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ECOFRIENDLY COMPRESSED NATURAL GAS: TECHNOLOGICAL AND ENVIRONMENTAL ASPECTS UNDER THE LEGAL FRAMEWORK

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Abstract :

Compressed Natural Gas, also known as, CNG is a cleaner, safer and healthier fuel in comparison to gasoline or diesel as a source of energy. The CNG is environmentally friendly, as such. Technically speaking, the CNG is, indeed, a natural gas and it is made by compressing the natural gas to less than 1 percent of the volume it occupies at standard atmospheric pressure. With natural gas mainly composed of methane (CH₄), CNG emits less air pollutants in the environment than petrol or diesel. The Supreme Court's ruling, in the year 2002, on air pollution, in the capital territory of Delhi, is undoubtedly a milestone in Indian judicial history. The Apex Court used significant innovations of the law, such as, health as an integral part of the right to life and use of the "polluter pays principle" to penalize a polluting technology. The Apex Court delivered a landmark judgement banishing diesel buses off the streets of Delhi, although in a phased manner. The Supreme Court of India, thus, ruled that all diesel buses in the city be converted to compressed natural gas. The Supreme Court also upheld the National Green Tribunal decision for CNG buses and coaches at the Indira Gandhi International Airport, in New Delhi. Sustainable development constitutes the core part of this research paper. Ecofriendly CNG technology is an essential tool for the doctrine of sustainable development. The doctrine is instrumental in ensuring that people have access to energy that is clean, affordable, and sustainable and to live in a less toxic environment. The aim of this paper is to study the technological and environmental aspects of the use of compressed natural gas under the legal framework and, thereby establishing the fact that the CNG, is a significant milestone on the road to sustainable development.

Keywords: Compressed Natural Gas, Gasoline, Diesel, Environmentally Friendly Fuel, Methane, Environmental Pollutants, Right to Life, Right to Health, The Supreme Court of India, the National Green Tribunal, Science and Technology and Sustainable Development.

INTRODUCTION :

Compressed Natural Gas, also popularly known as, CNG is a fuel that can be used in automobiles in place of¹ gasoline, diesel or Liquefied Petroleum Gas (LPG). CNG combustion produces fewer undesirable gases than the aforesaid gasoline, diesel and LPG². The CNG is, therefore, environmentally friendly.

Technically speaking, as stated above, CNG is compressed natural gas. With natural gas mainly composed of methane (CH₄),³ CNG emits less air pollutants, namely, carbon dioxide, carbon monoxide, nitrogen oxides and particulate matter than petrol, diesel or LPG.⁴

CNG is formed of natural gas and the later is formed by the decay of organic matter.⁵ When hydrogen is burnt, it releases energy and the only product left as a residue is a water. Since water is clean and not a pollutant, CNG is, therefore, a clean and safe energy source with a plethora of commercial applications, such as, electricity generation, heating, and fuel.⁶

CNG is made by compressing natural gas, which is mainly composed of methane (CH₄), to less than 1 percent of the volume it occupies at standard atmospheric pressure⁷. It is stored and distributed in hard containers at a pressure of 20-25 MPa (2,900 – 3,600 psi), usually in cylindrical or spherical shapes⁸.

CNG is a mixture of hydrocarbons consisting of approximately 80 to 90 percent methane (CH₄) in gaseous form.⁹ Because of its low energy density, it is compressed to pressure of 200 to 250 kg/cm².¹⁰ Due to this reason the fuel is called compressed natural gas.¹¹ CNG is colourless, non-carcinogenic and non-toxic¹². It is inflammable and lighter than air. It is not a liquid fuel, and is not the same as LPG, which consists of propane (C₃H₈) and butane (C₄H₁₀) in liquid form.¹³

Superior to petrol, it operates at one-third the cost of conventional fuel and is hence, increasingly becoming popular with automobile owners. Commonly referred to as the green fuel because of its lead free characteristics, it reduces harmful emissions.¹⁴

¹ en.m.wikipedia.org; energyeducation.ca.

² Ibid.

