

Public Consultation Document



National Policy on Natural Gas

Petroleum Resources Development Section

**Ministry of Highways, Road Development and Petroleum Resources
Development**

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1. Introduction

Exploratory evidence on natural gas deposits in Mannar Basin and the pursuit of relatively clean alternative fuels for enhancing the diversity of power generation energy mix have heightened the interest on natural gas in Sri Lanka. Recent offshore explorations indicated the existence of economically viable natural gas deposits within the territorial boundaries of the island. Demand for alternative fuels for power generation has complimented the interest on natural gas further. Natural gas has a strong potential to contribute the energy security goals of the country. It provides a relatively cleaner alternative for petroleum oils and coal that can be used not only in power generation but in other multiple economic sectors as well. Besides providing an alternative source of energy, natural gas can be used as a raw material in industrial activities too. It is used widely as a feedstock in the manufacture of chemical products such as urea fertilizer, methanol, ethanol and formaldehyde which form the basic substances in the production of a wide range of industrial and consumer products. Hence, the sustainable use of natural gas as an alternative source of energy and industrial input can be expected to bring in long-term benefits to the national economy.

1.1. Background

The Government of Sri Lanka (GOSL) launched explorations for oil and gas as early as 1960s. More recent studies of well data and regional studies indicated that the three offshore sedimentary basins located around the island, namely; Mannar, Cuavery and Lanka Basins, of which Mannar Basin located North West of the island, possess a proved working petroleum system with substantial deposits of natural gas. First natural gas discovery was made in the Mannar Basin off North Western coast in 2011. So far, exploratory drillings have made two discoveries from the same block with estimated reservoir capacities in excess of 1 Trillion Cubic Feet (TCF) of natural gas and 10 million BBL (barrels) of condensate. These discoveries have propelled further explorations in the Mannar Basin, both in onshore and offshore regions.

Positive outcomes of explorations enable Sri Lanka to reduce the dependency on fossil fuel imports and even to become an exporter of natural gas in the long run. Strategic location close to main international shipping routes provides a distinct advantage for Sri Lanka to operate as a natural gas outlet for bunkering. Hence, if managed wisely, natural gas provides a long-term prospect for reducing fuel imports as well as earning foreign exchange. However, development of indigenous resources of natural gas into a commercially viable source of energy supply may take some years to become a reality. Hence, the country has to depend on imported liquefied natural gas (LNG) to start with at least in the short run.

Natural gas is a relatively cleaner source of energy compared with other forms of fossil fuels such as petroleum oils and coal. Natural Gas burns more cleanly, producing about 25% less CO₂ than burning petroleum oils and about 40% less than burning coal, per unit of energy released. Hence, besides enhancing the energy security, natural gas can help reducing environmental problems associated with energy use too. In the Nationally Determined Contributions (NDCs) to the Paris Agreement on Climate Change (PA), Sri Lanka voluntarily declared her commitment in 2016 to reduce carbon emissions by specified amounts within a given timeframe. Switching to natural gas provides an effective way for reducing carbon emissions thereby helping to achieve national commitments to mitigate climate change. Moreover, zero generation of oxides of sulphur (SO_x) and particulates and low generation of oxides of nitrogen (NO_x) and carbon monoxide (CO) due to shift towards natural gas would help reducing the risk of health hazards associated with air pollution too.

Despite positive prospects, however, Sri Lanka has no experience in natural gas in any economic sector so far. The closest experience is domestic and industrial use of liquefied petroleum gas (LPG). The country also has a negligible share of vehicles run on LPG. Major source of LPG is imports and a minor share is sourced from the only local refinery in Sapugaskanda as a bi-product. On the other hand, Sri Lanka has a down-stream petroleum industry which is mainly aimed at supply of liquid fuels (i.e. petrol and auto diesel) for transportation, furnace oil for industries and kerosene for domestic use. Supplies of petroleum fuels are based on refining of imported crude oil locally and direct imports of refined products. Since the local refinery has faced several constraints, imports have become the dominant source of liquid fuels as well.

As a result of established down-stream petroleum and LPG industries, Sri Lanka already has a legal and institutional framework relating to petroleum. Currently, there are four statutes governing the petroleum sector in Sri Lanka:

- Ceylon Petroleum Corporation Act No. 28 of 1961 (amended in 1963 and 1965)
- Petroleum Resources Act No. 26 of 2003 to provide for the exploration and recovery of petroleum in Sri Lanka
- Petroleum Products (Special Provisions) Act No. 33 of 2002 to provide for an alternate procedure for import, export, sale, supply and distribution of petroleum products
- Public Utilities Commission of Sri Lanka (PUCSL) Act, No. 35 of 2002 to provide for exercising licensing, regulatory and inspection functions pertaining to utility industries

Implementation responsibilities of these statutes are vested with several public agencies. Among them the following key institutions are involved directly in matters connected with petroleum:

- The Ministry vested with the subject of Petroleum Resources Development assigned with the functions of ‘Import, refining, storage, distribution and marketing of petroleum-based products and natural gas’
- The Ceylon Petroleum Corporation (CPC), a state-owned enterprise (SOE) established with the mandate to carry on business as an importer, exporter, seller, supplier or distributor of petroleum covering the areas of exploring, exploiting, producing, and refining of petroleum with exclusive right to import, export, sell, supply or distribute petroleum of certain classes of products that include petrol, kerosene, diesel oil, aviation fuel and furnace oil.
- The Public Utilities Commission of Sri Lanka (PUCSL) established for the purpose of regulating utilities including that are involved in petroleum industry
- The Petroleum Resources Development Secretariat (PRDS) established to act as the upstream petroleum regulator

In addition, there are also several institutions indirectly involved with petroleum by way of granting approvals, financing, certifying and monitoring operations etc. They include central government agencies (relevant ministries and line agencies including public utilities), local government authorities, financial agencies, private sector companies, academic and research institutes, media and civil society and community organizations. Among the key central government agencies are; the Central Bank, Central Environmental Authority (CEA), Marine Environment Protection Authority (MEPA), Sri Lanka Ports Authority (SLPA), Coast Conservation and Coastal Resource Management Department (CCCRMD), Motor Traffic Department, Ministry of Industries and Sri Lanka Standards Institution (SLSI).

1.2. Need

There is substantial evidence to indicate that Sri Lanka can reap significant economic, social and environmental benefits from using natural gas as a source of energy in power, industrial, transportation, household and commercial sectors and a raw material for industrial purposes. However, absence of a national policy framework to address issues involved either with development of indigenous natural gas resources or use of imported LNG has constrained the effective utilization of this option. Although Sri Lanka has developed legal, regulatory and institutional means to address the use of petroleum including LPG, they cannot be expected to address the specific issues that may arise with commercial use of natural gas in wide range of economic sectors satisfactorily.

