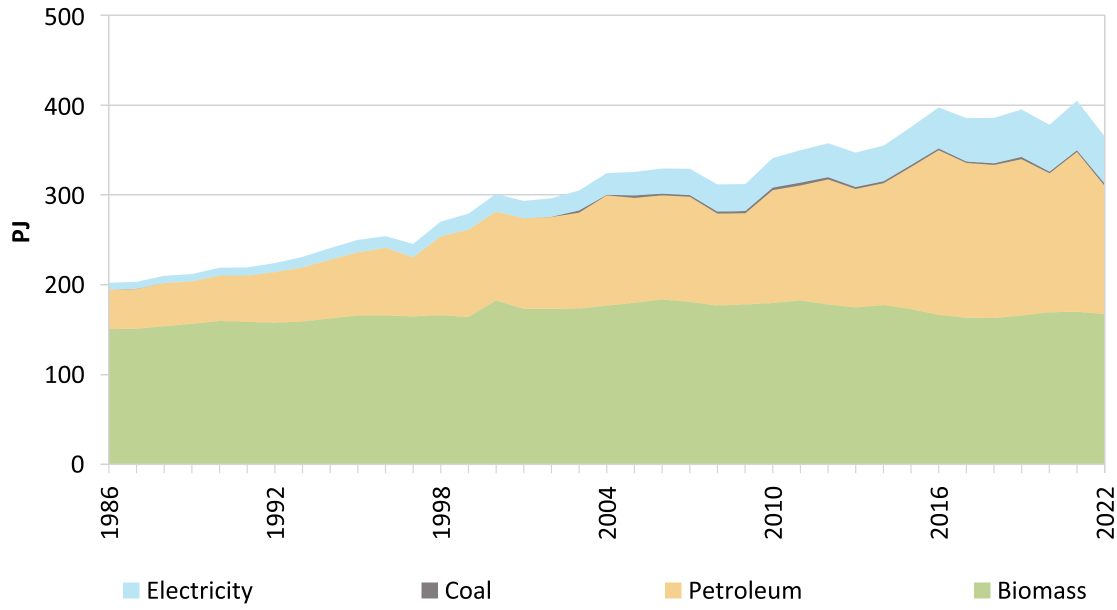

Figure 6.12 – Total Energy Demand by Energy Source

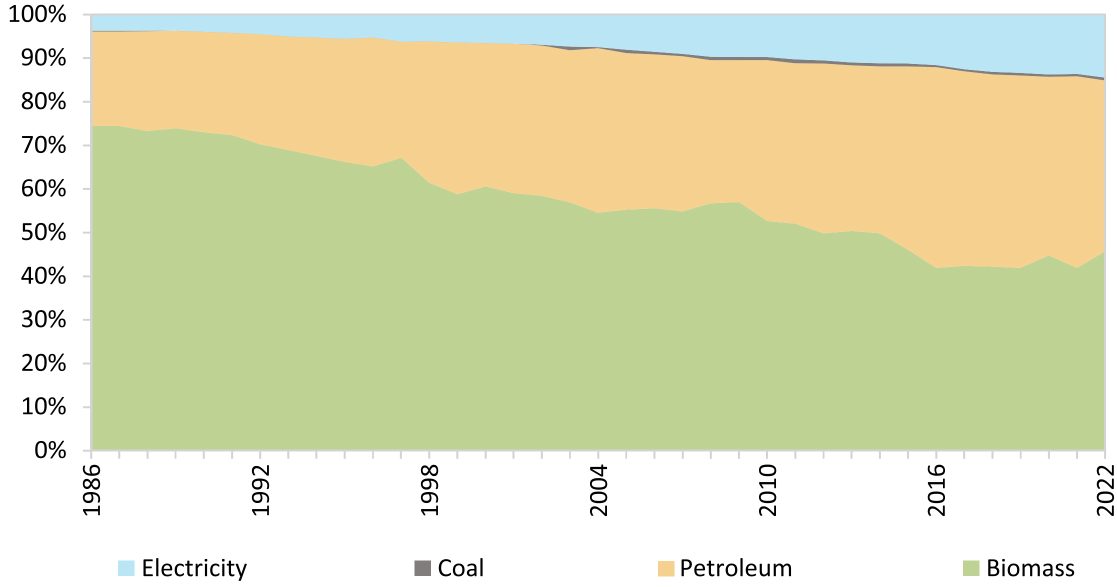

Figure 6.13 – Evolution of Energy Demand by Energy Source

As can be expected from any growing economy, the share of biomass in the energy demand portfolio was on a generally decreasing trend, while the share of electricity was on an increasing trend. Under the COVID-19 pandemic conditions in the country, these trends reversed in 2020. However it is expected that the long term trends will resume after the post pandemic recovery.

6.6.1 Total Industrial Energy Demand

Table 6.17 – Total Energy Demand of Industries by Energy Source

PJ	2010	2015	2019	2020	2021	2022
Biomass	62.7	75.5	83.1	85.9	87.4	84.5
Petroleum	10.2	14.6	9.3	7.6	13.2	22.4
Coal	2.5	2.3	2.3	2.1	2.1	2.1
Electricity	11.3	14.0	16.9	16.0	18.4	16.5
Total	**86.8**	**106.3**	**111.7**	**111.8**	**121.2**	**125.7**
%						
Biomass	72.3	71.0	74.4	77.0	72.2	67.3
Petroleum	11.8	13.7	8.3	6.8	10.9	17.8
Coal	2.9	2.1	2.1	1.9	1.7	1.7
Electricity	13.1	13.1	15.2	14.3	15.2	13.2

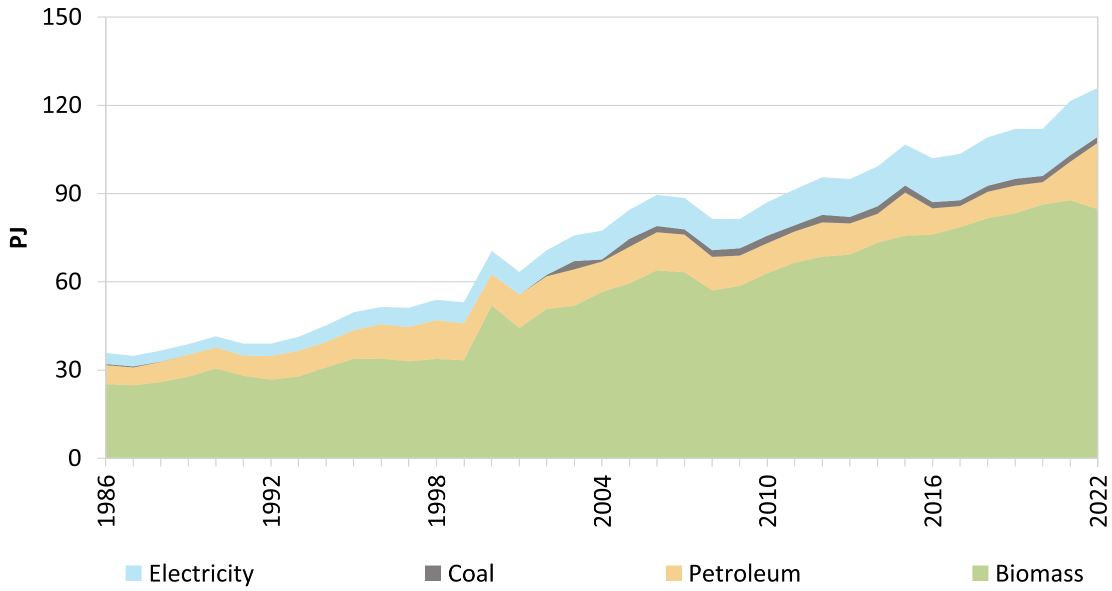

Figure 6.14 – Total Energy Demand of Industries by Energy Source

6.6.2 Total Transport Energy Demand

The transport demand declined sharply in 2020, owing to the mobility-restrictions imposed with the COVID-19 pandemic, but bounced back to the former levels in 2021. It decreased again in 2022, mainly owing to the fuel shortages.

Railway electrification project which anticipated to electrify the Kelani Valley line first and the Veyangoda – Panadura main line next which secured funding from the ADB failed to progress as expected.

Electricity used in transport is not reported, and a survey of the available fleet is necessary to estimate the usage levels.

Table 6.18 – Total Transport Energy Demand by Energy Source

PJ	2010	2015	2019	2020	2021	2022
Petroleum	100.4	127.7	139.3	121.3	139.1	106.4

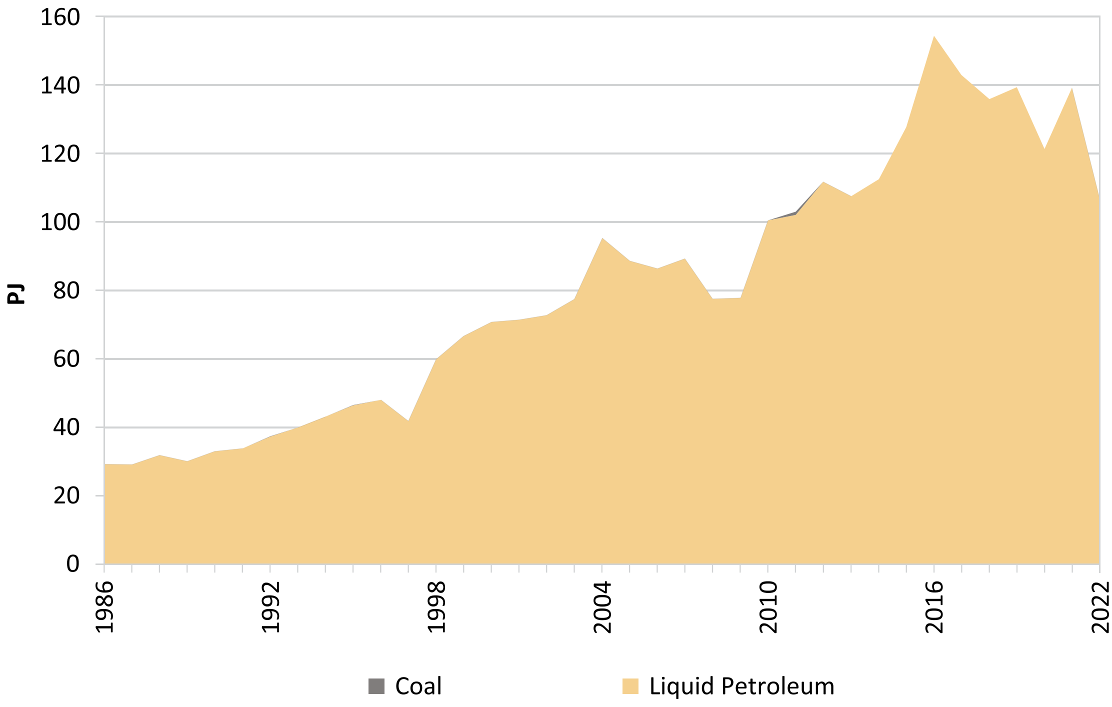

Figure 6.15 – Total Energy Demand of Transport by Energy Source

6.6.3 Total Energy Demand in Household, Commercial and Other Sectors

Table 6.19 – Total Energy Demand in Household, Commercial and Other Sectors by Energy Source

PJ	2010	2015	2019	2020	2021	2022
Biomass	143.8	97.5	82.7	83.4	82.5	82.7
Petroleum	14.9	15.8	25.7	25.9	22.0	12.4
Electricity	21.8	28.3	35.9	35.9	36.7	36.3
Total	**180.6**	**141.6**	**144.3**	**145.1**	**141.2**	**131.4**
%						
Biomass	79.6	68.9	57.3	57.4	58.4	62.9
Petroleum	8.3	11.1	17.8	17.9	15.6	9.4
Electricity	12.1	20.0	24.9	24.7	26.0	27.6

Biomass accounts for approximately 62.9% of the total household, commercial and other sector's energy demand. The share of petroleum indicates a decrease, while the share of and electricity indicates an increase.