³ www.mydisposal.com; afdc.energy.gov.

⁴ economictimes.indiatimes.com; indianexpress.com; www.engrow.com

⁵ Supra n.1.

⁶ www.tutorialspoint.com; www.toppr.com; edu.rsc.org.

⁷ www.waterworld.com; en.m.wikipedia.org.

⁸ Ibid.

⁹ web.delhi.gov.in; transport.delhi.gov.in

¹⁰ Ibid.

¹¹ Supra n. 5.

¹² www.cityofrockport.com

¹³ energymedia.info

¹⁴ www.bharatpetroleum.com

The difference between CNG and LPG needs to be understood and it lies in the fact that while CNG is comprised of methane (CH₄), LPG is comprised of propane (C₃H₈) and butane (C₄H₁₀).¹⁵ CNG is typically used as a substitute for gasoline in automobiles, while LPG is often used in the industrial refrigeration, agricultural and catering industries.¹⁶

AIR POLLUTION IN THE CAPITAL TERRITORY OF DELHI AND THE SUPREME COURT OF INDIA :

Air pollution, in India, has been a serious health issue. Of the most polluted cities in the world, 21 out of 30 were in India in the year 2019.¹⁷ India has a low per capita emissions of greenhouse gases but the country as a whole is the third largest greenhouse gas producer after China and the United States.¹⁸

In Delhi, air quality continues to be severe and has reached hazardous levels. In the capital city, the data shows that of the total 3000 metric tones of pollutants released daily, 66 percent¹⁹ is from vehicles.

The air quality in Delhi, the capital territory of India, according to a World Health Organisation (WHO) survey of 1,650 world cities, is the worst of any major city in the world. It also affects the districts around Delhi.²⁰ Air pollution, in India, is estimated to kill about 2 million people every year²¹. It is the fifth largest killer in India.²² India has the world's highest death rate from chronic respiratory diseases and asthma, according to the WHO.²³ In Delhi, poor quality air irreversibly damages the lungs of 2.2 million or 50 percent of all children.²⁴

Recently, on the 25th day of November, 2019. The Apex Court made statements on the pollution in Delhi saying "*Delhi has become worse than hell*".²⁵

¹⁵ Supra n. 11.

¹⁶ www.total.co.za; www.hindustanpetroleum.com

¹⁷ autocavindia.com

¹⁸ www.carbonbrief.org; www.thehindu.com; in.reuters.com

¹⁹ www.indiatoday.in; www.timesnownews.com; www.vox.com

²⁰ www.who.int; en.m.wikipedia.org

²¹ Ibid.

²² Ibid.

²³ www.bbc.com; yaleglobalhealthreview.com

²⁴ Ibid.

²⁵ m.timesofindia.com; m.hindustantimes.com; www.newsgram.com; www.indiatvnews.com

The Supreme Court of India delivered a landmark judgement in a Public Interest Litigation²⁶ filed by M.C. Mehta, in 2002, banishing diesel buses off the streets of Delhi, even though in a phased manner. In December, 2015 the Apex Court came down heavily on pollution in Delhi and gave major judgements. The Court declared that the taxis running in NCR region should mandatory run on CNG by March 31, 2016.²⁷ Apart from this, the Court put a ban on diesel cars which have an engine capacity of 2000cc and above.²⁸

Recently, in 2018, the Supreme Court upheld the decision of the National Green Tribunal for CNG buses at the Indira Gandhi International Airport in New Delhi.²⁹

THE NEW CONCEPT OF GREEN CHEMISTRY : CLEANER TECHNOLOGIES AND SAFER CHEMICALS :

“Green” is the keyword to all our environmental concerns in present times. Right from a cup of green tea to the internationally famous organization called “Greenpeace”, we hear very often about environmentally benign and ecologically friendly products, processes and technologies everywhere.