Introducing a commercially viable natural gas industry into Sri Lanka involves value chain development from up-stream resource extraction activities to down-stream distribution operations which covers a wide range of economic transactions. The whole exercise requires close guidance and supervision from a well-articulated national policy. Following the efforts taken by GOSL to develop recently discovered gas resources and the decision to import LNG for power generation, the importance of strengthening policy, legal, regulatory and institutional frameworks to address the issues involved with economic use of natural gas has been highlighted by many stakeholders. Recognizing the need, the Ministry of Highways, Road Development and Petroleum Resources Development (Formerly the Ministry of Petroleum Resources Development; hereinafter referred to as 'the Ministry') took the timely initiative to develop a National Policy on Natural Gas for Sri Lanka (hereinafter referred to as 'the NPNG'). The Ministry has also proposed amendments to the Petroleum Corporation Act No. 28 of 1961 and the Petroleum Products (Special Provisions) Act No. 33 of 2002, with the objective of broadening their scope to cover specifically natural gas and liquefied natural gas (LNG).

1.3. Purpose and Context

The NPNG is intended to address economic, technical, environmental, safety and social issues that are expected to arise due to introduction of natural gas as a novel source of energy and an industrial input in Sri Lanka. Hence, it is anticipatory and forward looking. It places the natural gas industry in the realm of broad national agenda towards sustainable development. Hence, the vision, goals and objectives of the NPNG have been identified in line with broad directions of macroeconomic policies, relevant sectoral policies such as energy policy as well as national commitments towards the Sustainable Development Goals (SDGs) and NDCs to Paris Agreement on Climate Change. The NPNG is expected to complement such policies, strategies and commitments by ensuring the energy security, contributing to the national economy and protecting the environment.

To achieve this purpose, the Ministry consulted relevant stakeholders and engaged the services of experts to gather necessary information for preparing the NPNG from early 2017. These consultations covered key areas such as commercial use of indigenous natural gas resources, import of LNG from regional markets, institutional and legal framework, skills and local capacity development, attraction of foreign investment, infrastructure development, local and export market development, revenue management, health and safety issues and management of environmental issues resulted in preparing a draft policy document made available to the Ministry in in mid-2018 after incorporating comments received from stakeholders. The Ministry commissioned the Institute of Policy Studies of Sri Lanka (IPS) to review the draft policy document along with other relevant policies and inputs from stakeholders and finalize the

NPNG so that it is in line with the broad national policy interests of the country. The draft National Policy thus developed has undergone further rounds of consultations and validation by relevant stakeholders before submission for the approval of the Cabinet of Ministers.

1.4. Rationale

The rationale of the NPNG is to facilitate establishing an economically viable, environmentally sustainable and socially responsible natural gas industry in Sri Lanka. To achieve this, the Policy upholds the roles of the Government, private sector, civil society and the public. The Government, as the trustee of indigenous resources of natural gas, is vested with the overall responsibility of sustainable development and use of resources for the maximum benefit to the present and future generations of the country. The private sector has been recognized as the engine of economic growth by successive governments of Sri Lanka. There are global and regional examples for economically viable successful ventures of natural gas run by the private sector. However, being dependent on sizeable investments and advanced technological developments, natural gas industry has a tendency to build up large corporate structures motivated to acquire market power that can curtail the competition. Healthy competition is the root source of consumer welfare and sustained growth of market economies. Hence the Government has a vital role to play here as the regulator, ensuring a level playing field for healthy competition among multiple private actors. Besides fulfilling the roles of the trustee of indigenous resources and the regulator of the local market system, the Government, is also expected to play other multiple roles in areas such as: overseeing the development of infrastructure; facilitation of investments; promoting good industrial practices; safeguarding the environment; minimizing health risks to the people; averting accidents due to mishandling; adopting internationally accepted norms, codes and standards; regular monitoring of the conduct of other players, and; protection of the rights of consumers as ultimate beneficiaries. The NPNG aims to establish a transparent, accountable and inclusive process of governance to fulfill the multiple roles by the Government and other stakeholders including private sector in an effective manner. Civil society, media and the general public have important roles to play here so that a viable system free of abuses, malpractices, corruption and anti-competitive behaviors will be established and maintained.

2. Vision, Goals and Objectives

The vision, goals and objectives of the NPNG are presented in this section. This includes a broad vision statement and a set of key policy goals and objectives.

2.1. Vision

The vision of the NPNG is to achieve positive and long-term economic, social and environmental benefits by introduction of natural gas as a new energy source and industrial feedstock to a wide range of economic sectors in Sri Lanka.

2.2. Goals

The NPNG envisages achieving the following goals:

- The share of natural gas reaches at least 1/3 of the mix of total fossil fuel consumption by 2030
- Dependency on imported fossil fuels reduced to at least half of the present level in terms of physical quantity by 2030
- Progressive penetration of natural gas in all sectors maintaining minimum 30% of the total energy mix.
- Profitable avenue of foreign exchange earnings established through exportation, exploitation and bunkering of indigenous gas resources
- Emission of greenhouse gasses minimized so that emission targets set by Sri Lanka's NDCs to Paris Agreement on Climate Change can be achieved
- Level of other harmful gasses that contribute to local air pollution minimized so that ambient air quality standards specified by the CEA can be reached
- Robust framework of legal, regulatory and institutional arrangements to bring about effective behavioral responses of producers, suppliers and consumers of natural gas in place by 2020
- Progressive growth of skilled employment and business opportunities with high local value content generated through steady stream of foreign and local investments on natural gas

2.3. Objectives

The overall objective of the NPNG is to provide guidance and direction for the sustainable development of the natural gas value chain ensuring optimal and equitable benefits to Sri Lanka in the short-, medium- and long-term. This is to be achieved through realizing following specific objectives.

