

Chapter 5

LNG Supply Chain Infrastructure Analysis

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Chapter 5

LNG supply chain infrastructure analysis

5.1 Introduction

This chapter analyses the spatial relationship between demand points and LNG supply chain infrastructures like LNG terminals and transport modes. The analysis used the results in Chapter 3.

The main outputs are the set of primary and secondary LNG terminals, assigned transport modes, and final demand points listed in the following tables.

5.2 Methodology

5.2.1 Procedure for LNG supply chain infrastructure development analysis

The LNG supply chain infrastructure development was analysed using the following procedure:

First, major LNG demand points and terminals (existing and planned, and thermal power plants/states) were identified. The thermal power plant location was identified using Enipedia. The area coordinates (latitude and longitude) were collected from the Enipedia site. The demand in a certain province, the centroid coordinate, is regarded as the demand point. The centroid is calculated from the polygons in shapefile format using QGIS.

Second, the nearest neighbour points between demand points and ports were identified. The direct distance can be calculated from the geographic coordinates of demand points and ports. The nearest ports based on this direct distance were then identified. At this point, the transport mode was still not being considered.

Third, LNG demand volume was summarized for each port using the previous procedure. According to the demand volume, the port is classified as either primary, secondary, or tertiary. Published national LNG terminal development plans were reviewed and, when some LNG terminals were planned as primary receivable terminals, they were classified as primary terminals even if the summarized estimated additional demand was not over the 1.0 MTPA threshold.

Through this process, all demand points were tied to ports. This is because ASEAN countries are surrounded by sea and secondary level LNG transport from primary terminals normally use sea transport. So, for hierarchizing ports, the nearest neighbour points based on sea route distance calculation should be used. Aquaplot, which provides sea route distance calculation service, was used in this study. The secondary and tertiary level ports were then tied to primary ports or larger secondary ports. After classifying and hierarchizing, the assigned LNG demands were recalculated and reclassified. Then, the final classification of the LNG terminal was decided.

The land transport modes were determined based on case studies in Japan. The criteria are

introduced in the following subsections. Most of the transport modes for demand points were automatically determined by considering those criteria. When some cases remained undetermined even by applying the criteria, the transport modes for those cases were determined case by case.

The outputs of this procedure are: map of LNG terminals (existing and planned), territorial map of each primary port, and lists of demand points with transport mode.

5.2.2 Dataset

The sources of data are shown in Table 8.

Table 8. Dataset and Source of Information for LNG Supply Chain Infrastructure Analysis

Datasets	Source
Ports	Aquaplot (https://www.aquaplot.com/)
Thermal power plant	Enipedia (http://enipedia.tudelft.nl/wiki/Portal:Power_Plants)
Province	DIVA-GIS (http://www.diva-gis.org/Data)

LNG = liquefied natural gas.

5.2.3 Criteria for LNG transport mode assignment

The criteria for LNG transport mode assignment are shown in Table 9.

Table 9. Criteria for LNG Transport Mode Assignment

Transport mode	Criteria	Threshold
Pipeline	Distance to nearest port (km)	32.5 km
Railway	Distance to rail (km) of demand point side	15 km
	Distance to rail (km) of port side	15 km
	Number of train (1,300 tonnes/day equivalent)	24 times/day
Truck	Distance of road transport (km)	700 km
	Lorry operability (times/day)	24 times/day

km = kilometre, LNG = liquefied natural gas.

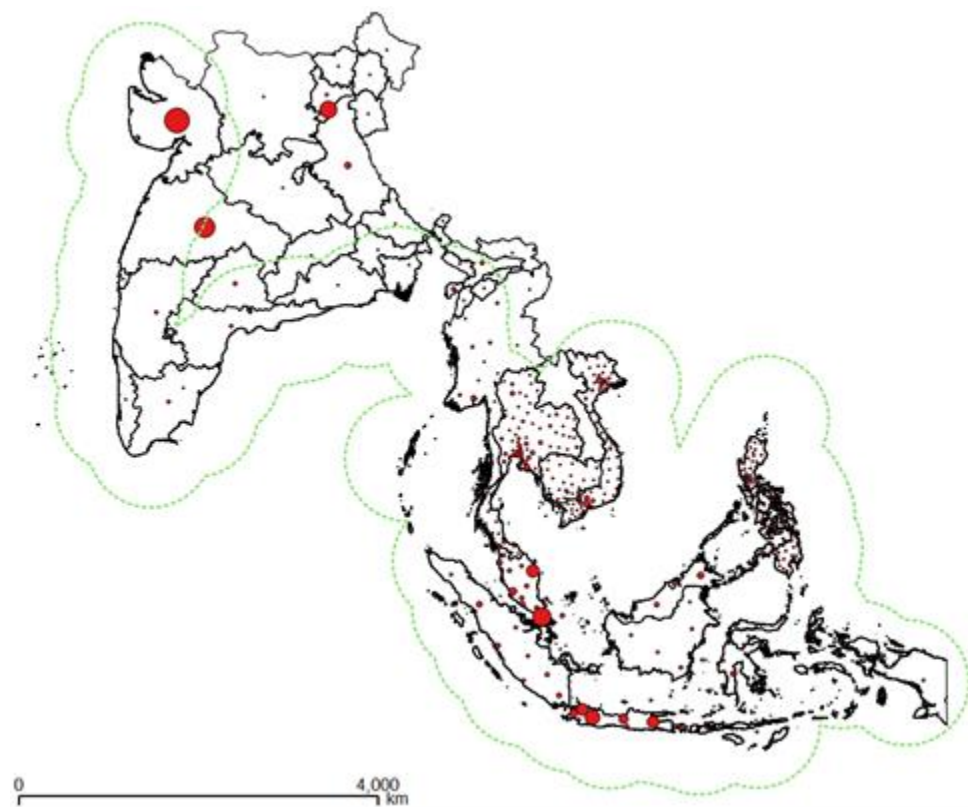
The most important criterion is the 700 km maximum distance for road transport. This is because ASEAN countries are surrounded by sea and from port to inland demand points, the distances are typically less than 700 km.