India needs to design, develop and implement the “green chemistry” or the “clean chemistry”, as it is known otherwise, in letter and spirit, for ensuring its sustainable development by eliminating the use of the substances that are hazardous to human health and the environment. As discussed earlier, in the previous chapter, CNG is a compressed natural gas. With natural gas mainly composed of methane (CH₄), CNG emits less air pollutants in the environment.³⁰ It is, as such, environmentally friendly and alternative to gasoline and diesel. The technology applied in CNG is, indeed, the application of safer chemical and cleaner technology.

“Green Chemistry” is defined as “the invention, design, development and application of chemical products and processes to reduce or eliminate the use of substances hazardous to human health and environment.”³¹

²⁶ M.C. Mehta –Vs- Union of India AIR 2002 SC 360; (2002) 2 SCR 963, the Apex Court order dated 05.04.2002 in vehicular pollution case in Delhi.

²⁷ Supra n. 19; All diesel run taxis in NCR must switch to cleaner CNG.

²⁸ Ibid.

²⁹ www.lexology.com; www.mondaq.com; www.indiatoday.in NGT wants Delhi Airport to go green allowing only CNG vehicles at the IGI Airport.

³⁰ P.C. Mahanta, “From Chairman’s Desk” in the Souvenir, *Green Chemistry : Cleaner Technology and Safer Chemicals* (2003) p. 2 published on the occasion of a day long National Seminar on “Green Chemistry” organized by the Assam State Centre of the Institution of Engineers (India) at its Panbazar premises, Guwahati on 15th of March, 2003.

³¹ Ibid.

Green Chemistry is a new field that seeks to reduce the environmental consequences of chemical industry. The field of green chemistry is arising to solve problems that are of great significance to the future of humanity. The principle of green chemistry is that pollution should be prevented or reduced at the source whenever and wherever feasible.³² Preventing pollution through the principles of green chemistry offers important economic benefits, as well, avoiding the need for expensive investments in waste management or cleanup.³³

Green Chemistry is oriented towards the replacement of hazardous chemicals with benign materials during their manufacture, use and disposal.³⁴ One of the goals of green chemistry is to reduce the risk associated with chemical substances.³⁵ Green Chemistry strives to promote technological advancements by incorporating benign materials into the design of chemical processes and to prevent the formation of pollution at its source.³⁶ It reduces or eliminates wastes at the source by modifying production processes, promoting the use of non-toxic or less-toxic substances, implementing conservation techniques, and reusing materials rather than putting them into the waste stream.³⁷ Green Chemistry includes modification of engineering practices to promote environmental protection as enshrined in Article 48-A³⁸ of the Constitution of India.

PRECAUTIONARY PRINCIPLE : THE JURISPRUDENTIAL BASIS OF COMPRESSED NATURAL GAS (CNG) TECHNOLOGY :

The logic behind the “Precautionary Principle” is the realization of the fact that prevention is always better than cure. The precautionary principle coincides with the basic concept of Green Chemistry in that pollution needs to be prevented or reduced at the source whenever and wherever feasible. From the jurisprudential view point, the aim of the precautionary principle is to anticipate, prevent and attack the causes of environmental degradation.³⁹

³² Dr. A.K. Baruah, *Green Chemistry – An Overview in the Souvenir, Green Chemistry : Cleaner Technology and Safer Chemicals* (2007).

³³ Ibid.

³⁴ Ibid.

³⁵ Ibid.

³⁶ Ibid.

³⁷ Ibid at pp 4-8.

³⁸ It is a Directive Principle of State Policy in Part-IV of the Constitution of India, inserted into the basic document by the Constitution (42nd Amendment) Act, 1976.

³⁹ The Apex Court in the Oleum Gas Leak Case; M.C. Mehta –Vs- Union of India AIR 1987 SC 1986.

The Earth Summit⁴⁰ also recognized the “precautionary principle” in principle 15 of the Rio Declaration⁴¹ as follows :

“In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.”

The Supreme Court of India defined and explained the “Precautionary and Polluter Pays Principle” in its historic judgement in the Oleum Gas Leak Case.⁴²

The precautionary principle is accepted, in India, as a fundamental tool to promote sustainable development⁴³ and is employed within Indian environmental governance to promote better health and environmental decisions.⁴⁴

As stated, earlier, in this regard, the precautionary principle concentrates on prevention rather than cure. The principle embodies the idea of careful planning to avoid risks in the first place, rather than trying to determine how much risk is acceptable.⁴⁵ Decision-making processes should always endorse a precautionary approach to risk management and in particular should include the adoption of appropriate precautionary measures.