- Ensure uninterrupted supply of natural gas for key economic sectors from domestic production and imports of LNG
- Encourage and promote the use of natural gas in prospective sectors, beginning from the power sector with progressive penetration into transport, industries, commercial and residential sectors; substituting emission intensive liquid fuels and coal totally or partially in the energy mix
- Promote and facilitate investments by prospective investors to undertake commercial production of natural gas from indigenous resources through appropriate scheme of incentives
- Develop necessary infrastructure and logistic facilities to enhance supply of natural gas to local market, bunkering and export markets from domestic production and imports
- Adopt a transparent process of procurement of LNG enabling the country to acquire LNG at the most competitive prices
- Develop a pricing mechanism that enables consumers to access natural gas at affordable prices while ensuring returns attractive enough for suppliers to encourage sustained investments
- Adopt necessary environmental safeguard measures to undertake all operations concerning exploration, exploitation, refining, importation, storage, regasification, transmission, distribution and consumption of domestically produced and imported forms of natural gas in the country causing least damage to the environment
- Formulate and enforce a robust policy, legal and regulatory framework which will ensure smooth functioning of all operations with regard to exploration, exploitation, refining, processing, importation, regasification, storage, exportation, bunkering, transmission, distribution and consumption of natural gas including approval, licencing and permitting of up-, mid- and down-stream operations of natural gas industry
- Ensure internationally accepted safety standards, codes of conduct and best practices are in place for all operations involving exploration, exploitation, refining, importation, storage, regasification, transmission, distribution and consumption of domestically produced and imported forms of natural gas so that they are carried out with least inconvenience and minimum health risk to the public and employees

- Promote the establishment of bunkering facilities to ocean-going vessels operating on LNG at Sri Lankan Ports as public-private partnership ventures and explore the options for supplying natural gas to export markets
- Initiate training programs to develop local expertise and technological skills and introduce the incentive schemes to develop the capacity of local businesses that are willing to take part in natural gas industry so that the value of local content is maximized

3. Key Policy Principles

The NPNG is built upon five main principles. Selection of policy measures to achieve the goals and objectives of the NPNG was made under the guidance of these principles.

3.1. Ensuring Energy security

Energy security implies uninterrupted supply of energy at affordable prices, minimizing the fluctuations in physical availability and prices. The broad dimensions of energy security are availability, accessibility, affordability and acceptability. The NPNG aims to enhance all four dimensions of energy security by introducing and promoting the use of natural gas as an alternative source of energy for key economic sectors while also reducing the dependence on imported fossil fuels.

3.2. Protection of environment through clean energy

Natural gas provides a relatively cleaner alternative for emission intensive petroleum fuels and coal, of which the share in national energy mix is growing. Hence, increasing the share of natural gas in the energy mix either through partial or total substitution of petroleum fuels and coal would help the protection of environment through reduced emissions. This would help to mitigate the impacts of climate change and decrease the human health risks and ecosystem losses associated with air pollution.

3.3. Ensure the safety and minimization of risk

While offering prospective benefits for the national economy and environment, natural gas is a product that needs to be handled with extreme care due to its highly flammable nature. Unless proper safety precautions are taken, handling of natural gas as well as LNG could lead to hazardous events causing loss of human life and damage to property. Therefore, ensuring the public safety and minimization hazard risk through adopting internationally accepted safety standards, codes of conducts and best practices is a key principle that guides the NPNG.

3.4. Optimal use of indigenous resources

Petroleum has the potential to open vital domestic and global market opportunities for advancing the national economic interests. Up to now, Sri Lanka has to depend on imports of petroleum to meet the demand for energy from power, transport, industrial and household sectors. The country spends substantial share of its foreign exchange earnings for fossil fuel imports. Natural gas resources discovered in the Mannar Basin provide the opportunity for Sri Lanka to reduce the dependency on fossil fuel imports with the potential prospects for earning foreign exchange through bunkering and exports as well. Wise use of options enabled by the discovery of indigenous natural gas could offer significant benefits to the national economy. Hence, the optimal use of indigenous resources to maximize the benefits to national economy through establishing a viable domestic natural gas industry is a major underline principle that guided the NPNG.

3.5. Enhanced private sector participation under effective regulatory regime

Private sector plays a leading role in global energy markets including the natural gas industry. There are profitably run private ventures of natural gas all over the world that generate sufficient returns to invest on growth of the industry too. In contrast, Sri Lanka's energy sector is dominated by state owned enterprises which have faced various constraints. Introduction of natural gas industry to Sri Lanka opens the opportunity for engaging the private sector in productive manner on mutually beneficial terms. To achieve maximum gains from the private sector involvement, an effective regulatory and monitoring regime is required. The NPNG aims to capture this opportunity by enhancing the private sector participation under a well-designed regulatory regime to optimize the gains for national economy and the public.

3.6. Adaptive development and optimization of market structure for inclusive benefits

Gas value chains involve complex market structures that determine the overall scheme of benefits enjoyed by different stakeholders. Studies on natural gas markets have established that gas industry could operate under varied market structures ranging from highly concentrated vertically integrated structures to industries having unbundled supply chains with open competition among business firms. It has generally been observed that market structures open for competition are likely to generate more efficient and equitable outcomes than concentrated market structures. Current market structure of petroleum in Sri Lanka is oriented more towards a concentrated structure dominated by state-owned enterprises. Departing from the existing tendency towards state monopolies, the NPNG would take a balanced approach

regarding the structure of future natural gas industry in Sri Lanka. It looks forward to find optimal market structures applicable to different stages of the development of industry under changing local and international conditions through an adaptive approach. In doing so, the NPNG would invariably strive to enhance the market competition with the active participation of private sector.

4. Policy Statements

This section is the main body of the NPNG. It presents the policy statements formulated to achieve the vision, goals and objectives of the NPNG, addressing issues involved with the introduction of natural gas as an alternative source of energy and industrial feedstock. Natural gas can be used in multiple economic sectors. Introduction of natural gas into multiple sectors involve cross-cutting needs as well as sector specific issues to be addressed through well-designed policies.

Accordingly, the policy statements are presented here under two broad sections:

- Policies to address cross-cutting needs in the use of natural gas in multiple economic sectors, and;
- Policies to address sector specific issues of use of natural gas in main economic sectors (i.e. power sector, transport sector, industrial sector, household and commercial sector and bunkering).

4.1. Policies to address cross-cutting needs in use of natural gas in multiple economic sectors

Addressing cross-cutting needs of multiple sectors is an essential pre-condition for promoting natural gas in individual sectors that have potential for making gains from switching to natural gas. Therefore, policies aimed to address cross-cutting needs provide the backbone of the natural gas industry in the country. Policy statements on cross-cutting needs are presented under eight broad areas, namely: sourcing and distribution of natural gas; infrastructure development; environmental sustainability; pricing; institutional, regulatory and policy framework; operational safety; capacity and local content development, and; consumption and market development.

4.1.1. Sourcing and distribution of natural gas

4.1.1.1. The Government will facilitate the access to natural gas from indigenous resource deposits as well as through imports by means of implementing development and regulatory measures applicable to up-, mid- and down-stream operations involved in natural gas value chains.

4.1.1.2. Up-stream operations pertinent to sourcing of natural gas from indigenous sources will be achieved through adopting transparent process of selecting prospective developers, adhering licensing procedures conforming to international standards, and entering contractual arrangements on mutually beneficial terms.