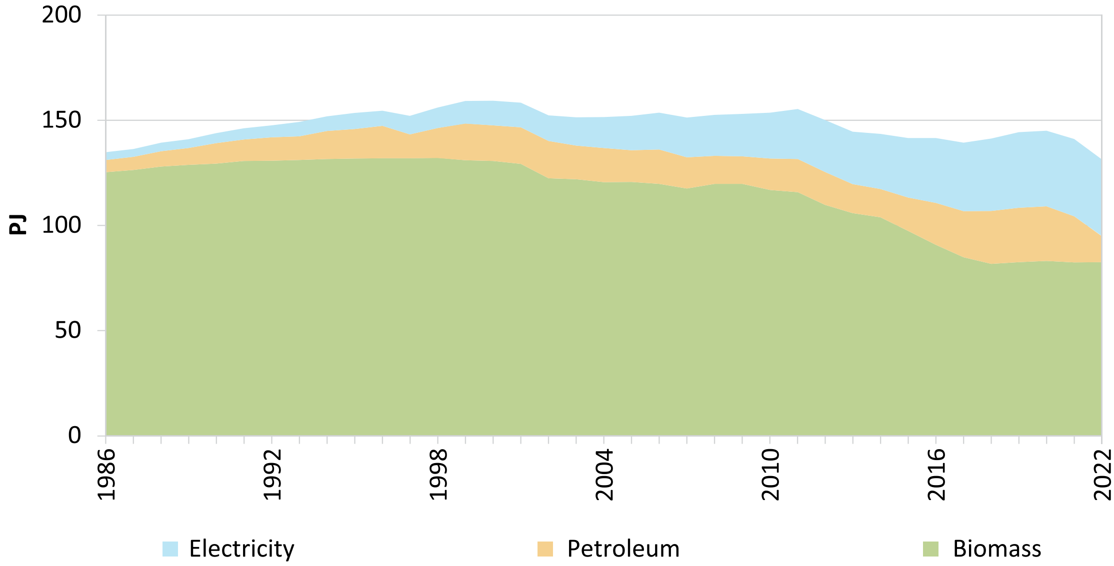

Figure 6.16 – Total Energy Demand of Household, Commercial and Other Sector by Energy Source

6.6.4 Total Energy Demand by Sector

Table 6.20 – Total Energy Demand by Sector

PJ	2010	2015	2019	2020	2021	2022
Industry	86.8	106.3	111.6	111.6	121.0	125.5
Transport	100.4	127.7	139.3	121.3	139.1	106.4
Household, Commercial & Others	153.7	141.6	144.3	145.1	141.2	131.4
Total	**367.7**	**375.6**	**395.3**	**378.1**	**401.4**	**363.3**
%						
Industry	23.6	28.3	28.2	29.5	30.2	34.5
Transport	27.3	34.0	35.2	32.1	34.7	29.3
Household, Commercial & Others	41.8	37.7	36.5	38.4	35.2	36.2

In 2022, households, commercial and other sectors accounted for the largest share of energy being 36.2%. The transport and industry sector accounted for 29.3% and 34.5%, respectively. The reduced demands are owing to the shortages in fuels experienced in 2022.

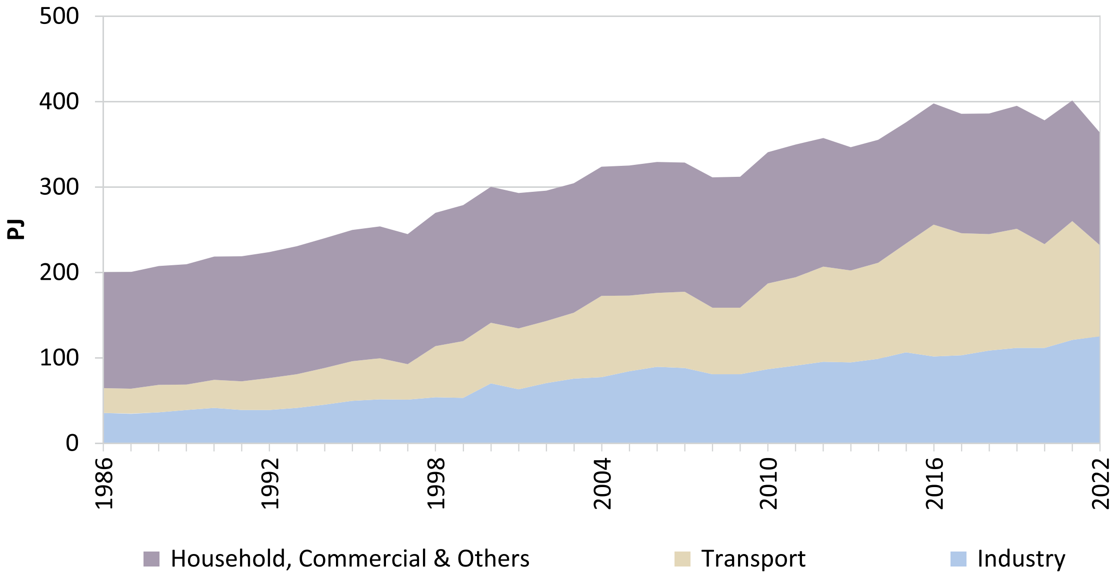

Figure 6.17 – Total Energy Demand by Sector

Figure 6.21 depicts the growth of energy demand in the three main Sectors.

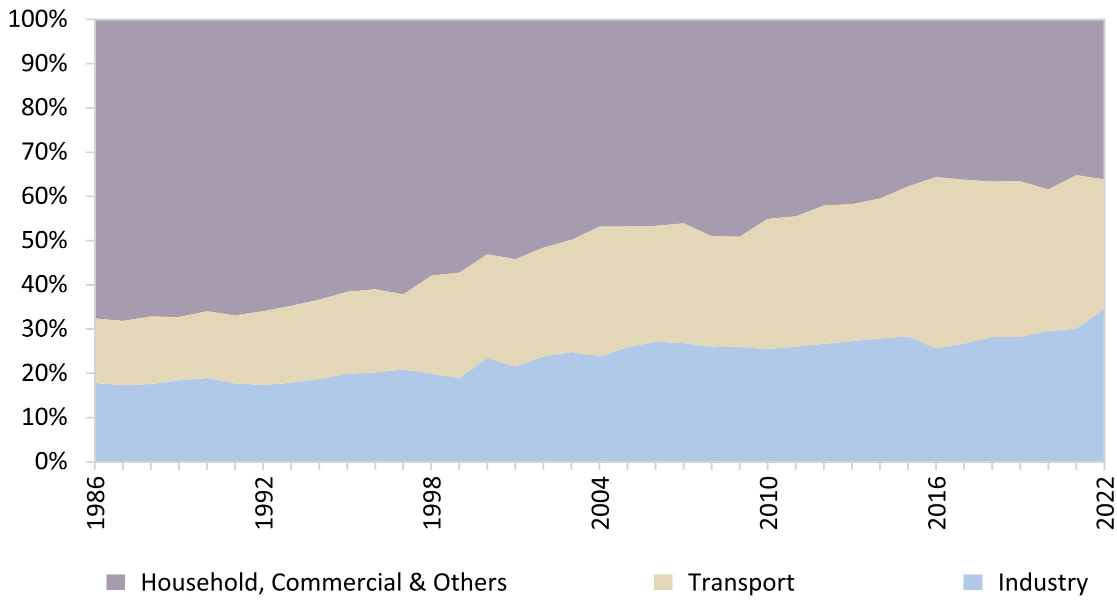

Figure 6.18 – Evolution of Total Energy Demand by Sector

Although the demand decreased in 2020 owing to the COVID-19 pandemic, the demand had gradually risen to its former levels by 2021, but decreased again in 2022, owing to shortages in fuel supply.

7 Energy Balance

The performance of the entire energy sector is summarised in the National Energy Balance shown in the following pages, in original commodity units and in SI Units of PJ (Peta Joules). The Energy Balance illustrates the energy supply, energy conversion, losses and energy consumption (demand) within the year. Figure 7.1 gives the Energy Balance for 2022 in PJ. Relevant conversion factors are given in *Annex II*.

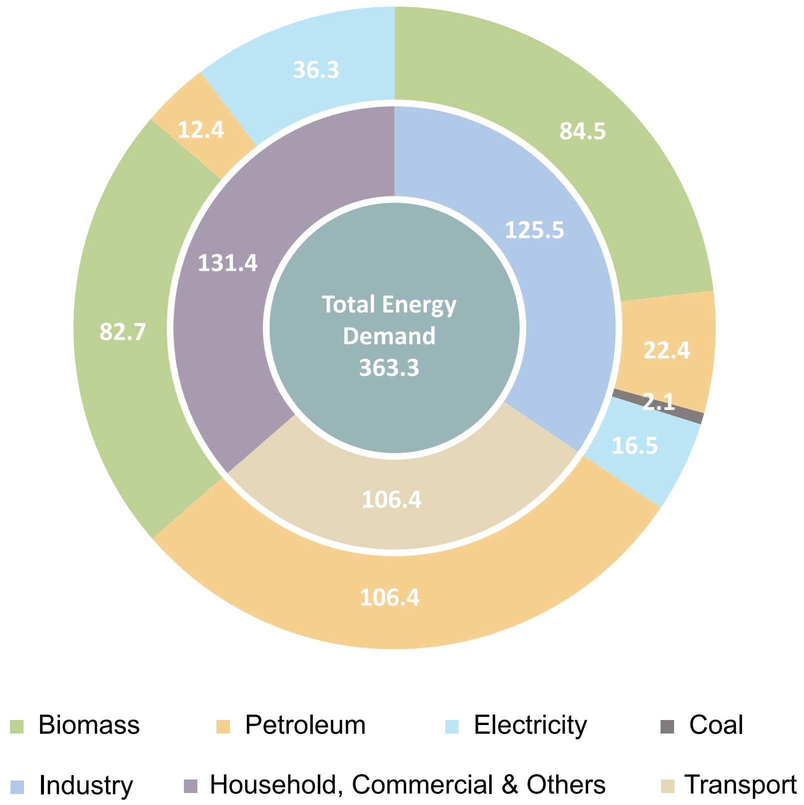

Figure 7.1 – Energy Balance 2022 (in PJ)

The total energy demand of the household, commercial and other sector was 131.4 PJ, out of which 82.7 PJ came from biomass, 12.4 PJ came from petroleum and 36.3 PJ came from electricity. The total energy demand in the industrial sector was 125.5 PJ. Biomass accounted for 84.5 PJ, petroleum for 22.4 PJ, coal for 2.1 PJ and electricity accounted for 16.5 PJ. In the transport sector, the total demand of 106.4 PJ was sourced by petroleum.