India is the only exception as shown in Figure 13. In the figure, the surrounding area within the green dotted line satisfies the condition of 700-km distance from the ports. The northern part of India (there is pipeline near Delhi) and the northern part of Myanmar are out of range. Those areas need tertiary transport networks⁵ from the satellite facilities near the gas thermal power plants. Otherwise, railway connectivity or pipeline connectivity should be developed. Of course,

⁴ Tertiary transport network means that the LNG was transported through primary and secondary terminals and then it reaches the major end consumption point like an LNG thermal power plant. In addition, from the storage facility at the end point, the next land transport to the further consumption point may be developed. In this case, the final land transport is defined as the tertiary transport network. Usually, the lorry transport is assumed.

the biggest demand point out of the green brake line is Delhi and it has a pipeline connection to primary LNG terminals located on the west coast of India. Therefore, only few cases need special care to transport LNG.

Figure 13. Cover Area of Each Primary LNG Terminal in 2030



LNG = liquefied natural gas.

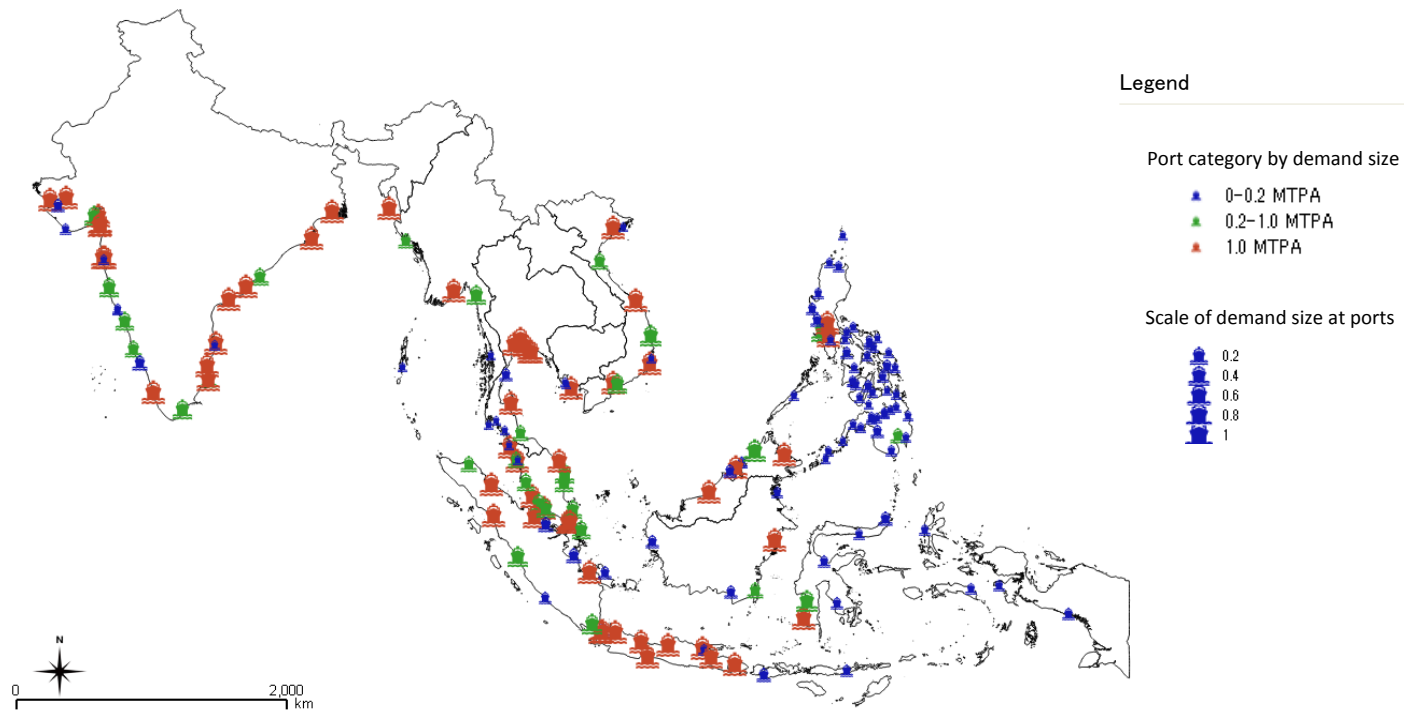
5.3 Results

5.3.1 Categorizing and hierarchizing LNG ports

The ship symbol in Figure 14 shows the location of the ports with LNG terminals. The colour shows the class of the LNG terminal. As can be seen, India and Indonesia have many primary LNG terminals, but the Philippines and Myanmar only have one LNG primary terminal.

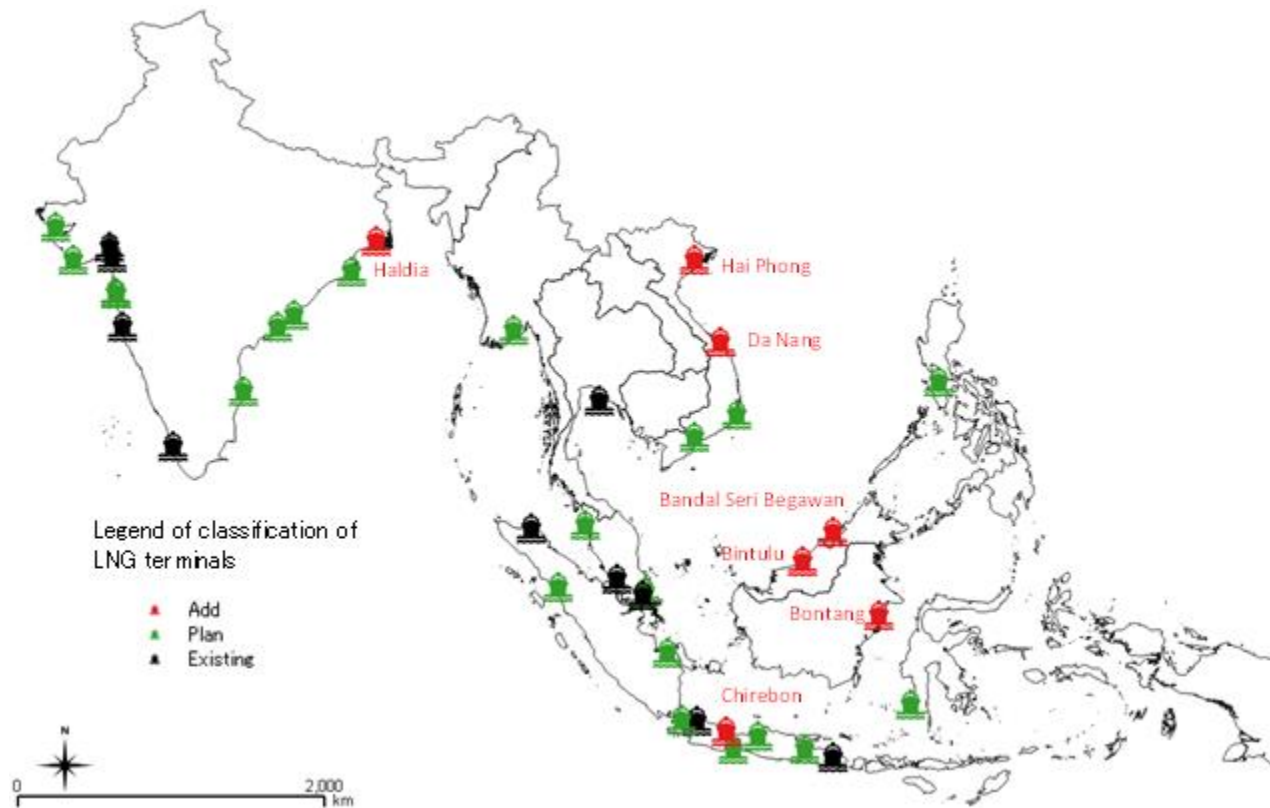
Most of the primary LNG terminals have already been planned by national governments. Only seven primary LNG terminals, namely: Haldia, Hai Phong, Da Nang, Bandal Seri Begawan, Bintulu, Bontang, and Chirebon, are recommended by this study to be added.