4.1.1.3. Supplies from indigenous sources will be channelled to meet the local demand as the first call, to cater demand from export markets and to fulfil bunkering needs of the shipping industry, rationalizing the supplies to each group of users so that maximum gains to the national economy can be achieved.

4.1.1.4. The Government will also facilitate the establishment of mid- and down-stream operations pertinent to importation of natural gas in the form of LNG to supplement the demand from power, transport, industry, commercial, household sectors as well as bunkering operations as a supportive and complementary channel to the supplies from indigenous sources.

4.1.1.5. Importation of natural gas will be facilitated mainly as a ancillary source of supply:

- To fulfil the demand from local users before commercial supplies from indigenous sources are made available;
- To ensure uninterrupted supplies by buffering the fluctuations in supply from local sources, and;
- To create healthy competition for local gas industry so that affordable prices for users can be maintained.

4.1.1.6. All stages of value chain related activities that include procurement, terminal operations, storage, distribution and consumption of gas in Sri Lanka either by public sector agencies or private parties will be conducted in a manner that ensures Sri Lanka's energy security needs and enhances her strategic position in regional and global energy markets.

4.1.1.7. The Government will adopt transparent and competitive procurement procedures in all natural gas sourcing transactions where public sector agencies and state-owned enterprises are involved. Sourcing will be conducted taking into consideration key factors such as price, time of purchase, quantity and quality requirements to give Sri Lanka a competitive advantage when negotiating contracts in the international LNG markets.

4.1.1.8. Preference will be given for locally produced natural gas within Sri Lankan territory, when such resources are available and accessible in commercial quantities at affordable prices, in all sourcing transactions involved by public sector agencies and state-owned enterprises.

4.1.1.9. The Government shall appoint the Ceylon Petroleum Corporation (CPC) or its fully owned subsidiary as the Single Credible Entity (SCE) giving due consideration to the Ceylon Petroleum Corporation Act (No.28 of 1961) to facilitate sourcing of natural gas from import markets by undertaking;

- Direct negotiations with one or more potential LNG suppliers (Govt. to Govt. or otherwise)
- International competitive bidding from LNG suppliers for mid-term or long-term supplies¹ (i.e. Term Supplies)
- Direct purchase from the LNG spot market after calling competitive bids for short term supply.

4.1.1.10. The Government shall approve only the import supply offers that comply with minimum quality standards specified with respect to heat content and composition by the Ministry and certified by recognized classification societies and meet the environmental requirements of the country, disregard of whether they are undertaken either by public sector agencies or private sector parties.

4.1.2. Infrastructure development

4.1.2.1. The Government will authorize, supervise and monitor construction, development and operation of all infrastructure pertaining to processing, liquefaction, storage, compression, transportation and distribution and consumption of natural gas/LNG/CNG giving due consideration to the existing Sri Lankan policies, laws and regulations, international standards and best practices.

¹ Mid-term means between 2 and 5 years; short term means less than 2 years and long term means more than 5 years (International Gas Union Report 2017)

4.1.2.2. The Ministry entrusted with the subject of petroleum will be responsible for undertaking these functions on behalf of the Government. Both public as well as private sector developers are required to comply with policies, laws, regulations, standards and best practices adopted by the Government.

4.1.2.3. All infrastructure facilities involved in section 4.1.2.1 have to be designed, constructed, operated and maintained based on internationally accepted codes, standards, guidelines and best practices all of which need to be certified by an independent classification society, particularly with respect to safety aspects, prior to being allowed to commence operations.

4.1.2.4. To ensure effective implementation of the section 4.1.2.3, necessary regulatory arrangements will be introduced so that relevant regulatory authorities and/or their representatives get non-discriminatory, transparent access as third-party agents to all types of natural gas/LNG/CNG infrastructure facilities for inspection, monitoring and auditing purposes.

4.1.2.5. In establishing such facilities, detailed feasibility studies including environmental impacts assessments (EIA) have to be conducted to determine the best options with respect to the location, type and capacity of facilities giving due consideration to immediate and future demand and financial and economic viability of ventures. Different options and alternatives have to be evaluated and best alternatives have to be determined using internationally accepted standard criteria applicable to such ventures.

4.1.2.6. The Government will encourage, actively promote and seek investments in natural gas infrastructure as a national development priority by public sector agencies, private sector companies and/or by public-private partnership ventures.

4.1.3. Environmental sustainability

4.1.3.1. The Government will ensure that the all construction, development and operational activities pertaining to uses of natural gas in power generation, transportation, industrial, household and bunkering operations undertaken by public and private sector parties would comply with the prevailing environmental laws, regulations and standards in Sri Lanka as well as international conventions & best practices so that they are implemented with minimum damage to the environment.

4.1.3.2. The Ministry responsible for the subject of petroleum will consult and coordinate with relevant regulatory bodies such as Central Environmental Authority (CEA), Marine

Environmental Protection Authority and provincial environmental statutes where applicable to ensure the compliance of safeguard measures by developers to minimize the environmental damages associated with such development activities.

4.1.3.3. In the case that prevailing safeguard measures (e.g. regulations, standards) are inadequate to address the potential environmental issues associated with construction, development and operational activities, the Ministry with the consultation and cooperation of relevant regulatory bodies will initiate necessary actions to introduce new safeguard measures.

4.1.3.4. The Government will encourage and direct to undertake Strategic Environmental Assessments (SEA) in case of large-scale ventures on natural gas development that are having complex involvements with marine, coastal and terrestrial ecosystems and their services.

4.1.4. Pricing

The Government will adopt a formula-based pricing policy for natural gas covering both supplies from indigenous sources as well as imported LNG that is aimed at ensuring affordable prices for consumers while guaranteeing sufficient returns on investments for suppliers to sustain and attract investments for growth of the industry.

4.1.4.1. Pricing policy will be based on the following key determinants.

- Cost of supply: Gas is priced to reflect the cost of production, transmission, storage, distribution and fair rate of return on investment
- Market replacement value: Gas is priced according to the closest alternative fuel paying due consideration for environmental and social impact².
- Bench marking indices: Gas price locally is competitive with prices prevailing in the region
- Taxes and levies due to trade related transactions along the supply chain

4.1.4.2. The above statements outline the general directions for structuring the price of domestically produced or imported natural gas available for different uses before reaching the final consumers. Gas can be used in different ways in different sectors: e.g. motive energy (power generation, transport, and industry), thermal energy (households, industry) and feed stock (industry). Depending on the final use, price of natural gas would vary and specific directions for pricing of gas for specific uses will be determined by reviewing sector specific parameters relating to supply and distribution of gas for respective uses.