Table 7.1 – Sri Lanka Energy Balance: 2022 (in original units)

	Renewables (GWh)	Electricity (GWh)	LPG (kt)	Gasoline (kt)	Naptha (kt)	Av. Gas (kt)	Kerosene (kt)
Supply							
Primary Energy	8,582.5	-	-	-	-	-	-
Imports	-	-	290.0	1,106.2	-	0.1	-
Direct Exports	-	-	-	-	-	-	-
Foreign Bunkers	-	-	-	-	-	-	-
Stock Change	-	-	(1.5)	(1.7)	0.4	(0.1)	2.6
Total Energy Supply	**8,582.5**	**-**	**288.5**	**1,104.5**	**0.4**	**0.1**	**2.6**
Energy Conversion							
Petroleum Refinery	-	-	5.7	38.7	30.8	-	25.3
Conventional Hydro Power	(5,382.7)	5,382.7	-	-	-	-	-
Thermal Power Plants	-	8,246.1	-	-	(31.0)	-	-
Small Hydro Power	(1,376.7)	1,376.7	-	-	-	-	-
Wind Power	(737.8)	737.8	-	-	-	-	-
Biomass Power	(47.2)	47.2	-	-	-	-	-
Solar Power	(190.3)	190.3	-	-	-	-	-
Waste Heat	(69.9)	69.9	-	-	-	-	-
Net-metered Power Plants	(777.7)	777.7	-	-	-	-	-
Self Generation by Customers	-	-	-	-	-	-	-
Off-grid Conventional	-	-	-	-	-	-	-
Off-grid Non-Conventional	-	-	-	-	-	-	-
Charcoal Production	-	-	-	-	-	-	-
Own Use	-	(635.7)	-	-	-	-	-
Conversion Losses	-		-	-	-	-	-
Losses in T&D	-	(1,524.0)	-	-	-	-	-
Non Energy Use	-	-	-	-	-	-	-
Total Energy Conversion	**(8,582.5)**	**14,669.0**	**5.7**	**38.7**	**(0.2)**	**-**	**25.3**
Energy Use							
Agriculture	-	-	-	-	-	-	46.5
Industries	-	4,584.9	66.6	-	-	-	2.9
Road Transport	-	-	-	1,176.1	-	-	-
Rail Transport	-	-	-	-	-	-	-
Domestic Aviation	-	-	-	-	-	0.1	-
Household, Commercial & Other	-	10,084.0	227.5	-	-	-	51.6
Total Energy Use	**-**	**14,668.9**	**294.1**	**1,176.1**	**-**	**0.1**	**101.0**

Table 7.1 – Sri Lanka Energy Balance: 2022 (in original units)

Jet A1 (kt)	Diesel (kt)	Fuel Oil (FO 1500) (kt)	Residual Oil (kt)	Solvents (kt)	Coal (kt)	Baggase Agro Residues (kt)	Firewood (kt)	Charcoal (kt)	Crude Oil (kt)
-	-	-	-	-	-	320.6	10,249.9	-	-
268.7	1,608.1	245.8	-	-	1,707.0	-	-	-	743.6
-	-	-	-	-	-	-	-	-	-
(248.3)	(106.9)	(453.3)	-	-	-	-	-	-	-
(5.8)	(13.9)	29.1	103.6	0.2	505.0	0.8	-	-	(179.8)
14.6	**1,487.4**	**(178.5)**	**103.6**	**0.2**	**2,212.0**	**321.4**	**10,249.9**	**-**	**563.8**
57.3	128.2	194.2	-	2.7	-	-	-	-	(529.8)
-	-	-	-	-	-	-	-	-	-
-	(190.2)	(184.2)	(103.6)		(2,143.2)	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	(77.5)	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	(34.0)
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
57.3	**(62.0)**	**10.0**	**(103.6)**	**2.7**	**(2,143.2)**	**(77.5)**	**-**	**-**	**(563.8)**
-	-	-	-	-	-	-	-	-	-
-	375.1	68.6	-	-	88.5	243.9	5,052.4	-	-
-	1,163.7	-	-	-	-	-	-	-	-
-	35.3	-	-	-	-	-	-	-	-
1.1	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	5,197.6	-	-
1.1	**1,574.1**	**68.6**	**-**	**-**	**88.5**	**243.9**	**10,249.9**	**-**	**-**

Table 7.2 – Sri Lanka Energy Balance: 2022 (in Tera Joules)

	Renewables	Electricity	LPG	Gasoline	Naptha	Av. Gas	Kerosene	Jet A1
Supply								
Primary Energy	86,239.3	-	-	-	-	-	-	-
Imports	-	-	12,870.2	50,484.9	-	6.2	-	11,810.4
Direct Exports	-	-	-	-	-	-	-	-
Foreign Bunkers	-	-	-	-	-	(0.1)	-	(10,914.6)
Stock Change	-	-	(68.5)	(78.5)	19.5	(2.5)	114.3	(253.0)
Total Energy Supply	**86,239.3**	**-**	**12,801.7**	**50,406.4**	**19.5**	**3.7**	**114.3**	**642.9**
Energy Conversion								
Petroleum Refinery	-	-	252.4	1,764.6	1,407.2	-	1,111.7	2,521.0
Conventional Hydro Power	(54,087.2)	19,381.3	-	-	-	-	-	-
Thermal Power Plants	-	29,691.5	-	-	(1,415.2)	-	-	-
Small Hydro Power	(13,834.0)	4,957.2	-	-	-	-	-	-
Wind Power	(7,413.8)	2,656.6	-	-	-	-	-	-
Biomass Power	(474.7)	170.1	-	-	-	-	-	-
Solar Power	(1,912.6)	685.3	-	-	-	-	-	-
Waste Heat	-	-	-	-	-	-	-	-
Net-metered Power Plants	(7,814.4)	2,800.2						
Self Generation by Customers	-	-	-	-	-	-	-	-
Off-grid Conventional	-	-	-	-	-	-	-	-
Off-grid Non-Conventional	-	-	-	-	-	-	-	-
Charcoal Production	-	-	-	-	-	-	-	-
Own Use	-	(2,288.9)	-	-	-	-	-	-
Conversion Losses	-	-	-	-	-	-	-	-
Losses in T&D	-	(5,487.2)	-	-	-	-	-	-
Non Energy Use	-	-	-	-	-	-	-	-
Total Energy Conversion	**(85,536.7)**	**52,566.0**	**252.4**	**1,764.6**	**(8.0)**	**-**	**1,111.7**	**2,521.0**
Energy Use								
Agriculture	-	-	-	-	-	-	2,043.5	-
Industries	-	16,508.5	2,955.6	-	-	-	127.5	-
Road Transport	-	-	2.1	53,673.7	-	-	-	-
Rail Transport	-	-	-	-	-	-	-	-
Domestic Aviation	-	-	-	-	-	3.0	-	49.9
Household, Commercial & Other	-	36,309.1	10,096.4	-	-	-	2,268.4	-
Total Energy Use	**-**	**52,817.6**	**13,054.1**	**53,673.7**	**-**	**3.0**	**4,439.4**	**49.9**

Table 7.2 – Sri Lanka Energy Balance: 2022 (in Tera Joules)

Diesel	Fuel Oil (FO 1500)	Residual Oil	Solvents	Coal	Baggase Agro Residues	Firewood	Charcoal	Crude Oil	Total
-	-	-	-	-	5,368.8	163,075.0	-	-	259,339.8
70,695.6	10,085.2	-	-	45,025.3	-	-	-	32,067.2	233,045.1
-	-	-	-	-	-	-	-	-	-
(4,698.1)	(18,600.7)	-	-	-	-	-	-	-	(34,213.4)
(609.6)	1,193.5	4,251.7	7.0	13,321.5	13.7	-	-	(7,755.0)	10,154.0
65,387.9	**(7,322.0)**	**4,251.7**	**7.0**	**58,346.8**	**5,382.5**	**163,075.0**	**-**	**24,312.2**	**468,325.5**
5,634.3	7,968.0	-	100.2	-	-	-	-	(22,846.0)	(2,086.5)
-	-	-	-	-	-	-	-	-	(34,706.0)
(8,361.9)	(7,556.9)	(4,251.7)	-	(56,531.3)	-	-	-	-	(48,425.5)
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	(1,297.6)	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	(2,288.9)
-	-	-	-	-	-	-	-	(1,466.2)	(1,466.2)
-	-	-	-	-	-	-	-	-	(5,487.2)
-	-	-	-	-	-	-	-	-	-
(2,727.6)	**411.1**	**(4,251.7)**	**100.2**	**(56,531.3)**	**(1,297.6)**	**-**	**-**	**(24,312.2)**	**(94,460.3)**
-	-	-	-	-	-	-	-	-	2,043.5
16,488.1	2,815.1	-	-	2,334.4	4,084.9	80,382.7	-	-	125,696.7
51,160.0	-	-	-	-	-	-	-	-	104,835.8
1,551.2	-	-	-	-	-	-	-	-	1,551.2
-	-	-	-	-	-	-	-	-	52.9
-	-	-	-	-	-	82,692.4	-	-	131,366.3
69,199.3	**2,815.1**	**-**	**-**	**2,334.4**	**4,084.9**	**163,075.0**	**-**	**-**	**365,546.4**

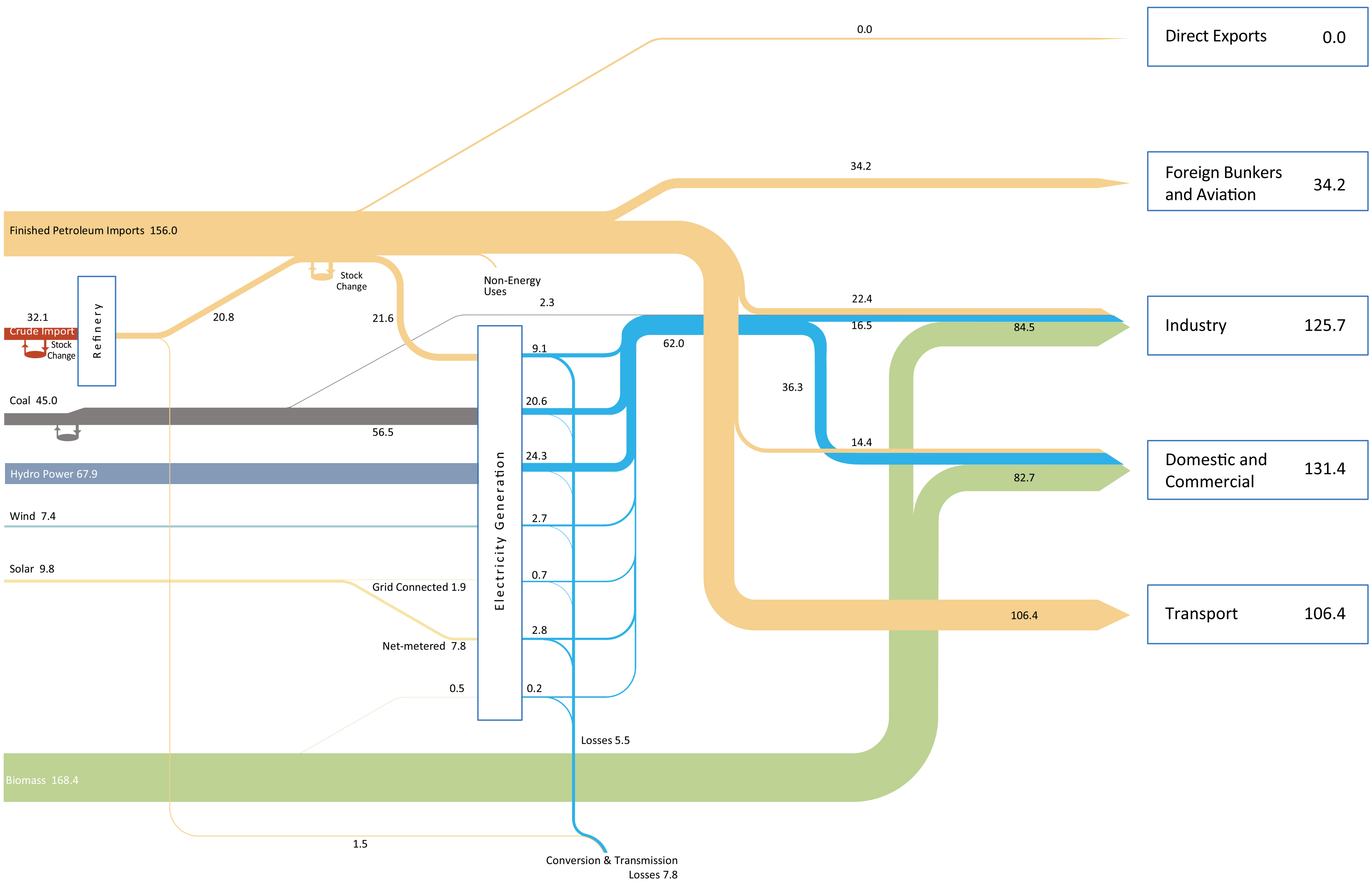

Figure 7.2 – Energy Flow Diagram - 2022 (PJ)

8 Energy and Economy

8.1 Electricity Sector Financial Performance

The year 2021 recorded poor financial performance for the CEB, and the return on assets (RoA) was negative for several consecutive years and stood at (19.8)%. The LECO recorded a better financial performance with an RoA of 5.0%. Table 8.1 summarises the financial performance of CEB and LECO.