Figure 14. LNG Terminal Location (hierarchized)



LNG = liquefied natural gas, MPTA = million tonnes per annum

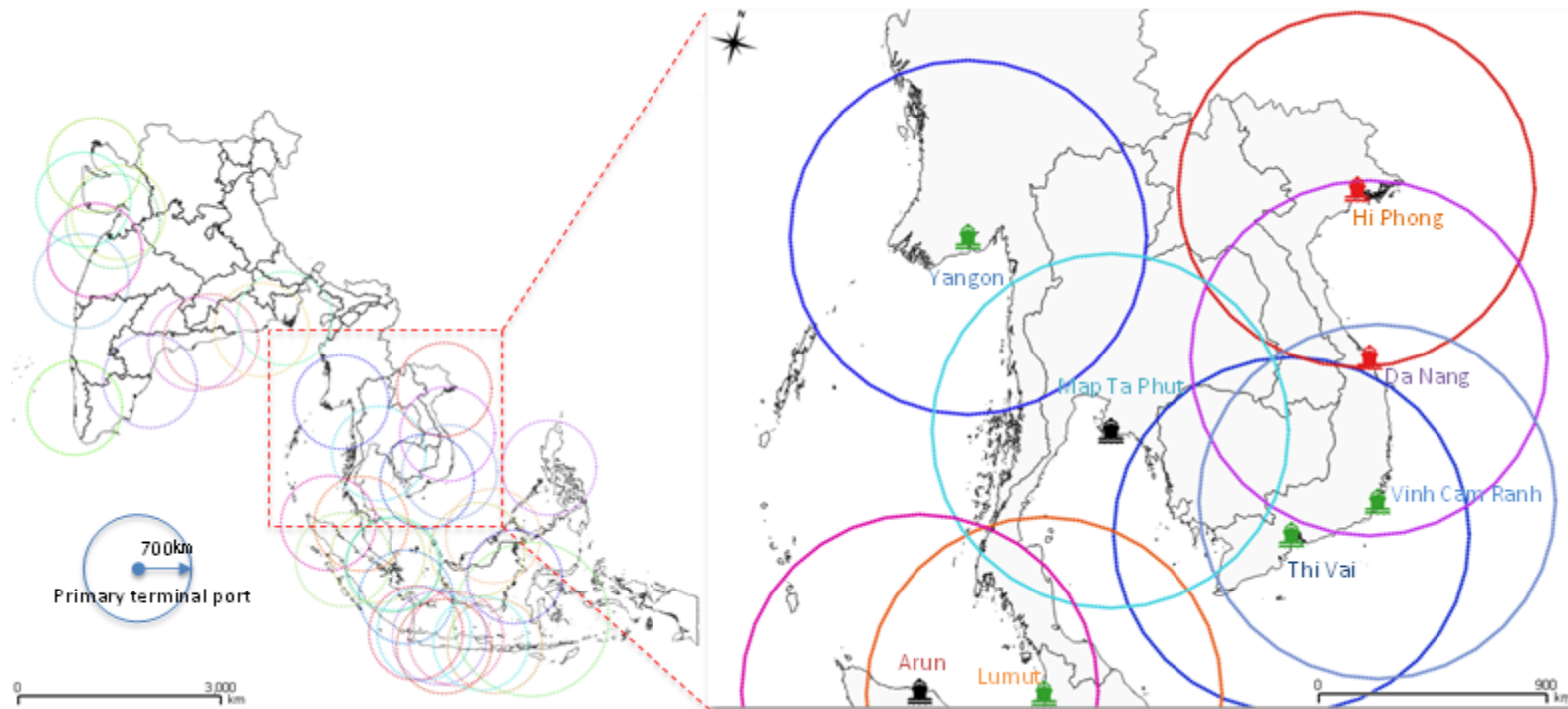
Figure 15. Existing, Planned, and Added Primary LNG Terminals



LNG = liquefied natural gas.

Note: Some of the existing and planned LNG terminals are used as acknowledged name, but it is not the port name.

Figure 16. Cover Area of Each Primary LNG Terminal in 2030



LNG = liquefied natural gas, km = kilometre.

5.3.2 Territorial map of each primary port

Except for northern India, Karnataka, and northern Myanmar, almost all areas in ASEAN and India can be covered by existing, planned, and added primary LNG terminal ports. Interestingly, some of the primary LNG terminals in ASEAN can also cover other countries' area. For example, in the Indochina peninsula, Map Ta Phut can cover southern Thailand, Cambodia, and southern Myanmar. Also, LNG primary terminals in Singapore, Malaysia, and Indonesia can cover each other.

This means that once countries in ASEAN and India cooperate with each other for developing an LNG primary terminal, the economic feasibility of such an LNG primary terminal will be improved and private entities may enter this business opportunity and make their countries save their public funds for investment. LNG transport operators who are expected to be in the private sector can also develop efficient LNG transport networks in ASEAN and India.