² This concept is intended to estimate the actual or potential value in the market resulting from replacing some other fuel with gas

4.1.5. Institutional, legal and regulatory framework

4.1.5.1. The Government will review the existing legal and regulatory framework along with the institutional structure covering all operations with regard to entire natural gas value chain. Based on the gaps identified in the review, amendments to current laws and regulations as well as new legal provisions that are necessary to incorporate domestically produced and imported forms of natural gas that will facilitate satisfactory operation of all activities connected to supply, storage, distribution and consumption of gas will be introduced.

4.1.5.2. In the amendment of existing laws and formulation of new legal provisions, special attention will be given to:

- Authorization of access: Licensing, approvals and permits to engage in of up-, mid- and down-stream activities of gas Industry;
- Award of land leases and equipment;
- Dispute resolution through arbitration as per international procedures and subject to Sri Lankan law covering areas of but not limited to: sovereign boundary disputes; state investment disputes; commercial disputes; human rights and environment disputes; pricing disputes, and; infrastructure and construction disputes, and;
- Damages arising from arbitration awards and the respective valuation methods and compensation standards under the Sri Lankan Law.

4.1.5.3. The Government will set out a robust regulatory framework for efficient implementation and management of up-, mid- and down-stream activities of natural gas industry. The regulatory framework, among others, will cover: licenses, permits and approvals; access rights for indigenous gas; leasing of lands and equipment's for LNG/CNG facilities; access to common infrastructure and services; tariff structure (tolling tariff and returns, tariff for LNG storage, rates and charges); sourcing of natural and LNG; reporting requirements; gas pricing; transmission and distribution of gas; quality and standards; health and safety issues; revenue management and related aspects; industry administration and regulation.

4.1.5.4. The Public Utilities Commission of Sri Lanka (PUCSL) will be appointed as the regulator of the midstream and downstream segments of the natural gas market by the virtue of resolution passed by the Parliament to include petroleum amongst the industries to be regulated by the PUCSL and the concurrence granted by the Cabinet of Ministers to assign the Public Utilities Commission of Sri Lanka as the regulator of the NG and LNG market.

4.1.5.5. Licensing and permitting shall be implemented for managing the establishment of gas related business in Sri Lanka, construction of LNG facilities and associated infrastructure, operations of the LNG installations, shutdown of operations and decommissioning of LNG facilities within the territory of Sri Lanka.

4.1.5.6. The Government shall establish a separate corporate body named 'National Gas Company' empowered by an Act of Parliament within the institutional framework in Sri Lanka to operate on private public partnership (PPP) models enabling government as well as Sri Lankan business community to participate in commercially viable upstream, midstream and downstream projects including exploration and production of indigenous gas, development, ownership and operation of the LNG facilities and/or internal gas storage, pipeline transportation and distribution infrastructure facilities as appropriate.

4.1.5.7. The Government, in compliance with applicable financial and other regulatory criteria, will decide and prescribe minimum threshold limits on liquidity, revenues, net income, net worth and other relevant corporate parameters that are indicative of operational capacity of the relevant local PPP partners involved in ventures relating to section 4.1.5.6.

4.1.5.8. The Government will establish an effective and efficient institutional framework with clear identification of roles and responsibilities of key institutions directed towards the successful implementation of the NPNG in order to achieve desired outcomes through efficient operationalizing, enforcing, monitoring and evaluation. The institutional framework will mainly focus on:

- Identify and assign the roles and responsibilities of institutions for smooth functioning, avoiding duplication or conflict with each other
- Develop smart tools/mechanisms and indicators for monitoring and evaluation within the institutional framework
- Review time-to-time the additional information requirements necessitated by the new developments
- Enforce transparency and accountability among all stakeholders involved in the gas value chain.

4.1.5.9. To ensure efficient and timely implementation of the proposed interventions in the NPNG, a Gas Utilization Master Plan (GUMP) will be prepared and updated periodically covering actions in all main sectors; power, transport, industry, household and commercial sectors.

4.1.6. Operational Safety

4.1.6.1. The Government will take necessary arrangements to ensure all operations involving exploration, processing, liquefaction, refining, transmission, importing of LNG, regasification, compression, storage, distribution and consumption of natural gas are carried out according to the highest safety standards published by relevant local and international bodies and classification societies while complying with the laws of Sri Lanka to cause least inconvenience to the people with minimum risk of hazardous events.

4.1.6.2. This would require relevant parties to comply with the following.

- Conduct comprehensive Health, Environmental and Safety Impact Assessment (HSEIA) of the activities relevant to the supply chain of projects inclusive of front-end engineering and design (FEED); engineering, procurement and construction (EPC); commissioning; operation and maintenance, and; decommissioning
- Undertake Quantitative Risk Assessment (QRA) to identify, evaluate and assess the hazards, credible accident scenarios, consequences and the corresponding probabilities;
- Carry out risk assessment studies to ensure the protection of the public, property and environment in the neighboring areas and the marine traffic in Sri Lankan waters
- Provide training to all operators of plant and machinery, pipeline networks, consumer installations connected with the transmission, storage, distribution and utilization
- Arrange the issuance of permits to operators of domestically produced and imported forms of natural gas
- Establish and declare safety zones at every natural gas installation as per international requirements and maritime standards
- Install disaster management systems to prevent and mitigate adverse impact in the natural gas operations
- Acquire appropriate schemes of insurance policy to cover vulnerable parties including employees, users as well as affected third parties in case of hazardous events

4.1.6.3. The Government, wherever found necessary, will take necessary measures to introduce standard specifications with respect to quality of domestically produced and imported forms of natural gas in the country, storage terminals, pipelines laid for transporting

natural gas and pipeline networks laid to distribute natural gas to consumers for mandatory compliance to be implemented through the Sri Lanka Standards Institution.

4.1.6.4. The Government will introduce necessary legal provisions and regulations with regard to safety aspects, making it an offence for a person to operate any domestically produced and imported forms of natural gas systems without complying valid safety measures accepted and prescribed by the GOSL.

4.1.6.5. The Government will also take necessary measures to strengthen the infrastructure and common safety facilities such as fire protection facilities at municipal or other local areas where domestically produced and imported forms of natural gas facilities are located.

4.1.7. Promotion of Consumption and Market Development

4.1.7.1. The Government will encourage and actively promote the use of natural gas in various economic uses such as electric power generation, thermal applications in industry, transportation, households and commercial establishments and as a raw material for industrial products (e.g. fertilizer, methanol, ethanol and formaldehyde).

4.1.7.2. To achieve this, strategic measures will be taken to facilitate establishing competitive and efficient domestic and export markets for natural gas, enabling Sri Lankan entities to participate effectively in the natural gas business. Accordingly, the following measures will be taken to promote the use of natural gas in different sectors.