Table 8.1 – Financial Performance of CEB and LECO

	2010	2015	2019	2020	2021	2022
CEB						
Net assets in Operation (LKRM)	378,207	616,154	781,869	819,086	851,938	894,718
Return on assets (%)	0.1	2.0	(7.4)	(5.7)	(2.7)	(19.8)
LECO						
Net assets in Operation (LKRM)	8,420	10,911	13,281	13,675	14,180	14,972
Return on assets (%)	(1.9)	4.5	13.9	7.5	16.0	5.0

8.2 Financial Performance of the Petroleum Sector

8.2.1 Impact on Macro Economy

The average crude oil price (Brent price) stood at USD 99.06 per barrel in 2022. The Brent price in 2021 was USD 70.80 per barrel, which rose by 39.9% in 2022. The net petroleum import bill was USD 5,131 million, a 21% increase from the USD 4,067 million in 2021. With the demand for petroleum increasing over the past years, expenditure on oil imports as a percentage of non-petroleum exports stood at a staggering 36.4% in 2022. Table 8.2 shows the historic trends of the petroleum import costs.

Table 8.2 – Petroleum Import Costs and its Impact on the Macro Economy

million USD	2010	2015	2019	2020	2021	2022
Total Exports	8,626	10,546	11,940	10,047	12,499	13,106
Total Imports	13,451	18,935	19,937	16,055	20,637	18,291
Petroleum Imports	3,183	2,864	4,133	2,778	4,067	5,131
Petroleum Re-exports	263	374	521	374	506	568
Net Oil Imports	2,920	2,490	3,612	2,404	3,561	4,563
Non Petroleum Exports	8,363	10,172	11,419	9,673	11,993	12,538
Net Oil Imports as % of Non Petroleum Exports	34.9	24.5	31.6	24.9	29.7	36.4

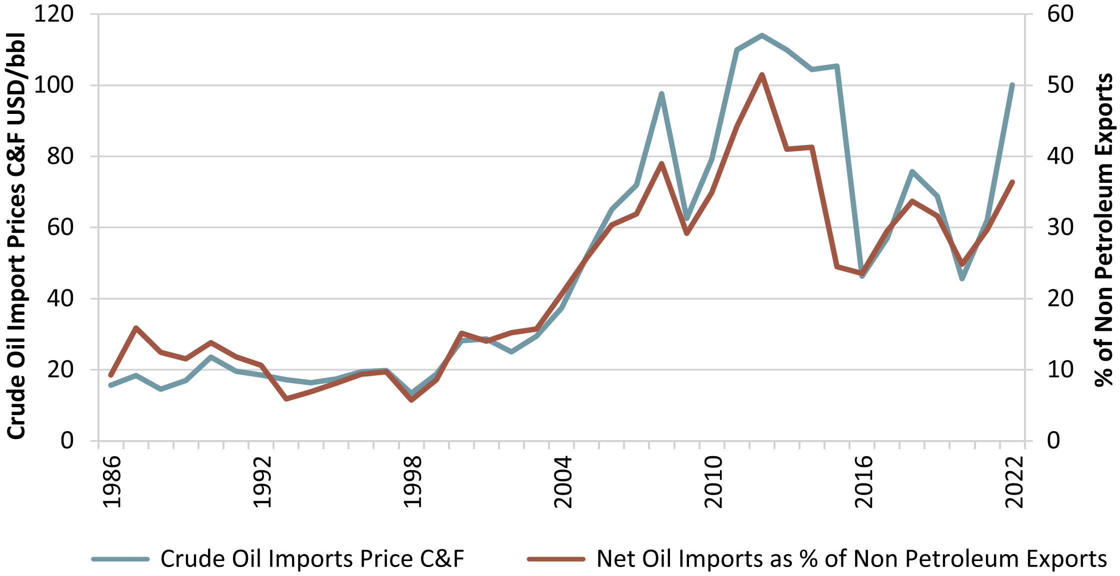

Figure 8.1 - Net Oil Imports as a Percentage of Exports

The impact of oil import bill on the national economy is clearly presented in the above graph, as the cost of net oil Imports as a percentage of all non-petroleum export earnings. This has two important points in history, first being in 1982, where it climbed to 44.8% and more recently in 2012 when it reached the highest ever value of 51.5%. This value for net oil imports as a percentage of non-petroleum exports climbed steadily over the consecutive years, declined in 2020, but rose sharply upto 36.4% in 2022.

8.2.2 Petroleum Sector Financial Performance

Ceylon Petroleum Corporation (CPC) dominates the petroleum sector of the country. However, the role of Lanka Indian Oil Company (LIOC) and the LP Gas companies also have a reasonable bearing on the overall sector performance. Several bunkering companies were also active in the petroleum sector. Table 8.3 presents financial performance details of the CPC and LIOC.

Table 8.3 – CPC and LIOC Financial Performance

LKR million	2010	2015	2019	2020	2021	2022
CPC						
Total Revenue	277,084	423,741	669,044	530,877	613,732	1,193,288
Total Cost	(304,007)	444,422	680,900	528,506	695,548	1,808,341
BTT/GST/VAT	20,222	37,761	15,731	8,740	9,079	5,648
Income Tax	-	634	-	-	-	-
Cost of Sales	-	-	626,599	454,880	588,823	1,108,952
Crude & Product Import Cost	(265,604)	337,119	-	-	-	-
Estimated other Cost	(18,181)	68,908	38,549	64,886	97,647	693,741
Profit/ Loss	**(26,923)**	**(20,681)**	**(11,856)**	**2,371**	**(81,816)**	**(615,053)**
LIOC *						
Total Revenue	51,423	68,728	78,227	68,268	81,126	242,254
Total Cost	(49,376)	69,114	76,521	68,709	78,713	208,367
VAT, ESC, Debit,Payee & other taxes	(998)	134	106	42	44	1,122
Income Taxes	(17)	286	8	(60)	371	6,236
Import Duty	-	-	-	-	-	-
Product Cost	-	65,986	73,344	66,244	75,575	193,444
Estimated other costs	-	2,709	3,063	2,484	2,722	7,565
Profit/ Loss	**1,032**	**(386)**	**1,706**	**(441)**	**2,412**	**33,887**

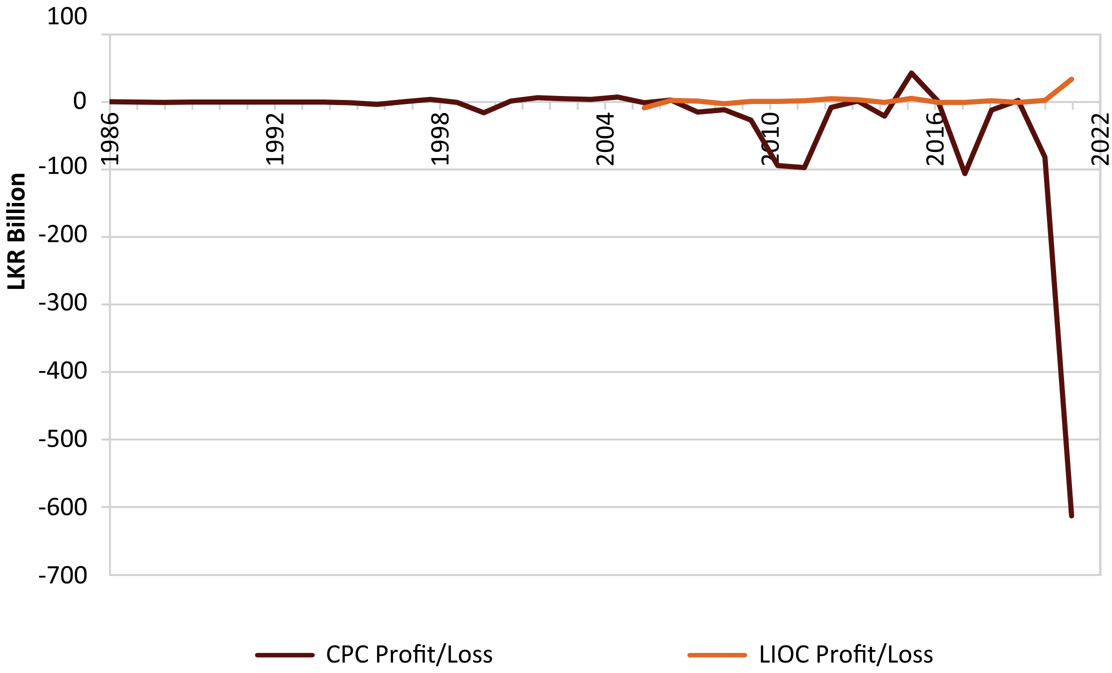

Figure 8.2 – Profit/Loss of CPC and LIOC

The CPC recorded a loss of LKR 615 billion in 2022, which was the greatest loss recorded in its history.

8.3 Energy-Economy Indicators

Commercial energy (petroleum, electricity and coal) intensity is an indicator of a country's energy utilisation with respect to the national output (measured in terms of Gross Domestic Product-GDP). The commercial energy intensity decreased from 0.72 TJ/GDP million LKR in 2021 to 0.66 TJ/GDP million LKR in 2022. This is attributable to the much lower economic output of the country and the increased demand for energy services from the population confined to their homes.

Table 8.4 – Sri Lanka Energy Indices

	2010	2015	2019	2020	2021	2022
Electricity (TJ)	33,156.4	42,274.8	52,846.7	51,849.8	55,088.1	52,817.6
Petroleum (TJ)	125,958.2	171,363.1	174,347.4	154,818.4	177,921.2	143,234.6
Coal (TJ)	2,509.2	2,283.7	2,311.0	2,092.7	2,113.2	2,334.4
Total commercial energy (TJ)	**161,623.9**	**215,921.5**	**229,505.1**	**208,761.0**	**235,122.5**	**198,386.5**
GDP at 1982 factor cost prices (million LKR)	352,878	473,954	540,042	520,601	539,863	497,754
Commercial Energy Index	2.58	3.44	3.66	3.33	3.75	3.16
GDP Index (Index 1984=1.0)	3.38	4.54	5.17	4.99	5.17	4.77
Commercial Energy Intensity (TJ/LKR million)	**0.46**	**0.46**	**0.43**	**0.40**	**0.44**	**0.40**
Commercial Energy Intensity Index (1984=1.0)	0.76	0.71	0.71	0.67	0.72	0.66

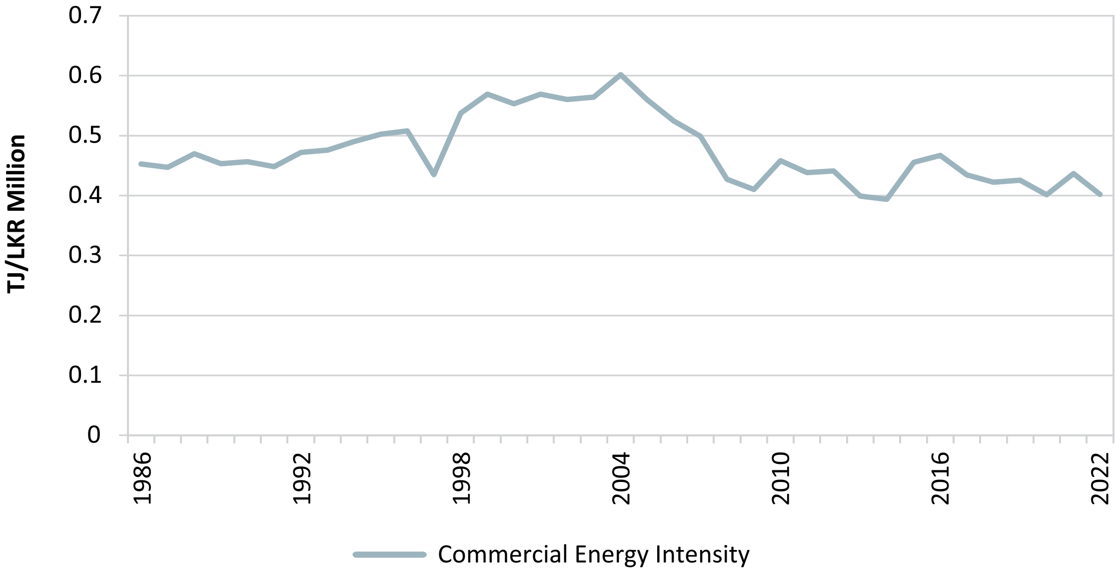

Figure 8.3 – Commercial Energy Intensity

9 Environmental Impacts

9.1 Grid Emission Factor

The 'Average Emission Factor (AEF)' is used mainly for reporting carbon footprint of electricity users. This emission factor is calculated by dividing the total emissions from the power sector from the total units of electricity used in the country in a given year. If the emission reductions due to any sustainable energy intervention are to be calculated, the appropriate emission factor would be the Grid Emission Factor (GEF).