In Vellore Citizens Welfare Forum –Vs- Union of India,⁴⁶ the Supreme Court of India accepted the precautionary principle as an integral part of the environmental law of the country.

CONSTITUTIONAL AND LEGISLATIVE FRAMEWORK FOR ENVIRONMENTALLY FRIENDLY TECHNOLOGIES TO PROMOTE SUSTAINABLE DEVELOPMENT :

Compressed Natural Gas, being environmentally benign and friendly, in its use, as a fuel in automobiles, as well as, a source of energy, protects and promotes the environment within the meaning of the provisions of Articles 48-A⁴⁷, 51-A⁴⁸ and 21⁴⁹ of the Constitution of India.

⁴⁰ The United Nations Conference on Environment and Development, also popularly known as, Earth Summit was held at Rio de Janeiro, in Brazil, from 3rd to 14th June, in the year 1992.

⁴¹ Rio Declaration, 1992 adopted in the Rio Earth Summit, 1992.

⁴² M.C. Mehta –Vs- Union of India, AIR 1987 SC 1086.

⁴³ journals.sagepub.com; thefactfactor.com

⁴⁴ Ibid.

⁴⁵ Ibid.

⁴⁶ AIR 1996 SC 2715.

⁴⁷ Fundamental duty of the State concerning environmental protection, as well as, a Directive Principle of State Policy.

The Constitution of India, itself, is a green document.⁵⁰ All environmental legislations passed by the parliament of India, particularly in the post-Stockholm period, are the beneficent legislations from ecological view point. One and all of them encourage environmentally friendly technologies in order to promote sustainable development and social justice.

His holiness the 14th Dalai Lama of Tibet assets⁵¹:

“We can share the earth and take care of it together rather than trying to possess it to destroy the beauty of life in the process.”

The Constitution (42nd Amendment) Act, 1976 drew its immense inspiration from the Stockholm Conference.⁵² Facts remain that prior to this amendment, there was no provision in the Indian Constitution directly dealing with environmental protection. It was realized in the Stockholm Conference and, subsequently, the Parliament of India passed a number of very comprehensive and scientific legislations including the Constitution (42nd Amendment) Act, 1976. The amendment inserted two important Articles into the Constitution of India, namely, Article 48-A⁵³ and Article 51-A⁵⁴ concerning the fundamental duty of the State and the citizens, respectively.

The development of legislature environmentalism, in India, can be divided into three phases, namely, Phase-I (Stockholm⁵⁵ and thereafter), Phase-II (Rio⁵⁶ and thereafter) and Phase-III, (Copenhagen⁵⁷ and thereafter) as follows :-

⁴⁸ Fundamental duty of every citizen of India in Part-IV-A of the Constitution.

⁴⁹ Right to Life and personal liberty.

⁵⁰ See generally Justice Ashok A. Desai *Environmental Jurisprudence* (2002).

⁵¹ Meltdown in Tibet www.amazon.in www.pinterest.com; www.dalailama.com.

⁵² 1972, held at Stockholm, Sweden from 5th to 16th June, 1972.

⁵³ Supra n. 47.

⁵⁴ Supra n. 48.

⁵⁵ Supra n. 52.

⁵⁶ Supra n. 40.

⁵⁷ Copenhagen Summit on Climate Change, 2009 in Denmark, between 7th and 18th of December, 2009.