- Grant duty and other tax concessions for industries that use natural gas for importing items of plant and machinery which operate with gas including vehicles, enabling rapid shifting to natural gas
- Provide technical and financial assistance to industrialists willing to convert their thermal energy generation units from oil to natural gas
- Expedite the acquisition of technology for converting into natural gas by offering technical assistance through relevant government agencies
- Build up necessary legal and institutional support, safety guidelines and physical infrastructure facilities for the supply of domestically produced and imported forms of natural gas to consumers interested in shifting from other fossil fuels

4.1.7.3. The Government will always encourage the development of open and competitive market structures along the supply chain of natural gas as well as natural gas

markets in different economic sectors in Sri Lanka through formulation and implementation of appropriate policies and strategies that promote competition and private sector participation.

4.1.7.4. The Ministry, with the assistance of regulators involved with up-, mid- and downstream segments of natural gas supply chain and active operational support of existing and proposed state-owned industry operators, will take appropriate measures to prevent the accumulation and concentration of market power in the hands of few powerful players in a manner unfavourable to consumers, other market operators and the public, whenever it perceives necessary.

4.1.8. Capacity and Local Content Development

4.1.8.1. A progressive development of the national capacity in up-, mid- and downstream operations of natural gas industry is anticipated from implementing the NPNG. This will be achieved through enhanced collaboration with key stakeholders of the industry such as investors, developers, contractors/sub-contractors, technical experts etc. so that opportunities are made available for Sri Lankans by way of employment, technical knowhow and managerial skills and productive capital assets.

4.1.8.2. The Government will take measures to enhance the local content of natural gas industry through encouraging the setting up of industries that use gas as a feed stock and energy source in local areas by offering appropriate incentive schemes as proposed in the policy statement 4.1.7.2. Such schemes will aim at generating direct and indirect employment opportunities, enhancing productive skills of local communities, creating business opportunities for local entrepreneurs, increasing the competitiveness of local enterprises, development of local infrastructure facilities and improving the efficiency of local institutions.

4.1.8.3. Industry stakeholders will be encouraged to undertake locally prioritized community development programmes to share some gains with local communities and enhance the social standing and acceptability of ventures.

4.1.8.4. In addition, the national capacity will be increased through targeted government interventions in the following areas.

- Strengthen local universities, technical colleges, vocational training centres and relevant accreditation bodies for imparting requisite technical and management skills involved in natural gas industry to Sri Lankans
- Facilitate international collaboration in education, research and exchange of data and information on gas industry

- Engage investors and developers to provide internship opportunities for undergraduates, post graduates and vocational trainees.
- Establish a Centre of Excellence in natural gas industry with private public partnership to promote knowledge, skills and innovations in technology and management. This will engage in personnel presently employed overseas in the petroleum industry including Sri Lankans with sufficient experience regarding technical, financial, legal and health and safety and environmental aspects of natural gas industry
- Establish and develop a comprehensive ICT-based natural gas information system that gather information from multiple stakeholders of the industry involved in different stages of value chain, including private parties. The information system will be updated regularly and will be used for planning, policy development and management purposes.
- Develop local competencies in ancillary services such as repairs and maintenance activities
- Develop effective communication strategy to inform the public on the development activities in natural gas industry in order to inculcate a sense of commitment
- Levy a nominal fee or impose a nominal duty for the LNG imported to or exported from the country to be used for the sustainable development of upstream, midstream and downstream petroleum industry
- Strengthen the National Oil and Gas Company to participate strategically in developing local capacities and competencies

4.2 Use of Natural Gas in Key Economic Sectors

Sri Lanka can anticipate progressive growth in the use of natural gas in several sectors of the economy through the implementation of National Policy in years to come. Power sector is expected to make the shift first, to be followed gradually by industry, transport and household and commercial sectors. Use of natural gas in individual sectors involves different technical and management issues that cannot be addressed by cross-cutting policies that apply across all sectors alone. The NPNG recognizes the necessity of formulating policies to address the sector specific issues. Accordingly, policy statements applicable to use of natural gas in power generation, transportation, industry, households and bunkering are presented in this section.

4.2.1 *Use of Natural Gas in Power, Transport, Industry and Household Sectors*

4.2.1.1 The Government will take measures to systematically assess the feasibility of introducing and promoting the use of natural gas in power, transport, industry and household and commercial sectors focusing on the following areas.

- Current profile of energy use in respective sectors and flexibility for and advantages of shifting to natural gas and/or LNG
- Sector specific infrastructure development needs for introducing natural gas as a source of energy and/or industrial input
- Technology and capacity development needs of different sectors to shift from the current source of energy to natural gas and/or LNG
- Specific roles, relevant areas of involvement and scale of investments demanded from public and private sector stakeholders to make the shift
- Willingness and capacity of public and private sector stakeholders in respective sectors to make necessary investments to switch from the current source of energy to natural gas/LNG
- Key environmental and socio-economic impacts associated with the conversion to natural gas in different sectors
- Health and safety standards applicable to different forms of natural gas use (e.g. motive energy, thermal energy, industrial inputs) in respective sectors
- Comparative assessment of switching costs and potential benefits due to shifting from the current source of energy to natural gas and/or LNG

4.2.1.2 Depending on the outcome of such assessments, the use of natural gas will be promoted in strategically selected sectors and activities by offering appropriate incentive schemes as proposed in the policy statement 4.1.7.2.

4.2.1.3 The Gas Utilization Master Plan (GUMP) proposed in the policy statement 4.1.5.6 will cover realizable near term (five years) sectors specific actions and strategic interventions for promoting the use of natural gas in power, transport, industry and household and commercial sectors and long-term projections for the utilization or promotion of natural gas based on future development projects in alignment with National Energy Policy. This Plan has to be reviewed in every five years.

4.2.1.4 Supply prices and tariffs of domestically produced and imported forms of natural gas for energy applications in power, transport, industry and household sectors will be subjected to the approval of the Public Utilities Commission of Sri Lanka (PUCSL). The price/tariff shall be structured to ensure the optimum utilization of domestically produced and

imported forms of natural gas considering the relevant fixed, variable charges and tax structures. The prices/tariffs may be set to protect the suppliers as well as consumers from extreme price volatility.

4.2.1.5 Special attention will be directed on distribution of natural gas and LNG for different uses/sectors since it may be the area where sector specific policy interventions are most needed. The proposed National Gas Company and the CPC, under the direction and guidance of the Ministry, will look into the matters relating to distribution of natural gas within the country, providing technical assistance and institutional support to prospective public and private sector investors involved in natural gas distribution for different users.

4.2.1.6 The supportive arrangements proposed in section 4.2.1.5 will focus on the following areas of natural gas distribution.