5.3.3 Nearest neighbour points analysis between demand points and neighbour ports, and transport mode assignments

The following tables show demand points, demand size, country, nearest port, primary port, distance to railway, distance to the nearest port, and possibility of lorry transport, lorry operability, and pipeline constructability and so on. The table headings show the types of LNG consumption at demand points and transport mode. For example, Table lists new gas thermal power plants which will be supplied by natural gas pipelines from the primary or secondary LNG terminals at the nearest port. Some of the new gas thermal power plants like Thoi Hoa are assumed to use natural gas pipelines for transporting natural gas because of the size of the demand. Railway and lorry cannot transport such a huge amount of LNG so new pipeline construction was assumed.

Table 10. List of New Gas Thermal Power Plants × Pipeline

Plant name	LNG	Country	Nearest port name	Primary port name	Distance to rail (km)	Distance to nearest port (km)	Railroad within 15 km	Possibility of lorry transport (within 700 km)	Lorry operability (24 times/day)	Pipeline constructability (within 32.5 km to port)
	(MTPA)									
Nhon Hoi Refinery	0.819	Viet Nam	Qui Nhon	Vinh Cam Ranh	11	9	Available	Possible		Constructible
Phu My	0.151	Viet Nam	Phu My	Cat Lai	43	9		Possible		Constructible
Thoi Hoa	1.17	Viet Nam	Cat Lai	Cat Lai	6	61	Available	Possible		
Nhon Trach	1.078	Viet Nam	Cat Lai	Cat Lai	29	19		Possible		Constructible
Hiep Phuoc	0.89	Viet Nam	Cat Lai	Cat Lai	5	22	Available	Possible		Constructible
Ca Mau City	1.924	Viet Nam	Duong Dong	Map Ta Phut	214	176		Possible		
Prodair Kochi	0.3	India	Kochi (Cochin)	Kochi (Cochin)	10	17	Available	Possible		Constructible
Pillaiperumalnallur	1.613	India	Karaikal Port	Ennur	7	27	Available	Possible		Constructible
Mangalore Refinery	0.291	India	New Mangalore	Kochi (Cochin)	1	9	Available	Possible		Constructible
Rajahmundry	3.279	India	Kakinada Bay	Kakinada Bay	2	54	Available	Possible		
Trombay	4.935	India	Mumbai (Bombay)	Mumbai (Bombay)	9	5	Available	Possible		Constructible
Sugen	5.946	India	Magdalla	Magdalla	18	34		Possible		
Palatana	1.557	India	Chittagong	Haldia Port	194	142		Possible		
Sultan Iskandar	2.684	Malaysia	Pasir Gudang	Jurong Island	15	2	Available	Possible		Constructible
Bintulu	2.017	Malaysia	Bintulu Port	Bintulu Port	142	11		Possible		Constructible
Kulim Indust Park	1.24	Malaysia	Butterworth	Butterworth	15	23		Possible		Constructible
Kimanis Power	0.867	Malaysia	Sapangar Bay	Bandar Seri Begawan	1	55	Available	Possible		
Khanom	0.53	Thailand	Khanom	Map Ta Phut	367	4		Possible		Constructible
Glow Spp Phase 3–5	0.599	Thailand	Map Ta Phut	Map Ta Phut	242	3		Possible		Constructible

Sriracha Ipt	0.169	Thailand	Si Racha Terminal	Map Ta Phut	238	8		Possible		Constructible
Ratchaburi	1.502	Thailand	Petchburi Terminal	Map Ta Phut	271	71		Possible		
South Bangkok	0.32	Thailand	Bangkok	Map Ta Phut	279	12		Possible		Constructible
North Bangkok	0.466	Thailand	Bangkok	Map Ta Phut	287	34		Possible		
Korat	0.547	Thailand	Bangkok	Map Ta Phut	196	228		Possible		
Nong Chok	0.538	Thailand	Bangkok	Map Ta Phut	227	290		Possible		
Jurong Island	9.373	Singapore	Jurong Island	Jurong Island	16	6		Possible		Constructible
Gadong	0.407	Brunei	Bandar Seri Begawan	Bandar Seri Begawan	82	11		Possible		Constructible
Pemaron	0.59	Indonesia	Celukan Bawang	Celukan Bawang	87	26		Possible		Constructible
Cilegon Nsi	0.94	Indonesia	Banten	Banten	2	5	Available	Possible		Constructible
Cilacap	1.425	Indonesia	Cilacap	Cilacap	6	5	Available	Possible		Constructible
Petorkima Gresik	1.985	Indonesia	Gresik	Gresik	8	2	Available	Possible		Constructible
Bontang Works	0.783	Indonesia	Bontang Lng Terminal	Bontang Lng Terminal	541	1		Possible		Constructible
Paya Pasir	1.312	Indonesia	Belawan	Butterworth	3	8	Available	Possible		Constructible
North Duri	1.183	Indonesia	Dumai	Pelabuhan Sungai Udang	132	2		Possible		Constructible
Muara Tawar	3.969	Indonesia	Jakarta	Jakarta	18	13		Possible		Constructible
Calaca Semirara	0.569	Philippines	Nasugbu	Batangas City	6	25	Available	Possible		Constructible
Santa Rita Batangas	0.58	Philippines	Batangas City	Batangas City	1	1	Available	Possible		Constructible
Therma South	0.165	Philippines	Davao	Bontang Lng Terminal	40	19		Possible		Constructible