Table 9.1 – Average Emission Factor

	2010	2015	2019	2020	2021	2022
Emission Factor (kg CO_2/kWh)	0.3158	0.4753	0.5625	0.5309	0.4357	0.4173

The SEA conducted a survey on the usage of electrical appliances in the domestic sector in collaboration with the Department of Census and Statistics in 2019, covering a representative sample of over 6,000 households. Cooking energy fuels were also assessed during this survey. Three cooking fuels were used, and based on this preliminary data, the emissions from cooking in the domestic and commercial sector were estimated, using IPCC emission factors. The results for 2022 are given in Table 9.2.

Table 9.2 – CO_2 Emissions from Cooking in the Domestic and Commercial Sector

Fuel (kt per annum)	2022
Fuel wood	2,100
LPG	321
Kerosene	5

The GEF indicates the amount of CO_2 avoided, if a specific intervention is made either through the introduction of a renewable energy project to a grid or through the introduction of an energy saving project in the grid. The GEF also represents the quantity of CO_2 emitted by a power system during a year. The GEF pivots on three factors, *viz*., Operating Margin, Build Margin and Combined Margin. 'Margin' refers to the happenings of renewable energy based power or an energy saving project.

The Grid Emission Factor for 2022 was calculated using the Methodological Tool 07 'Tool to calculate the emission factor for an electricity system' (Version 07.0).

9.1.1 Operating Margin

The Operating Margin (OM) is a concept which includes all power plants which can have reduced outputs due to a project. It specifically excludes 'low cost, must run' power plants, implying that with or without the project, such generation will continue. Table 9.3 gives the Simple Operating Margin (OM).

Table 9.3 – Operating Margin

	2019	2020	2021	2022
Emissions from Power Plants (t-CO_2)	3,552,816.2	2,960,912	1,908,745	1,642,648
Net Electricity Generation (GWh) excluding low-cost must run power plants	5,006.7	4,179.3	2,498.4	2,464.5
Operating margin CO_2 emission factor (kg-CO_2/kWh)				
Three-year generation based weighted average	0.7084	0.7084	0.7208	0.7123

9.1.2 Build Margin

The Build Margin (BM) is a concept which attempts to foretell the happenings of a generation system in future, during the crediting period of a project, considering the recent additions to a generation system.

Table 9.4 – Build Margin

	Unit	2019	2020	2021	2022
Emissions of power plants considered for the BM	tonnes of CO_2	4,266,621.5	4,111,940.3	3,922,524.3	3,290,087.8
Generation of power plants considered for the BM	GWh	5,101.3	5,381.3	5,863.0	5,632.3
Build margin emission factor	kg-CO_2/kWh	0.8364	0.7641	0.6690	0.5841

9.1.3 Combined Margin

The Combined Margin (CM) is a weighted average of OM and BM and is commonly known as the Grid Emission Factor (Table 9 5).

Table 9.5 – Combined Margin (kg-CO_2/kWh)

	2019	2020	2021	2022
For solar, wind Projects	0.7404	0.7224	0.7079	0.6803
All other Projects; 1st crediting period	0.7724	0.7363	0.6949	0.6482
All other Projects; 2nd - 3rd crediting period	0.8044	0.7502	0.6820	0.6162

The OM, BM and CM are required for the assessment of CO2 emission reductions for projects claiming carbon credits under UNFCC guidelines. The GEF is indicated in Figure 9.1.

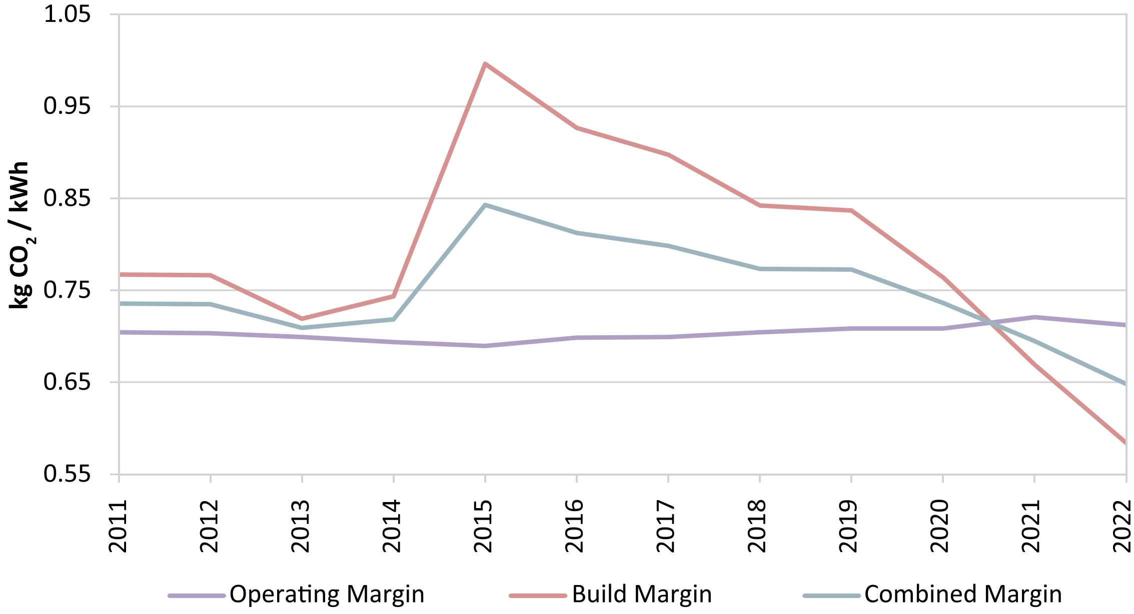

Figure 9.1 – Grid Emission Factors

The emission of CO_2 from power plants are depicted in Figure 9.2. The emission of CO_2 per kWh decreased in 2022 owing mainly to fuel supply shortages in power generation and load shedding.

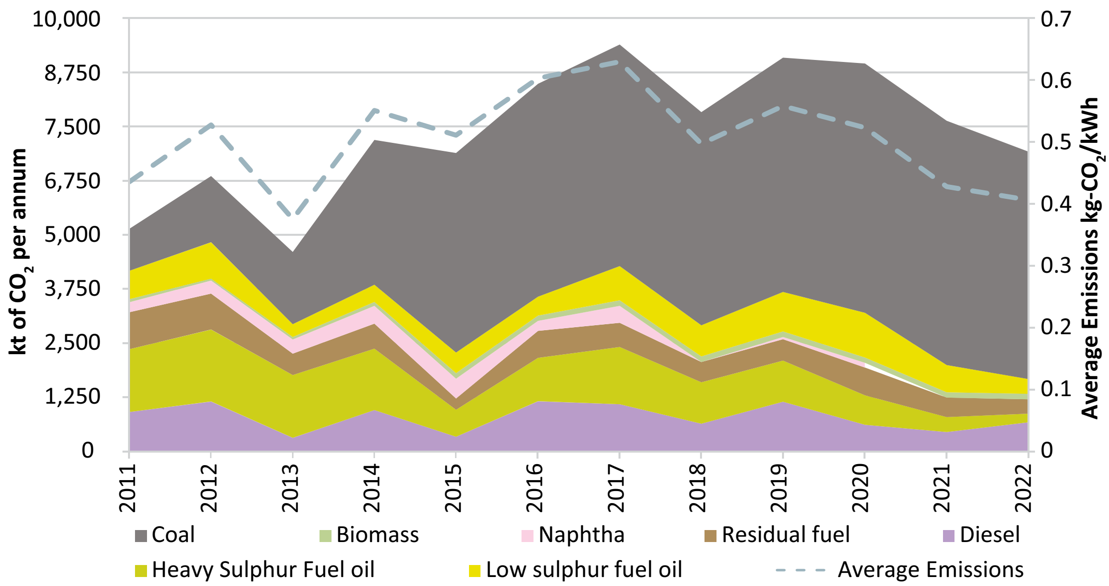

Figure 9.2 – Emissions from Power Plants by Type of Fuel

10 Energy Sector Performance and Future Outlook

The power and energy sector of the country faced insurmountable challenges in 2022, with the supply of petroleum products in disarray. Significant power outages and fuel shortages, particularly during mid-2022, caused unprecedented disruptions in socio-economic activities, resulting in a major setback to the overall economy of the country during 2022. However, the severity of the energy crisis subsided in the second half of the year amidst increased contribution of hydropower generation, and measures introduced to address supply and demand imbalances, including the introduction of a QR code based fuel rationing system for transport fuel supply, securing of foreign financial assistance to import cooking gas, rolling out cost reflective revisions to prices of fuel products and electricity after long overdue price adjustments. Accordingly, the domestic retail prices of petroleum products were revised several times in 2022, based on a pricing formula introduced in May 2022. Electricity tariffs were also revised upward in August 2022, after eight years.

10.1 Electricity

Electricity generation decreased by 4.7% in 2022, compared with the generation of 2021 recording the total generation in 2022 as 16,828.4 GWh. The generation from major hydro was 5,382.7 GWh in 2022, which recorded a decrease of 5% compared with the generation of 2021. The generation from coal was 5,372.4 GWh in 2022, which marked a decrease of 7%, while the generation from oil was 2,513.6 GWh in 2022, which marked a decrease of 8%.

The share of power generated by the CEB stood at 76% in 2022, while the balance was provided by IPPs, new renewable energy plants and micro power producers.

Power generation in 2022 was severely affected by shortages in fuel supply, in both oil and coal required for power generation, owing to the crisis stemming from the dwindling foreign reserves. Additionally, the decrease in rainfall only exacerbated the power generation crisis. In response, the Utility had to execute significant demand management controls in the electricity sector, including power cuts, particularly from March to April in 2022. The CEB executed daily scheduled power cuts from February 2022 onwards, amidst low reservoir water levels in early 2022. The length of power outages increased to over ten hours per day towards early April 2022, reflecting the sharp drop in reservoir water levels due to dry weather conditions, the lack of fuel for power generation amidst the cashflow pressures of CEB to procure fuel, and delays in procuring fuel due to the foreign exchange pressures in the country. The torrential monsoon rains during May-September 2022 supported the provisioning of electricity, largely through hydropower generation, thereby curbing high reliance on thermal sources. Accordingly, the load shedding was gradually confined to one to three hours per day from May 2022, when reservoir levels started rising under conducive weather patterns. However, there were also several shutdowns of thermal plants amidst fuel shortages and intermittent closures of certain units of the Norochcholai coal power plant due to scheduled maintenance and repairs. However, the vulnerability of the electricity system increased further, owing to the interruptions in the coal procurement process and the delays in coal shipments caused by the foreign exchange shortages. The Central Bank facilitated coal procurement by establishing a sinking fund to provide required foreign exchange for importation of coal since September 2022.

Electricity sales too, decreased by 3.3% in 2022, compared with 2021. This was mainly driven by power interruptions and demand contraction in primary user categories. The consumption of electricity declined notably owing to power interruptions, albeit improvements in electricity sales during the early part of

2022 and the recovery of economic activity following the COVID-19 pandemic.

Recognising the need for adopting state-of-the-art technologies, the CEB initiated a project to implement smart metering techniques to collect accurate and real time sales data on energy usage, while notifying users of their consumption levels. The progress of this project however, was hampered due to several factors, including high costs of smart metres, lack of awareness among users and technical issues.