- Ensure timely and uninterrupted supply to users/sectors that place demands for natural gas, causing least damage to the environment and least inconvenience to the public with minimum risk of hazards
- Provide technical assistance and guidance to construction of distribution facilities including laying the pipelines, storage and other facilities
- Assist in getting the necessary approvals and licenses from relevant authorities for undertaking distribution activities
- Authorize and oversee the establishment of Regional Centres (RCs) for distribution of natural gas via road, railway and gas transportation lines and maintenance of stocks in storage tanks
- Regulate the distribution of natural gas from RCs to major consumer points such as industrial zones, housing schemes and condominiums and fuel dispensing outlets in cryogenic bowsers and local pipeline networks up to individual consumers
- Conduct public awareness campaigns to consumers supplied by pipelines through local networks about the risks involved and precautionary measures necessary to minimize hazards
- Ensure mandatory training of personnel that handle distribution of gas either by trucks or by pipelines on safety standards and formulate guidelines and protocols to be followed by the operators
- Authorize and oversee the establishment of CNG and LNG at fuel outlets along major roads including expressways to feed vehicles running on CNG and LNG

4.2.2 *Bunkering and exports*

4.2.2.1 Operation of ocean-going vessels with LNG is an emerging trend in the shipping industry mainly driven by environmental concerns and requirements to reduce emissions. The Government will take necessary measures to capture the market opportunity that opens as a result of this trend for LNG bunkering facilities to serve vessels operating on LNG.

4.2.2.2 The Government will encourage and facilitate the establishment of bunkering facilities using either domestically produced or imported LNG under public-private partnership arrangements.

4.2.2.3 In the case of supply of domestically produced gas, arrangements will be made to transport of gas from landfall sites to convenient ports via pipelines to supply for bunkering.

4.2.2.4 The Government will develop selected port facilities to be promoted as LNG trading hubs by establishing necessary facilities for liquefaction of natural gas into LNG for bunkering and exporting under public-private partnership arrangements.

4.2.2.5 In the case of selling LNG to other countries as an export product or to vessels calling for bunkering services, prices are determined on the basis of international benchmarking indices, to be competitive with those prevailing in the region

5 *Applicability and Scope*

The scope of the NPNG, in principal, covers the entire range of activities involved in up-, mid- and down-stream segments of the natural gas value chain, taking the supplies from both domestic production (from indigenous resources) and imports of LNG into account. However, up-stream activities, being involved with exploration and development of indigenous resources, will be guided in more detail by other policy documents too. Hence, this National Policy focusses more on mid-stream and down-stream linkages in natural gas value chain that involve gas supply, processing, liquefaction, transportation, storage, regasification, distribution and other ancillary services.

6 *Policy Implementation*

The success of achieving the policy goals of NPNG will be determined by the level of efficiency and effectiveness of implementing proposed policy interventions. Therefore, the NPNG identifies a broad outline of implementation strategy with overall responsibility and authority

and key elements of monitoring and evaluation framework. More detailed strategies with specific activities that are necessary for implementation of each policy intervention in the NPNG will be identified by relevant stakeholders in the due course of implementation. The Gas Utilization Master Plan (GUMP) proposed in the policy statement 4.1.5.9 will provide means for consolidating efforts by multiple stakeholders for successful implementation of the NPNG.

6.1 Implementation Strategy

Given the complexity of gas value chains and challenges involved in introducing a natural gas industry beginning from the limited existing capacity, the Government intends to adopt a stepwise implementation strategy. This implementation strategy will be comprised of the following major steps.

- **Preliminary coordinating and cooperation building measures:** This will involve undertaking essential coordinating activities by the Ministry such as initiating inter-agency communications, nominating focal points at agency level, appointing multi-agency coordinating committees, identification of specific roles and responsibilities of existing agencies and preliminary review of activities, stocktaking and preliminary planning.
- **Initiating the interventions feasible within the existing legal and institutional framework:** Making use of the coordinating mechanism developed in the preliminary stage, stakeholders will jointly identify interventions that can be initiated within the existing legal and institutional framework and take necessary measures to implement them.
- **Identification of structural changes in legal, institutional and regulatory frameworks:** While implementing the interventions that are feasible with the existing framework, stakeholders will identify the necessary structural changes in the legal, institutional and regulatory frameworks that are required for implementation for other policy interventions.
- **Preparation and launching of GUMP:** This will involve carrying out stakeholder consultations, identification of goals and targets within a five-year planning horizon, preparation of GUMP by compiling specific strategies and activities with timelines, identification of responsible agencies for specific actions, developing M&E framework and launching of planned activities within the prescribed timeframe.

- **Full implementation of the NPNG with all required changes in place:** With the speedy implementation of GUMP, it is expected to reach the capacity for full implementation of NPNG within the planning horizon of first GUMP.

The tentative time plan of the implementation strategy will be:

Step of Implementation	Tentative time line
Preliminary coordinating and cooperation building measures	Within 3 months of the Cabinet Approval
Initiating the interventions feasible within the existing legal and institutional framework	6 months
Identification of structural changes in legal, institutional and regulatory frameworks	8 Months
Preparation and launching of GUMP	One year
Full implementation of the NPNG with all required changes in place	Within the planning horizon of first GUMP

6.2 Responsibility and Authority

The main responsibility of implementation of the NPNG lies with the Ministry entrusted with the subject of 'Petroleum Resources Development' (Currently the Ministry of Highways, Road Development and Petroleum Resources Development). The Ministry is vested with the decision-making responsibility of exploring, importing, storing and distribution of natural gas in collaboration with relevant stakeholders and institutions so that natural gas is made available to potential consumers at affordable prices. The Ministry will take the leadership of implementing the NPNG fulfilling necessary management and coordination functions to achieve the goals and objectives of the Policy.

In this connection, the Ministry will be assisted by the line agencies coming under own purview as well as other ministries and line agencies, depending on the area of policy interventions concerned. The Ministry will be directly assisted by the Petroleum Resources Development Secretariat (PRDS) in the implementation of policy interventions that are concerned with commercial development of indigenous resources of natural gas. Responsibility of facilitating the exploration and exploitation of natural gas from indigenous sources up to the point of title transfer is vested with the PRDS. Ministry will also draw on from expertise and technical knowledge exists with the existing agencies such as Ceylon Petroleum Corporation (CPC) which has a mandate relevant to importing and distribution of petroleum in the country.

The Ministry will also take actions to establish new institutional arrangements to implement the proposed policy interventions, as proposed in the policy statement 4.1.5. To handle and coordinate matters relating to the distribution of natural gas in the country, the Ministry will take necessary measures to establish the ‘National Gas Company’ as proposed by the policy statement 4.1.5.6, with necessary powers and resources. As proposed in the policy statements 4.1.5.2 and 4.1.5.3, smooth functioning of these institutional arrangements will require introducing appropriate legal provisions and regulatory mechanisms too. As laid down by the different policy statements, the institutions with key implementation responsibilities include the following.