Phase-I : (Stockholm and thereafter) :

- (i) The Wildlife (Protection) Act, 1972;
- (ii) The Water (Prevention & Control of Pollution) Act, 1974;
- (iii) The Constitution (42nd Amendment) Act, 1976;
- (iv) The Water (Prevention & Control of Pollution) Cess Act, 1977;
- (v) The Forest (Conservation) Act, 1980;
- (vi) The Air (Prevention & Control of Pollution) Act, 1981;
- (vii) The Environment (Protection) Act, 1986;
- (viii) The Public Liability Insurance Act, 1991;

Phase-II: (Rio and thereafter) :

- (ix) The Protection of Human Rights Act, 1993;
- (x) The National Environment Tribunal Act, 1995;
- (xi) The National Environment Appellate Authority Act, 1997;
- (xii) The Protection of Plant Varieties and Farmers Rights Act, 2001;
- (xiii) The Biological Diversity Act, 2002;
- (xiv) The Right to Information Act, 2005;

Phase-III : (Copenhagen and thereafter) :

- (xv) The National Green Tribunal Act, 2010, the Parliament, thereby, repealing the earlier two legislations of 1995 and 1997. This new legislation draws inspiration from the India's constitutional provision of Article 21 which assures the citizens of India the right to a healthy environment.

The National Green Tribunal (NGT) came to be established, in India, under the National Green Tribunal Act, 2010. It started functioning w.e.f. 18th of October, 2010 and has already seen a large number of cases being transferred from the erstwhile National Environment Appellate Authority and from the various Courts including the Supreme Court of India.

There are, at present, four circuit branches of NGT with eastern branch at Kolkata, the western branch at Pune, the central (northern) one at Bhopal and the southern branch in Chennai. New Delhi is the principal place of sitting of the National Green Tribunal besides the above Bhopal, Pune, Kolkata and Chennai circuit branches.

SUSTAINABLE DEVELOPMENT AND SOCIAL JUSTICE :

“Sustainable Development” constitutes the core part of this paper. The non-conventional⁵⁸ approach of the CNG technology is to ensure that the people have accesses to energy that is clean, affordable and sustainable.

Rio Declaration⁵⁹ proclaims, in principle1, that human beings are at the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature.

In 1983, the United Nations General Assembly, constituted a Commission, called, the World Commission on Environment and Development (WCED) with Mrs. G.H. Brundtland⁶⁰ as its chairperson to study the world environment and development beyond 2000.⁶¹

The Commission submitted its Report in 1987 under the caption “Our Common Future”, which noted that human future was at a risk if we continue the current modes of unsustainable development.⁶² The report defined sustainable as *“the development that meets the need of the present without compromising the ability of future generations to meet their own needs.”*⁶³

Mr. Rajiv Gandhi, the former Prime Minister of India in forward to “Our Common Future” observed⁶⁴:

“Main challenges before mankind are three to preserve peace, to eradicate poverty and to conserve environment.”

The term “sustainable development” was used at the time of Cocoyoc Declaration on Environment and Development in the early 1970s.⁶⁵ Since then it has become the trademark of international organizations dedicated to achieving environmentally benign or beneficial development. Sustainable development means an integration of developmental and environmental imperatives. To be sustainable, development must possess both economical and ecological sustainability. It indicates the way in which developmental planning should be approached. The environment and development are for people, not people for environment and development.⁶⁶

⁵⁸ Conventional source of energy, namely, gasoline, diesel, liquefied petroleum gas emit environmental pollutants. CNG, being environmentally friendly and benign, is non-conventional fuel energy.

⁵⁹ Supra n.56.

⁶⁰ P.D. Sharma *Environment and Ecology* (1997), p. 404.

⁶¹ Ibid.

⁶² Ibid.

⁶³ Ibid.

⁶⁴ Justice Ashok A. Desai *Environmental Jurisprudence* (2002) p. x.

⁶⁵ P.S. Jaswal and Nistha Jaswal, *‘Environmental Law’*(1999) P. 79.

⁶⁶ Ibid.

“Environmental Sustainability” and “Social Justice” stand in a relationship of mutual reinforcement rather than mutual antagonism. Social justice is functional for environmental sustainability and environmental sustainability is at the very least necessary condition for social justice.⁶⁷

While inaugurating the Constitution Day Celebration on the 26th day of November, 2018, Sri Ramnath Kovind, His Excellency, the President of India said⁶⁸ :-

“In India, the idea of social justice too has expanded to encompass modern civic parameters, such as, clean air, less polluted cities and towns, rivers and water bodies; sanitary and hygienic living conditions; and green and ecofriendly growth and development. These are all implications of environmental and climate justice, within the framework of social justice. If a child suffers from asthma due to air pollution, I would consider that a gap in providing social justice.