km = kilometres, LNG = liquefied natural gas, MTPA = million tonnes per annum.

Source: authors.

The following new gas thermal power plants will use railway to transport LNG because it is difficult to connect them and the ports through pipelines due to the long distance, and both ports and power plants have railway connectivity. For example, from the Jakarta port to Cikarang, a maximum of 12 trains of 1,300 tonnes (40-ft × 100 containers per train) are needed.

Table 11. List of New Gas Thermal Power Plants × Railway

Plant name	LNG	Country	Nearest port name	Primary port name	Distance to rail (km)	Distance to nearest port (km)	Railroad within 15 km	Possibility of lorry transport (within 700 km)	Lorry operability	Pipeline constructability (within 32.5 km to port)
	(MTPA)								(24 times/day)	
Pha Lai	0.389	Viet Nam	Hai Phong	Hai Phong	15	46		Possible		
Hai Phong Thermal	0.046	Viet Nam	Nghe Tinh	Hai Phong	2	12	Available	Possible	Operable	Constructible
Ninh Binh	0.195	Viet Nam	Hai Phong	Hai Phong	2	107	Available	Possible		
One Asia Quang Tri	1.404	Viet Nam	Da Nang	Da Nang	0	145	Available	Possible		
Vinh Tan	2.282	Viet Nam	Vinh Cam Ranh	Vinh Cam Ranh	1	74	Available	Possible		
Talcher Kaniha	0.291	India	Paradip	Paradip	37	191		Possible		
Mejia	0.204	India	Haldia Port	Haldia Port	22	188		Possible		
Dholpur	1.125	India	Dahej	Dahej	0	769	Available			
Kathalguri	1.346	India	Chittagong	Haldia Port	6	664	Available	Possible		
Leh District	0.058	India	Dahej	Dahej	9	875	Available		Operable	
Faridabad Ntpc	0.462	India	Dahej	Dahej	9	875	Available			

Dadri	0.252	India	Dahej	Dahej	17	911				
Pragati	1.595	India	Dahej	Dahej	1	894	Available			
Lalkua Mill	0.054	India	Dahej	Dahej	24	1,084			Operable	
Talwandi Sabo	0.058	India	Navlakhi	Mandvi	24	899			Operable	
Klcc/Dcs Cogen	0.086	Malaysia	Port Klang	Port Klang	1	42	Available	Possible	Operable	
Thaton	0.009	Myanmar	Moulmein Harbor	Rangoon	2	55	Available	Possible	Operable	
Cikarang	4.479	Indonesia	Jakarta	Jakarta	3	34	Available	Possible		
Borang-2	1.743	Indonesia	Muntok	Muntok	27	92		Possible		
Navotas Barge	0.348	Philippines	Manila	Batangas City	19	35		Possible		
Malaya	0.122	Philippines	Manila	Batangas City	26	39		Possible		

km = kilometres, LNG = liquefied natural gas, MTPA = million tonnes per annum.

Source: Authors.

The following new gas thermal power plants will have truck transport with 40-ft ISO containers.

Table 12. List of New Gas Thermal Power Plants × Truck Transport with ISO Containers

Plant name	LNG	Country	Nearest port name	Primary port name	Distance to rail (km)	Distance to nearest port (km)	Railroad within 15 km	Possibility of lorry transport (within 700 km)	Lorry operability (24 times/day)	Pipeline constructability (within 32.5 km to port)
	(MTPA)									
O Mon	0.056	Viet Nam	Cat Lai	Cat Lai	161	132		Possible	Operable	
Karaikal	0.117	India	Karaikal Port	Ennur	2	12	Available	Possible	Operable	Constructible
Tribeni	0.058	India	Haldia Port	Haldia Port	50	543		Possible	Operable	
Teluk Gong (Panglima)	0.008	Malaysia	Pelabuhan Sungai Udang	Pelabuhan Sungai Udang	25	16		Possible	Operable	Constructible
Tuanku Jaafar	0.058	Malaysia	Port Dickson	Pelabuhan Sungai Udang	2	3	Available	Possible	Operable	Constructible
Kuala Langat	0.002	Malaysia	Port Klang	Port Klang	3	26	Available	Possible	Operable	Constructible
Kuantan	0.081	Malaysia	Kuantan New Port	Kuala Trengganu	51	22		Possible	Operable	Constructible
Lumut Segari	0.04	Malaysia	Teluk Anson	Port Klang	65	53		Possible	Operable	
Paka Ytl	0.077	Malaysia	Kirteh Oil Terminal	Kuala Trengganu	14	13	Available	Possible	Operable	Constructible