Agency	Major role/responsibility
Ministry in charge of the subject of petroleum resources development	Policy direction, guidance, inter-agency coordination and overall supervision of implementation of NPNG
Petroleum Resources Development Secretariat (PRDS)	Up-stream gas industry regulator
Ceylon Petroleum Corporation (CPC)	Single Credible Entity (SCE) for sourcing LNG; technical and institutional assistance for implementation of NPNG
Public Utilities Commission of Sri Lanka	Mid- and down-stream gas market regulator
National Gas Company (Proposed by the NPNG)	Operation of private public partnership (PPP) ventures; technical and institutional assistance for implementation of NPNG

In majority of policy interventions, the Ministry will have to coordinate not only with its own line agencies but with several other ministries such as the Ministry of Power and Renewable Energy, Ministry of Transport and Civil Aviation, Ministry Ports and Shipping and Southern Development, Ministry of Industry and Commerce and the Ministry of Finance and Mass Media. The Ministry will also have to work together with number of regulatory bodies to achieve the goals and objectives of the NPNG. They will include national government agencies such as the Public Utilities Commission of Sri Lanka (PUCSL), Central Environment Authority (CEA), Marine Environmental Protection Authority (MEPA), Directorate of Merchant Shipping (DMS), Coast Conservation and Coastal Resource Management Department (CCCRMD) and the Motor Traffic Department (MTD). The Ministry will initiate appropriate coordination mechanisms such as appointing ‘multi-agency committees’ to enlist the cooperation of such agencies whenever necessary.

The NPNG is comprised of interventions that need the support of sub national agencies such as Local Government Authorities and Provincial Councils too. Ministry will take necessary measures to coordinate with sub national agencies when their assistance is required for implementation of the NPNG.

Not only the assistance of national and sub-national public agencies, successful implementation of the NPNG requires close cooperation and coordination with private sector and non-state actors too. As suggested in the policy principle 3.5 and the policy statement 4.1.5.3, the foundation for effective engagement of non-state actors is establishing a robust regulatory framework. The Ministry will initiate actions to establish a regulatory mechanism for governance of natural gas industry as an urgent priority for implementation of the NPNG.

6.3 Monitoring and Evaluation

For successful implementation of proposed policy interventions, a well-defined Monitoring and Evaluation (M & E) Framework will be introduced by the Ministry with the following key elements.

- Organizational set-up for implementation of NPNG and GUMP with specific roles and responsibilities of each stakeholder agencies
- Actions identified for each agency with well-defined timelines
- Protocols and procedures for collection of baseline data, coordinating actions of key stakeholders and reporting the progress
- Set of indicators for:
 - defining benchmarks
 - measuring goals and targets
 - establish key performance indicators for each stakeholder
- Timeframe for periodic evaluation
- Guidelines for undertaking monitoring and evaluation functions

The M & E framework will assess the effectiveness, efficiency, sustainability and the impact of the policy interventions with timely inputs for necessary corrective actions. The proposed ICT-based natural gas information system in section 4.1.8.4 will facilitate and enhance the implementation of M & E framework.

Glossary

Fossil fuels	Naturally occurring organic fuel compounds found in the earth's crust, E.g. petroleum, coal or natural gas.
Hydrocarbons	Organic compounds comprised of hydrogen and carbon. Hydrocarbons may exist in gaseous, liquid, or solid forms.
Petroleum	A generic name for hydrocarbons that include crude oil, natural gas and their products.
Petroleum oils	Liquid hydrocarbons of different molecular weights that are resulted as outputs of the process of refining naturally occurring crude oil. Examples are petrol, diesel, kerosene and furnace oil.
Natural gas	A naturally occurring mixtures of hydrocarbon compounds found in the gaseous phase often in association with crude petroleum in natural underground reservoirs at reservoir conditions. The principal hydrocarbons usually contained in natural gas are methane, ethane, propane, butanes, and pentanes. Natural gas may be associated with small quantities of various non-hydrocarbons too such as carbon dioxide, helium, hydrogen sulphide, and nitrogen.
Liquefied natural gas (LNG)	Natural gas cooled to extreme low temperatures (<-160°C) so that it becomes liquid, making it more convenient and less risky to store and transport. It is made through process known as liquefaction undertaken in liquefaction plants.
Compressed natural gas (CNG)	Natural gas compressed into cylinders, mainly to be used as an alternative liquid fuel in road vehicles. CNG relies on applying pressure as the mechanism to reduce the volume.
Liquefied petroleum gas (LPG)	Light hydrocarbons that are held in the liquid state by applying pressure at normal temperatures and pressures to facilitate storage, transport and handling. Commercial LPG comprised mainly of either propane or butane, or their mixtures.
Feedstock gas	Dry gas used as raw material for industrial processes involving production of petrochemicals and other industrial outputs
Liquefaction	Process that converts natural gas into LNG. It requires removal of latent heat over a wide temperature range using a refrigerant.
Compression	Process of contracting a volume of gas into a smaller space resulting in CNG
Regasification	Process that converts LNG back to its gaseous form by applying heat so that the gas can be delivered into a pipeline system.
Upstream gas industry	Term usually used to describe exploration and production activities in the gas industry up to the point of piping or shipping.
Downstream gas industry	Commercial gas operations closer to the end-user involving selling and distribution of natural gas.
Midstream	The activities that lie between the <i>Upstream</i> and <i>Downstream</i> sections of the

activities	gas supply chain mostly involving pipeline transportation of raw natural gas to a processing facility. The term is not well defined and may sometimes be used also to elements that fall into the other two categories.
Storage	Maintaining a reserve of natural gas supplies to meet seasonal demands by storing them in tanks.
Pipeline	Pipe-based system for the transportation natural gas between two points, either offshore or onshore including other facilities located in stations such as valves and/or pig barrels required for isolating, measurement, gathering, transportation, and distribution of gas.
Price indexation	The practice in which a contract price is linked to price of another, product (usually less complex) or economic indicator allowing the resulting price to vary according to another factor. Gas contract prices are often linked to major crude oil indices, certain fuel oil prices, or, less frequently, energy or economic growth indicators.
Spot price	Price offered in short-term buying and selling of natural gas
Classification societies	Private organisations that arrange inspections and advise on the condition of ships (including the vessels that transport gas), supervise vessels during and after their construction to assess their seaworthiness, and place vessels in grades or classes. The major classification societies have included the International Maritime Organisation (IMO) LNG Gas Codes in their rules.