Perhaps the most tantalizing influence on justice is that of technology. This is especially so because we live in an era of rapid and enormous technological change Technology is an enhancer of justice, as well as, a challenge. It calls for us to think of technology justice as a subset of economic justice. This is very true in the context of access to technology for our poorer and less-privileged fellow citizens.

Technology has made huge contributions to our quality of life.....”

INTERVENTIONAL ENVIRONMENTAL JURISPRUDENCE AND COMPRESSED NATURAL GAS (CNG) :

In 1998, the Supreme Court of India, embracing its activist role, issued a controversial order *suo motu*⁶⁹ mandating the conversion of the entire Delhi fleet of diesel powered buses to compressed natural gas (CNG).⁷⁰ The judgement of the Apex Court came as a surprise to the executive agencies that lacked the technology and finances to implement the order.⁷¹

About two years before the aforesaid judgement, the Apex Court, in 1996,⁷² ruled that all government vehicles in the city be converted to CNG. The Supreme Court endorsed the Central Government’s decision to setup the Environmental Pollution (Prevention and Control) Authority (EPPCA) headed by Mr. Bhare Lal.⁷³

⁶⁷ Andrew Dobson, *Justice and Environment : Conceptions of Environmental Sustainability and Theories of Distributive Justice* (1998), p. 134.

⁶⁸ Constitution Day Celebration organized by the Supreme Court Bar Association at Vigyan Bhawan, New Delhi on 26th day of November, 2018 : Delhi Doordarshan Telecast.

⁶⁹ www.environmentaljournal.org.

⁷⁰ Ibid.

⁷¹ Ibid.

⁷² M.C. Mehta –Vs- Union of India AIR 1996 SC 382.

⁷³ Ibid.

The Supreme Court ruling,⁷⁴ in the year, 2002, on air pollution in the capital territory of Delhi is undoubtedly a milestone in Indian judicial history. The Apex Court used significant innovations of the law, such as, health as an integral part of the right to life and use of the “polluter pay principle”⁷⁵ to penalize a polluting technology. The Apex Court delivered a landmark judgement banishing diesel buses off the streets of Delhi, even though in a phased manner.⁷⁶ The Supreme Court of India, thus, ruled that all diesel buses in the city be converted to CNG.⁷⁷

The Apex Court supported its judgement on the basis of two principles of sustainable development, namely, the Precautionary Principle (PP) and the Polluter Pays Principle (PPP).

The Court referred to Vellore Citizen’s,⁷⁸ case and held that the precautionary principle and the polluter pays principle are the two integral part of the legal system of the country.

CONCLUSION :

CNG as an alternative fuel, to the conventional gasoline, diesel or LPG is a significant milestone on the path to a sustainable future. The technology applied in CNG is a green technology. Significantly, the CNG can play a very pivotal role while reducing the emission of green house gages and contributing a lot to climate justice movement.

The interventional jurisprudence developed by the activist judges giving judicial approval to CNG as an alternative fuel in the automobiles is another very significant milestone on the road to sustainable development.

The Constitution of India is, itself, a green document. Constitutional environmentalism is reflected in Article 48-A which enjoins a directive principle of state policy, as well as, a fundamental duty on the State to protect and improve the environment. The Acts enacted by the Government of India, in the post Stockholm period, are also very comprehensive and scientific in its application that encourage CNG as an alternative fuel to gasoline, diesel or LPG.

It is also one of the aims of the sustainable development goals to ensure affordable and clean energy to all.

⁷⁴ M.C. Mehta –Vs- Union of India (2002) 2 SCR 963.

⁷⁵ Ibid.

⁷⁶ Ibid.

⁷⁷ Ibid.

⁷⁸ AIR 1996 SC 2715.