After a continuous stagnation of eight years, the electricity tariffs were revised upward in 2022 considering the soaring cost of power generation, which further exacerbated the financial crisis of the CEB. The electricity tariffs were revised on August 10, 2022, with an average upward revision of 75%, considering the energy affordability of low income households by allowing concessions on the fixed charge for low consumption categories of 0-30 unit and 31-60 unit blocks. However, even after this upward revision, the CEB was unable to achieve a break-even level of financial performance as reflected in their financial statements, underlining the need for regular cost reflective price revisions to ensure the financial viability of the CEB. The increased reliance on hydropower generation and the upward revisions to electricity tariffs helped improve the financial performance of the CEB in 2022, despite the surge in cost of thermal power generation.

However, owing to the increased reliance on thermal-based power generation in the early months of 2021, the CEB experienced difficulties in meeting the corresponding electricity demand of the country. Therefore, the difficulties in fuel procurement caused by foreign exchange issues amidst soaring global prices of energy commodities took a heavy toll on the energy industry.

The CEB reported a loss of LKR 272.9 billion in 2022, compared with the loss of LKR 34.6 billion recorded in 2021. This includes a part of the revaluation loss of the foreign loan outstanding of the Norochcholai coal power plant, amounting to LKR 94.7 billion. The short term debt of the CEB from banks and other outstanding liabilities to CPC and IPPs increased to LKR 361.9 billion by end 2022 from LKR 289.0 billion recorded by end 2021. Meanwhile, non-settlement of payment dues by the CEB since late 2021, amounting to LKR 37.3 billion for renewable energy purchases, remained a formidable obstacle to the expansion of the renewable energy sector.

The Government undertook several initiatives in 2022 with a view to transforming the power and energy sector to an economically viable sector. The State Owned Enterprise Restructuring Unit, established under the Ministry of Finance, Economic Stabilisation and National Policies in 2022, facilitated the restructuring of government owned business entities, including the CEB. The report, 'National Energy Potentials, Strategies and the Roadmap for the Next Decade', which was submitted to the Cabinet of Ministers, was approved in late 2022.

The Long Term Generation Expansion Plan 2022–2041 (LTGEP) was prepared during 2022, wherein this plan seeks to expand the share of renewable energy of the total electricity generation to 70% by 2030, while committing to carbon neutrality in power generation by 2050. The updated LTGEP 2023–2042 was drafted in accordance with Government policies and submitted to the Public Utilities Commission of Sri Lanka for approval in September 2022.

The Sri Lanka Electricity Act, No. 20 of 2009 was amended, removing procedural obstacles to facilitate the development of the renewable energy sector, and the Sri Lanka Electricity (Amendment) Act, No. 16 of 2022 was published in June 2022.

Diversifying energy sources and expanding the generation capacity remain major priorities of the Government in fulfilling the ever increasing energy demand. The Government has opted to diversify the energy mix by including new energy sources, such as liquefied natural gas (LNG). Accordingly, the 300 MW Sobadhanavi LNG plant in Kerawalapitiya was under construction in 2022, while the preliminary process to set up a second 300 MW LNG plant in Kerawalapitiya, was also underway.

The 35 MW Broadlands hydropower project was in the commissioning stage at end of 2022, while the construction work of other hydropower projects, such as Uma Oya (120 MW), Moragolla (31 MW), Gin Ganga (20 MW), and Thalpitigala (15 MW) was in progress. Further, feasibility studies for large scale solar projects in Hambantota and Trincomalee were initiated in 2022, in a bid to expand solar capacity.

10.1.1 New Renewable Energy Development

The NRE industry recorded a marginal decrease of generation by (4.9%) from 2,540.3 GWh in 2021 to 2,422.0 GWh to 2022, even with the achievements of many milestones. This includes the power generation of the 100 MW Mannar wind power plant of the CEB, which was 362 GWh in 2022.

The report 'National Energy Potentials, Strategies and the Roadmap for the Next Decade' was submitted to the Cabinet of Ministers and approved in late 2022. Additionally, the Long Term Generation Expansion Plan 2022–2041 (LTGEP) was prepared in 2022, with the expectations of expanding the share of renewable energy of the total electricity generation to 70% by 2030, while committing to carbon neutrality in power generation by 2050. The updated LTGEP 2023–2042 was drafted in accordance with Government policies and submitted to the Public Utilities Commission of Sri Lanka for approval in September 2022.

Further, a 50 MW Mannar wind park as an extension to the existing plant and another two wind plants in Mannar, (Phase II and III, 100 MW respectively, were in the pipeline for 2022. Initially identified wind potential areas that were earmarked in the Renewable Energy Resource Development Plan (2021–2026), including the Veravil Wind Project (200 MW), Karachchi Wind Project (100 MW), Ponnalei Wind Power Project (100 MW), and Manthai West Wind Power Project (100 MW). In 2022, these were in the preliminary stages of implementation. Further, the instalment of 100 MW wind power capacity was initiated in the Pooneryn renewable energy park project of 233 MW wind power capacity and 150 MW solar power capacity. Also, the construction of the 100 MW Siyambalanduwa solar power project was in progress in 2022. Further, feasibility studies for large scale solar projects in Hambantota and Trincomalee were initiated to expand solar capacity.

The Sri Lanka Sustainable Energy Authority also revised the Renewable Energy Resource Development Plan for 2024-2029 in 2022. Under the Soorya Bala Sangramaya, a cumulative capacity of 660 MW was added to the grid, generating 777.7 GWh. By end of 2022, 45,845 consumers served the grid. The Training Hub for Renewable Energy Technologies in Sri Lanka (THREE Lanka) project was also underway in collaboration of universities in Europe and Sri Lanka.

10.2 Petroleum

In 2022, the fuel procurement procedure of the Ceylon Petroleum Corporation (CPC) was challenged and worsened by the financial crisis and sparse liquidity in the domestic foreign exchange market. Inconsistency in fuel distribution and uncertainty in availability of fuel prompted longer queues and severe shortages, hampering day to day life as never experience before. The Government secured a short term credit line facility of USD 500 million from the Import Export Bank India for financing the purchase of petroleum products during the year, while utilising USD 200 million out of the credit facility amounting to USD 1,000 million obtained from the State Bank of India for the same purpose, amidst the worst economic crisis in the country. In May 2022, the Cabinet of Ministers approved the implementation of a new pricing formula for petroleum products, and accordingly a committee was appointed to devise an appropriate cost reflective pricing formula. The pricing formula adopted from May 2022 was revoked subsequently in December 2022, as the Government decided to implement the pricing formula adopted in 2018 and to revise domestic petroleum prices on monthly basis. The Ministry of Power and Energy also granted the approval for several bunker license holders to supply selected fuel products for a specific period through the oil bank at Jaya Container Terminal to exporters, power generation companies, tourism service providers, licensed telecommunication service providers, and other industries against the receipt of payment in US dollars. In early July 2022, CPC commenced registration of priority consumers engaged in the export sector with business registration in Sri Lanka to purchase fuel by paying in US dollars, subject to a guaranteed quota for fuel.

To ensure uninterrupted supply of fuel for the transport sector, CPC introduced a system, wherein fuel was dispensed through its own filling stations according to a system based on the last digit of the vehicle number plate from late July 2022 onwards, before implementing the QR code system for fuel distribution. Under the National Fuel Pass QR code system, which was effective from 01 August 2022, weekly quotas were given for prescribed vehicle categories, thereby economising the limited availability of fuel and distributing island-wide under severe constraints. Further, several measures were implemented to ensure supply of fuel for Industries, Agriculture sector, and Fisheries sector during the year. The Tourist Fuel Pass prepaid card system was implemented at the beginning of October 2022, enabling tourists to use a US dollar denominated prepaid card to purchase fuel at stations across the island with a view to facilitating the recovery of the tourism industry. In the latter part of 2022, the CPC implemented the storage module concept for importation of crude and refined products, thereby facilitating unloading of fuel cargo without delays over fragmented payments for the quantity drawn from the storage terminals of CPC and CPSTL. This arrangement rendered a continuous fuel supply, albeit with limitations, and helped minimise cash flow deficiencies of CPC to a greater extent.

Crude oil prices rose sharply in 2022, primarily driven by the geopolitical tensions in Eastern Europe and the tightened global oil supply conditions, despite the downward pressures observed towards the second half of the year, following the growing concerns over the global economic slowdown. Crude oil prices were on a rising trend during the first half of 2022 with daily prices (Brent) briefly reaching USD 140 per barrel in March 2022 for the first time since July 2008, mainly due to the sanctions imposed on Russia by Western countries, one of the leading exporters of petroleum products in the world.

In 2022, the average crude oil price (Brent) increased by 39.9% to USD dollars 99.06 per barrel, compared with the average price of USD 70.80 per barrel recorded in 2021. The average global prices of major refined petroleum products, including gasoline 92 octane, gasoline 95 octane, auto diesel, super diesel, and kerosene, also increased within the range of 40 – 75%, year-on-year, in 2022. In line with rising trends in global crude oil prices, the average price of crude oil imported by the CPC increased by 45.4% to USD 100.11 per barrel in 2022, compared to the average of USD 68.86 per barrel recorded in 2021.

As part of the demand management strategy, the prices of petroleum products were revised multiple times by the CPC in 2022, in collaboration with the Ministry of Power and Energy. Prices were revised upwards as well as downwards in line with the fluctuation of global prices of petroleum products. The retail price of kerosene was notably adjusted upward by CPC towards the end of August 2022, to curb the substantial losses incurred by CPC in selling kerosene at a significantly subsidised rate. The LIOC also revised the domestic prices of petroleum products in accordance with the CPC revisions.

Further, the overall sales volume of petroleum products in the domestic market recorded a decline in 2022. The total petroleum sales registered a year-on-year contraction of 13.8% in 2022 with a decline in sales volumes of CPC, while sales volumes of LIOC recorded a notable growth in the period under review, mainly attributed to the disrupted fuel supply of CPC.

The output from the Sapugaskanda refinery recorded a significant decline by 55.4% in 2022, since the refinery remained closed for almost 225 days due to unavailability of crude oil for refinery operations.

The financial performance of CPC continued to deteriorate in 2022, largely driven by losses due to significant depreciation of the exchange rate, despite the cost reflective price revisions implemented in the latter part of 2022. As per the unaudited provisional financial statements, the operational loss of the CPC was limited to LKR 615 billion in 2022. The loss in 2021 was however LKR 81.8 billion.

Several infrastructure development initiatives and legal enforcements aimed at enhancing the efficiency and performance of the petroleum industry in Sri Lanka were implemented in 2022. Expressions of Interest (EoI) were called from new fuel suppliers, with the approval of Cabinet of Ministers, to explore a feasible business model for importation, distribution and selling of petroleum products in the domestic market. This process was complemented by the enactment of the Petroleum Products (Special Provisions) (Amendment) Act, No. 27 of 2022 with effect from 26 October 2022. The Agreement for the development of the Trincomalee Oil Tank Farm was signed on January 6, 2022 with the participation of CPC, LIOC, and Trinco Petroleum Terminal (Pvt.) Limited (TPTL) and undertook a range of initiatives to develop 61 tanks, accordingly.

The supply of LP gas in the country was significantly interrupted by the shortage of foreign exchange mainly during the first half of 2022, largely affecting urban and semi-urban households. A major resurgence of electric cooking, fuel wood cooking, improved cookstoves and even charcoal supply were witnessed in many urban and rural locations, as an alternative for LP gas cooking energy. However, with the receipt of financial assistance from the World Bank and the Central Bank's actions to increase foreign exchange liquidity in the banking system helped importation of LPG, restoring normalcy of LPG supply in the domestic market. In August 2022, the Cabinet of Ministers approved the adoption of a cost reflective formula to determine domestic LPG prices of which the implementation commenced since August 2022.

List of Small Power Producers

hydro | solar | biomass/dendro | wind | waste heat

Annex I

Independent Power Producers (IPPs)

Starting from 1997, many IPPs entered the electricity market, supplying electricity to the national grid. CEB has separate power purchase agreements with these private sector companies.