Labuan Methanol	0.027	Malaysia	Victoria	Bandar Seri Begawan	60	2		Possible	Operable	Constructible
Gelugor	0	Malaysia	Butterworth	Butterworth	1	18	Available	Possible	Operable	Constructible
Kota Bharu	0.577	Malaysia	Kuala Trengganu	Kuala Trengganu	13	129	Available	Possible		
Perlis	1.597	Malaysia	Pelabuhan Bass	Butterworth	18	37		Possible		
Prachin Buri Mill	0.065	Thailand	Bangkok	Map Ta Phut	151	111		Possible	Operable	
Navanakorn	0.082	Thailand	Bangkok	Map Ta Phut	280	63		Possible	Operable	
Wang Noi	0	Thailand	Bangkok	Map Ta Phut	260	82		Possible	Operable	
Kaeng Khoi-2	0.163	Thailand	Bangkok	Map Ta Phut	253	126		Possible		
Singburi Promburi	0.069	Thailand	Bangkok	Map Ta Phut	346	154		Possible	Operable	
Shwedaung	0.001	Myanmar	Rangoon	Rangoon	18	237		Possible	Operable	
Mann	0.001	Myanmar	Sittwe	Haldia Port	147	200		Possible	Operable	
Myingyan	0.017	Myanmar	Sittwe	Haldia Port	1	294	Available	Possible	Operable	
Kawthaung	0.024	Myanmar	Khanom	Map Ta Phut	304	171		Possible	Operable	
Ywama	0.011	Myanmar	Rangoon	Rangoon	1	2	Available	Possible	Operable	Constructible
Lhokseumawe Pertamina	0.049	Indonesia	Lhokseumawe	Lhokseumawe	6	2	Available	Possible	Operable	Constructible

Jambi Lontar	0.057	Indonesia	Jabung Batanghari Marine Terminal	Jurong Island	122	86		Possible	Operable	
Tello	0.027	Indonesia	Ujung Pandang	Ujung Pandang	599	8		Possible	Operable	Constructible
Siantan	0.005	Indonesia	Pontianak	Muntok	407	20		Possible	Operable	Constructible
Amamapare Port	0.011	Indonesia	Amamapare	Ujung Pandang	1,854	12		Possible	Operable	Constructible
Ilijan	0.028	Philippines	Batangas City	Batangas City	16	16		Possible	Operable	Constructible
Naga City	0.078	Philippines	Catbalogan	Batangas City	136	45		Possible	Operable	
Gt Barge 207	0.05	Philippines	Port Romblon	Batangas City	117	63		Possible	Operable	
Cotabato Basin	0.067	Philippines	Polloc (Cotabato)	Bontang Lng Terminal	126	65		Possible	Operable	

km = kilometres, LNG = liquefied natural gas, MTPA = million tonnes per annum.

Source: Authors.

Table 13. List of Fuel Conversion Thermal Power Plants × Pipeline

Plant name	LNG	Country	Port name	Primary port	Distance to rail (km)	Distance to nearest port (km)	Railway connectivity at demand points (less than 15 km)	No. of train (1,300 tonnes/day equivalent)	Possibility of lorry supply (less than 700 km)	Impossibility of Lorry supply (more than 700 km)	Possibility of lorry operation	Lorry operability	Pipeline	Connectivity from port to rail
	(MTPA)													
Thu Duc	0.051	Viet Nam	Cat Lai	Cat Lai	2	32	transportable	0.1	transportable		10	operable	Constructible	
Hai Phong Thermal-I	0.025	Viet Nam	Nghe Tinh	Hai Phong	2	12	transportable	0.1	transportable		5	operable	Constructible	connected
Vizag Refinery	0.004	India	Vishakhapatnam	Vishakhapatnam	7	2	transportable	0	transportable		1	operable	Constructible	connected
Vizag Steel Plant	0.127	India	Vishakhapatnam	Vishakhapatnam	7	2	transportable	0.3	transportable		26		Constructible	connected
Kribhco Hazira	0.021	India	Magdalla	Magdalla	4	11	transportable	0	transportable		4	operable	Constructible	
Sikka	0.085	India	Sikka	Mandvi	4	3	transportable	0.2	transportable		17	operable	Constructible	connected
Kochi Refinery	0.002	India	Kochi (Cochin)	Kochi (Cochin)	2	11	transportable	0	transportable		0	operable	Constructible	connected
Mahul Refinery	0.004	India	Mumbai (Bombay)	Mumbai (Bombay)	2	6	transportable	0	transportable		1	operable	Constructible	connected
Mumbai HII	0.002	India	Mumbai (Bombay)	Mumbai (Bombay)	2	6	transportable	0	transportable		0	operable	Constructible	connected
Thane Plant	0.003	India	Jawaharlal Nehru Port (Nhava Shiva)	Jawaharlal Nehru Port (Nhava Shiva)	3	28	transportable	0	transportable		1	operable	Constructible	connected
Trombay	0.353	India	Mumbai (Bombay)	Mumbai (Bombay)	9	5	transportable	0.7	transportable		72		Constructible	connected