1. Asia Power (Pvt) Ltd
2. Colombo Power (Pvt) Ltd
3. AES Kelanitissa (Pvt) Ltd
4. ACE Power Embilipitiya (Pvt) Ltd
5. Yughadhanavi (Pvt) Ltd

Small Power Producers

Many new small power producers came into existence as a result of the attractive tariffs offered by the CEB and the lending facilities provided by the RERED project. A total of 280 SPPs were operational by the end of 2022. CEB has signed Standardised Small Power Purchase Agreements (SPPAs) with these companies.

List of Small Power Producers

hydro | solar | biomass/dendro | wind | waste heat

	Name of Power Plant	Yr commissioned	Capacity (MW)	Generation (GWh)
1	Dick Oya	1996	0.96	1.7
2	Seetha Eliya	1996	0.07	0.4
3	Ritigaha Oya	1997	0.80	-
4	Rakwana Ganga	1999	0.76	1.9
5	Kolonna	1999	0.78	1.7
6	Ellapita Ella	1999	0.55	2.1
7	Carolina	1999	2.50	12.0
8	Weddamulla	1999	0.20	-
9	Delgoda	2000	2.65	13.6
10	Mandagal Oya	2000	1.28	4.7
11	Glassaugh	2000	2.53	4.3
12	Minuwnella	2001	0.64	-
13	Kabaragala	2001	1.50	5.0
14	Bambarabatu Oya	2001	3.20	12.4
15	Galatha Oya	2001	1.20	-
16	Hapugastenna I	2001	4.60	23.0
17	Belihuloya	2002	2.50	9.4
18	Watawala (Carolina II)	2002	1.30	3.1

List of Small Power Producers

hydro | solar | biomass/dendro | wind | waste heat

	Name of Power Plant	Yr commissioned	Capacity (MW)	Generation (GWh)
19	Niriella	2002	3.00	9.8
20	Hapugastenna II	2002	2.30	5.0
21	Deyianwala	2002	1.50	3.3
22	Hulu Ganga 1	2003	6.50	17.4
23	Ritigaha Oya -II	2003	0.80	2.9
24	Sanquhar	2003	1.60	5.1
25	Karawila Ganga	2004	0.75	2.8
26	Brunswic	2004	0.60	-
27	Sithagala	2004	0.80	2.5
28	Way Ganga	2004	8.93	27.1
29	Alupola	2004	2.52	7.6
30	Rathganga	2004	3.00	12.2
31	Waranagala	2004	9.90	44.0
32	Nakkawita	2004	1.01	0.3
33	Walakada	2004	4.21	20.1
34	Miyanawita Oya	2004	0.60	1.7
35	Atabage Oya	2004	2.20	6.0
36	Batalagala	2004	0.10	-
37	Hemingford	2005	0.18	-
38	Kotapola	2005	0.60	1.9
39	Wee Oya	2005	6.00	23.3
40	Radella	2005	0.20	0.6
41	Kumburuteniwela	2005	2.80	7.4
42	Asupini Ella	2005	4.00	15.5
43	Kalupahana	2005	0.80	2.5
44	Upper Korawaka	2005	1.50	3.5
45	Badalgama (Biomass)	2005	1.00	-
46	Delta Estate	2006	1.60	5.3
47	Gomala Oya	2006	0.80	2.9
48	Gurugoda Oya	2006	4.45	9.6
49	Coolbawan	2006	0.75	2.1
50	Henfold	2006	2.60	9.0
51	Dunsinane	2006	2.70	11.1
52	Nilambe oya	2006	0.75	1.8
53	Kolapathana	2006	1.10	-
54	Guruluwana	2006	2.00	8.8
55	Kuda Oya	2006	2.00	6.7
56	Labuwewa	2006	2.00	6.1
57	Forest Hill	2006	0.30	-
58	Batatota	2007	2.60	0.7
59	Kehelgamu oya	2007	3.00	9.6
60	Kotankanda	2007	0.15	0.5

List of Small Power Producers

hydro solar biomass/dendro wind waste heat

	Name of Power Plant	Yr commissioned	Capacity (MW)	Generation (GWh)
61	Lower Neluwa	2007	1.45	5.7
62	Barcaple	2008	2.00	6.6
63	Kadawala 1	2008	4.85	1.5
64	Blackwater	2008	1.65	3.2
65	Koswatta ganga	2008	2.00	6.3
66	Kadawala ii	2008	1.32	1.2
67	Loggal oya	2008	4.00	8.7
68	Manelwala	2008	2.40	7.4
69	Somerset	2008	0.80	3.4
70	Sheen	2008	0.56	2.2
71	Palmerston	2008	0.60	2.7
72	Giddawa	2008	2.00	8.9
73	Magal ganga	2008	9.93	43.9
74	Soranathota	2008	1.40	2.4
75	Tokyo	2008	10.00	0.2
76	Lower Atabage	2009	0.45	0.6
77	Halathura Ganga	2009	1.30	4.8
78	Nugedola	2009	0.50	1.0
79	Pathaha Oya	2009	1.00	2.9
80	Badulu Oya	2009	5.80	20.2
81	Amanawala	2009	1.00	4.4
82	Adavikanda	2009	6.50	20.6
83	Bogandana	2009	3.00	9.5
84	Gangaweraliya	2009	0.30	1.1
85	Watakella	2010	1.00	4.7
86	Ganthuna Udagama	2010	1.20	3.5
87	Aggra Oya	2010	1.50	3.9
88	Mampury I	2010	10.00	17.9
89	Seguwanthivu	2010	10.00	23.9
90	Vidatamunai	2010	10.00	25.5
91	Willpita	2010	0.85	0.3
92	Denawak Ganga	2011	1.40	6.3
93	Maduru Oya	2011	5.00	19.1
94	Laymasthota	2011	1.30	3.2
95	Kalupahana Oya (Pahala)	2011	1.00	3.0
96	Bowhill	2011	1.00	3.7
97	Kirkoswald	2011	4.00	19.0
98	Kiriwan Eliya	2011	4.65	17.8
99	Gnnoruwa - II	2011	0.50	0.1
100	Thiruppane	2011	0.12	-
101	Gnnoruwa - I	2011	0.74	0.2
102	Nirmalapura	2011	10.00	31.0

List of Small Power Producers

hydro | solar | biomass/dendro | wind | waste heat

	Name of Power Plant	Yr commissioned	Capacity (MW)	Generation (GWh)
103	Watawala B	2012	0.44	1.9
104	Denawak Ganga MHP	2012	7.20	25.8
105	Waltrim	2012	2.00	8.0
106	Branford	2012	2.50	9.4
107	Upper Ritigaha Oya	2012	0.64	2.2
108	Koladeniya	2012	1.20	5.8
109	Upper Magalganga	2012	2.40	7.4
110	Kokawita MHP I	2012	1.00	2.9
111	Upper Hal Oya	2012	0.80	0.5
112	Kalugala Pitawala	2012	0.80	0.9
113	Bambarabotuwa MHP III	2012	4.00	12.4
114	Nandurana Oya	2012	0.35	0.5
115	Kaduruwan Dola Athuraliya	2012	0.02	-
116	Barcaple Phase II	2012	4.00	15.3
117	Bopekanda	2012	0.35	1.3
118	Falcon Valley	2012	2.40	4.6
119	Indurana	2012	0.06	-
120	Punagala	2012	3.00	8.3
121	Ambewala	2012	3.00	3.3
122	Madurankuliya	2012	10.00	34.1
123	Uppudaluwa	2012	10.00	13.6
124	Kalpitiya	2012	9.80	21.5
125	Green Energy	2013	0.25	1.3
126	Rakwana Ganga	2013	1.00	5.4
127	Wembiyagoda	2013	1.30	6.1
128	Pathanahenagama	2013	1.80	1.8
129	Wellawaya	2013	1.20	3.7
130	Lenadora	2013	1.40	5.3
131	Mulgama	2013	2.80	11.7
132	Rajjammana	2013	6.00	29.6
133	Kandadola	2013	0.18	1.0
134	Waverly	2013	1.20	3.6
135	Bambatuwa Oya	2013	3.00	7.1
136	Baharandah	2013	0.36	0.8
137	Gampola	2013	1.00	1.2
138	Gonagamuwa	2013	0.75	1.5
139	Kadurugaldora	2013	1.20	4.0
140	Werapitiya	2013	2.00	5.9
141	Madugeta	2013	2.50	9.8
142	Malpel	2013	0.01	-
143	Dunsinane cottage	2013	0.90	1.8
144	Mile Oya	2013	1.20	2.7

List of Small Power Producers

hydro   solar   biomass/dendro   wind   waste heat

	Name of Power Plant	Yr commissioned	Capacity (MW)	Generation (GWh)
145	Maduru Oya 2	2013	2.00	6.5
146	Mul Oya	2013	3.00	4.6
147	Embilipitiya (Dendro)	2013	1.50	-
148	Erumbukkudal	2013	4.80	13.4
149	Stellenberg	2014	1.00	3.6
150	Devituru	2014	1.20	4.6
151	Bulathwaththa	2014	3.80	6.8
152	Ranmudu Oya	2014	0.50	1.5
153	Ninthaur	2014	2.00	0.4
154	Bathalayaya	2014	5.00	18.0
155	Mampury II	2014	10.00	16.2
156	Mampury III	2014	10.00	22.5
157	Monaraella MHP	2014	1.80	6.2
158	Lower Kotmale Oya MHP	2014	4.30	18.4
159	Gammaduwa MHP	2014	0.90	2.6
160	Ritigaha Oya MHP - I	2014	0.40	2.2
161	Ross Estate MHP	2014	4.55	20.2
162	Maa Oya MHP	2014	2.00	3.4
163	Maha Oya MHP	2014	3.00	7.8
164	Bowhill MHP	2014	0.60	1.1
165	Kudawa Lunugalahena	2014	0.05	0.0
166	Puloppalai	2014	10.00	30.4
167	Vallimunai	2014	10.00	31.4
168	Musalpetti I	2015	10.00	21.1
169	Owala	2015	2.80	13.2
170	Naya Ganga	2015	1.60	8.6
171	Rideepana	2015	1.75	6.3
172	Thebuwana	2015	0.80	2.5
173	Maduru Oya II	2015	0.60	2.5
174	Demodara	2015	1.00	2.6
175	Lower Atabage Oya II	2015	1.25	4.4
176	Kehelwatta	2015	1.00	4.7
177	Theberton	2015	1.30	2.7
178	Ranmudu Oya	2015	0.55	1.4
179	Andaradeniya	2015	0.80	3.0
180	Jannet Valley	2015	0.95	2.3
181	Gawaragiriya MHP	2016	0.99	2.8
182	Samanalawewa MHP	2016	1.20	6.1
183	Upper Lemastota MHP	2016	1.00	2.4
184	Kurundu Oya Ella MHP	2016	4.65	13.1
185	Maskeli Oya MHP	2016	2.00	6.7
186	Hittaragewela MHP	2016	0.46	0.0

List of Small Power Producers

hydro | solar | biomass/dendro | wind | waste heatt

	Name of Power Plant	Yr commissioned	Capacity (MW)	Generation (GWh)
187	Ginigathhena Thiniyagala MHP	2016	0.80	1.4
188	Dolekanda MHP	2016	0.35	1.6
189	Gomale Oya	2016	1.40	3.0
190	Mawanana	2016	4.30	16.9
191	Ethamala Ella MHP	2016	2.00	12.1
192	Upper Waltrim MHP	2016	2.60	11.6
193	Urubokka MHP	2016	1.00	4.7
194	Ebbawala MHP	2016	4.00	10.6
195	Hulkiridola MHP	2016	0.75	1.9
196	Dambulu Oya MHP	2016	3.25	12.8
197	Saga (Baruthankanda)	2016	10.00	18.4
198	Solar One Ceylon Power	2016	10.00	19.2
199	Loluwagoda DPP	2016	4.00	5.9
200	Kiruwana Ganga MHP	2017	0.63	2.3
201	Ruhunu MHP	2017	0.35	0.8
202	Winsor Forest MHP	2017	0.40	1.6
203	Nahalwathura MHP	2017	0.40	2.6
204	Hapugahakumbura MHP	2017	1.60	5.1
205	Padiyapelella MHP	2017	3.50	15.3
206	Moragaha Oya MHP	2017	1.50	5.0
207	Campion MHP	2017	1.00	4.1
208	Demodara MHP	2017	1.60	6.7
209	Berannawa MHP	2017	0.50	1.3
210	Loggal Oya DPP	2017	2.00	2.2
211	Iris (Baruthankanda) SPP	2017	10.00	18.7
212	Anorchi Lanka (Baruthankanda) SPP	2017	10.00	18.5
213	Nedunkulam SPP	2017	10.00	19.8
214	Udawela MHP	2018	1.40	3.4
215	Mossville Estate MHP	2018	0.90	3.2
216	Loggal Oya MHP - Phase I	2018	1.60	2.9
217	Bambarapana MHP	2018	2.50	10.6
218	Manakola MHP	2018	2.50	9.6
219	Moragahakanda Phase I	2018	10.00	5.6
220	Moragahakanda Phase II	2018	7.50	36.9
221	Muruten Ela MHP	2018	0.50	1.3
222	Moragahakanda Phase III	2018	7.50	34.5
223	Polgaswaththa MHP	2018	0.30	2.7
224	Maliyadda MHP	2018	0.90	0.9
225	Ankanda MHP	2018	6.50	30.1
226	Thannewatha MHP	2018	1.00	1.7
227	Ranwala Oya MHP	2018	0.70	2.6

List of Small Power Producers

hydro | solar | biomass/dendro | wind | waste heat

	Name of Power Plant	Yr commissioned	Capacity (MW)	Generation (GWh)
228	Binathura Ela MHP	2018	0.70	1.8
229	Panamure DPP	2018	0.99	-
230	Kalawa Aragama DPP	2018	10.00	-
231	Loinorn MHP	2019	1.00	3.9
232	Koswathu Ganga MHP	2019	3.00	16.5
233	Elgin MHP	2019	2.40	8.7
234	Denipalle Oya MHP	2019	0.75	2.1
235	Deegalahinna Cascade II MHP	2019	0.55	0.6
236	Loggal Oya MHP	2019	1.35	2.2
237	Upper Hulu Ganga MHP	2019	1.90	5.0
238	Marukanda MHP	2019	1.80	6.5
239	Ganthuna MHP	2019	1.30	1.7
240	Kitulgala MHP	2019	1.00	3.3
241	Beramana MHP	2019	1.20	6.7
242	Dehiattakandiya DPP	2019	3.00	20.6
243	Vavuniya 2 SBSPII SPP	2019	1.00	1.7
244	Vavuniya 3 SBSPII SPP	2019	1.00	1.8
245	Beliatta 1 SBSPII SPP	2019	1.00	1.3
246	Embilipitiya 2 SBSPII SPP	2019	1.00	1.5
247	Embilipitiya 3 SBSPII SPP	2019	1.00	1.5
248	Pallekelle 1 SBSPII SPP	2019	1.00	1.6
249	Koskulana	2020	0.60	2.1
250	Halgran Oya MHP	2020	2.00	2.9
251	Chunnakam I	2020	10.00	35.3
252	Chunnakam II	2020	10.00	34.5
253	Pannala I	2020	1.00	1.3
254	Mathugama I	2020	1.00	1.4
255	Anuradhapura 2	2020	1.00	1.3
256	Anuradhapura 3	2020	1.00	1.4
257	Panadura I SBSP II	2020	1.00	1.5
258	Vaunia I	2020	1.00	1.3
259	Embilipitiya I	2020	1.00	1.3
260	Maho 2 SBSP II	2020	1.00	2.0
261	Maho 3 SBSP II	2020	1.00	2.1
262	Ampara I SBSP II	2020	1.00	1.6
263	Mathugama I SBS II 90	2020	1.00	1.8
264	Mathugama I SBS II 91	2020	1.00	1.4
265	Ampara 2 SBSP II	2020	1.00	2.1
266	Mahiyanganaya 1	2020	1.00	2.1
267	Mahiyanganaya 2	2020	1.00	2.1
268	Mahiyanganaya 3	2020	1.00	1.6

List of Small Power Producers

hydro | solar | biomass/dendro | wind | waste heat

	Name of Power Plant	Yr commissioned	Capacity (MW)	Generation (GWh)
269	Galle 2 SBS II 90	2020	1.00	1.5
270	Galle 3 SBS II 91	2020	1.00	1.5
271	Colombo Waste to Energy Waste (Municipal) PP	2020	10.00	69.9
272	Deduru Oya MHP	2021	2.00	6.1
273	Karapalagama MHP	2021	2.00	5.5
274	Madapitiya MHP	2021	0.60	2.5
275	Polonnaruwa 1 SBSPII SPP	2021	1.00	1.2
276	Horana 2 SBSPII SPP	2021	1.00	1.6
277	Horana 3 SBSPII SPP	2021	1.00	1.5
278	Mathugama 2 SBSII(90) SPP	2021	1.00	1.6
279	Anuradhapura 1 SBSPII SPP	2021	1.00	1.4
280	Kilinochchi 1 SBSPII SPP	2021	1.00	2.2
281	Kilinochchi 2 SBSPII SPP	2021	1.00	2.2
282	Kilinochchi 3 SBSPII SPP	2021	1.00	2.3
283	Mathugama I SBS II 90	2020	1.00	1.2
284	Mathugama I SBS II 91	2020	1.00	1.5
285	Ampara 2 SBSP II	2020	1.00	1.5
286	Mahiyanganaya 1	2020	1.00	0.7
287	Mahiyanganaya 2	2020	1.00	1.4
288	Mahiyanganaya 3	2020	1.00	1.2
289	Galle 2 SBS II 90	2020	1.00	1.5
290	Galle 3 SBS II 91	2020	1.00	1.2
291	Valachchenai 2 SBSPII SPP	2021	1.00	1.2
292	Valachchenai 3 SBSPII SPP	2021	1.00	1.1
293	Monaragala 2 SBSPII SPP	2021	1.00	1.5
294	Monaragala 3 SBSPII SPP	2021	1.00	1.4
295	Galle 1 SBSII (90) SPP	2021	1.00	1.5
296	Beliatta 3 SBSII (90) SPP	2021	1.00	1.5
297	Maho 1 SBSII (90) SPP	2021	1.00	1.5
298	Beliatta 1 SBSII (90) SPP	2021	1.00	1.4
299	Anuradhapura 2 SBSII(90) SPP	2021	1.00	1.5
300	Habarana 3 SBSII(90) SPP	2022	1.00	1.4
301	Pannala 1 SBSII(90) SPP	2022	1.00	1.3
302	Anuradhapura 3 SBSII(90) SPP	2022	1.00	1.5
303	Anuradhapura 4 SBSII(90) SPP	2022	1.00	1.4
304	Pallekele 4 SBSII(90) SPP	2022	1.00	0.9
305	Pallekele 5 SBSII(90) SPP	2022	1.00	0.9
306	Maho 5 SBSII(90) SPP	2022	1.00	1.2
307	Maho 6 SBSII(90) SPP	2022	1.00	1.1
308	Maho 7 SBSII(90) SPP	2022	1.00	0.9

List of Small Power Producers

hydro | solar | biomass/dendro | wind | waste heat

	Name of Power Plant	Yr commissioned	Capacity (MW)	Generation (GWh)
309	Pallekele 1 SBSII(90) SPP	2022	1.00	0.9
310	Mahiyanganaya 2 SBSII(90) SPP	2022	1.00	0.9
311	Mahiyanganaya 3 SBSII(90) SPP	2022	1.00	0.9
312	Mahiyanganaya 4 SBSII(90) SPP	2022	1.00	1.1
313	Mahiyanganaya 5 SBSII(90) SPP	2022	1.00	1.1
314	Mahiyanganaya 6 SBSII(90) SPP	2022	1.00	1.1
315	Mahiyanganaya 7 SBSII(90) SPP	2022	1.00	1.1
316	Horana 1 SBSPII SPP	2022	1.00	1.0
317	Pallekele 2 SBSII(90) SPP	2022	1.00	0.5
318	Pallekele 3 SBSII(90) SPP	2022	1.00	0.5
319	Vavunathivu SPP	2022	1.00	-
320	Pannala 2 SBSII(90) SPP	2022	1.00	0.3
Total			**742.45**	**2,060.10**

Litro Gas Lanka Limited

Liquefied Petroleum Gas (LPG) industry was privatised in 1995, when Shell Gas purchased a stake in the previously Government-owned Gas Company, under a five-year concession. Over 1995-2000, Shell Gas purchased LPG available in the CPC refinery and also imported LPG, and marketed in Sri Lanka. The monopoly status ended in late 2000. The Company markets LPG to all customer segments, in all provinces of the country.

The full ownership of Shell Gas Lanka (Pvt) Ltd was handed over to the Government in November 2010, forming Litro Gas Lanka Limited (LGLL). Sri Lanka depends on imported LPG to bridge the growing gap between demand and the limited local production by Ceylon Petroleum Corporation's (CPC) Refinery in Sapugaskanda. To meet this demand, the Government also took steps to purchase the Shell owned LPG Storage Terminal situated in Kerawalapitiya. The LPG Storage Terminal was re-named Litro Gas Terminal Lanka (Private) Limited (LGTLL). Litro Gas also owns a modernised LPG bottling plant situated in Mabima, Sapugaskanda which is one of the largest in the region and a fleet of modernised LPG tanker trucks.

LAUGFS Gas PLC

Established in the year 1995, LAUGFS Holdings is a Sri Lankan diversified business conglomerate covering most of the commercial spectrum of industries. LAUGFS Gas PLC is a subsidiary of Laugfs Holdings Limited. It plays a key role in the importation, storage filling, distribution and sale of Liquefied Petroleum Gas (LPG) for domestic, industrial and auto gas users. LAUGFS hold one of the state-of-art storage and filling facility at Mabima, with a storage capacity of 2,500 tonnes, equipped with a strong dealer network in the country.

Lanka Indian Oil Company (LIOC)

LIOC is a subsidiary of Indian Oil Company, which is owned by the government of India. It operates about 150 petrol & diesel stations in Sri Lanka, and has a very efficient lube marketing network. Its major facilities include an oil terminal at Trincomalee, Sri Lanka's largest petroleum storage facility and an 18,000 tonnes per annum capacity lubricants blending plant and state-of-the-art fuels and lubricants testing laboratory at Trincomalee.

Annex II

Conversion to Uniform Energy Units

For comparison, energy products expressed in their respective units used for ordinary transactions need to be converted to a common equivalent unit. Similar to most other countries, Sri Lanka used tonnes of oil equivalent (toe) as the common denominator for this purpose (1 toe = 10 GCal = 41868000 kJ). Sri Lanka is contemplating using Joules as the common unit in future. Shown below are the conversion factors used for converting each energy product to equivalent toe. After two more years, this publication will cease to report toe as the common energy denominator.

Conversion Factors and Calorific Values

Primary Energy	**toe/t**	**kJ/t**
Bagasse	0.40	16,747,200
Charcoal	0.65	27,214,200
Coal	0.70	29,307,600
Crude Oil	1.03	43,124,040
Fuel wood	0.38	15,909,840
Hydro electricity (thermal equivalent) (toe/GWh)	240.00	10,048,320,000

Products	**toe/t**	**kJ/t**
Aviation Gasoline	1.06	44,380,080
Aviation Turbine Fuel	1.05	43,961,400
Ethane	1.18	49,404,240
Fuel Oil	0.98	41,030,640
Gas Oil /Diesel Oil	1.05	43,961,400
Kerosene	1.05	43,961,400
LPG	1.06	44,380,080
Motor Gasoline (Petrol)	1.09	45,636,120
Naphtha	1.09	45,636,120
Refinery gas	1.15	48,148,200
Residual Oil	0.98	41,030,640
Solvent	0.89	37,262,520

Electricity	**kJ/kWh**
Electricity	3,600

Compiled by

Sri Lanka Sustainable Energy Authority
No. 72, Ananda Coomaraswamy Mawatha, Colombo 07, SRI LANKA
e-mail : info@energy.gov.lk, Web : www.energy.gov.lk
+94 11 2575203 (Voice), +94 11 2575089 (Facsimile)

ISSN 2386-172X