Paradip Works	0.023	India	Paradip	Paradip	3	6	transportable	0	transportable		5	operable	Constructible	connected
Ennore	0.318	India	Ennur	Ennur	1	5	transportable	0.7	transportable		64		Constructible	connected
Madras Southern Petro	0.013	India	Chennai (Madras)	Ennur	1	3	transportable	0	transportable		3	operable	Constructible	connected
Manali Refinery	0.004	India	Chennai (Madras)	Ennur	6	8	transportable	0	transportable		1	operable	Constructible	connected
Tuticorin	0.593	India	Tuticorin	Kochi (Cochin)	12	4	transportable	1.2	transportable		120		Constructible	connected
Durgapur Plant Hfcl	0.025	India	Haldia Port	Haldia Port	27	6		0.1	transportable		5	operable	Constructible	
Sultan Iskandar	0.164	Malaysia	Pasir Gudang	Jurong Island	15	2	transportable	0.3	transportable		33		Constructible	connected
Patau-Patau	0.023	Malaysia	Labuan	Bandar Seri Begawan	62	1		0	transportable		5	operable	Constructible	
Kuantan	0.012	Malaysia	Kuantan New Port	Kuala Trengganu	51	22		0	transportable		2	operable	Constructible	
Pera	0.006	Malaysia	Butterworth	Butterworth	2	2	transportable	0	transportable		1	operable	Constructible	connected
Prai	0.268	Malaysia	Butterworth	Butterworth	2	2	transportable	0.6	transportable		54		Constructible	connected
Sultan Aziz (Kapar)	0.824	Malaysia	Port Klang	Port Klang	16	13		1.7	Transportable		167		Constructible	Connected
Sultan Ismail (Paka)	0.481	Malaysia	Kirteh Oil Terminal	Kuala Trengganu	20	8		1	transportable		98		Constructible	
Khanom	0.051	Thailand	Khanom	Map Ta Phut	367	4		0.1	transportable		10	operable	Constructible	
South Bangkok	0.275	Thailand	Bangkok	Map Ta Phut	279	12		0.6	transportable		56		Constructible	

Jurong	0.06	Singapore	Jurong Island	Jurong Island	16	6		0.1	transportable		12	operable	Constructible	connected
Pulau Seraya	0.01	Singapore	Jurong Island	Jurong Island	10	1	transportable	0	transportable		2	operable	Constructible	connected
Mawlamyaing	0.008	Myanmar	Moulmein Harbor	Chittagong	4	1	transportable	0	transportable		2	operable	Constructible	connected
Ywama	0.008	Myanmar	Rangoon	Chittagong	1	2	transportable	0	transportable		2	operable	Constructible	connected
Suralaya	0.183	Indonesia	Tanjung Sekong	Banten	8	4	transportable	0.4	transportable		37		Constructible	connected
Tambak Lorok	0.029	Indonesia	Semarang	Semarang	1	3	transportable	0.1	transportable		6	operable	Constructible	connected
Gresik	0.08	Indonesia	Gresik	Gresik	6	2	transportable	0.2	transportable		16	operable	Constructible	connected
Petak	0.026	Indonesia	Surabaya	Gresik	5	1	transportable	0.1	transportable		5	operable	Constructible	connected
Perak	0.011	Indonesia	Surabaya	Gresik	5	1	transportable	0	transportable		2	operable	Constructible	connected
Pulogadung	0.039	Indonesia	Jakarta	Jakarta	5	11	transportable	0.1	transportable		8	operable	Constructible	connected
Tanjung Priok	0.015	Indonesia	Jakarta	Jakarta	2	2	transportable	0	transportable		3	operable	Constructible	connected
Berushaan	0.007	Indonesia	Jakarta	Jakarta	1	18	transportable	0	transportable		1	operable	Constructible	connected
Muara Karang	0.046	Indonesia	Jakarta	Jakarta	4	11	transportable	0.1	transportable		9	operable	Constructible	connected
Belawan	0.03	Indonesia	Belawan	Butterworth	0	2	transportable	0.1	transportable		6	operable	Constructible	connected
Batamindo Industrial	0.003	Indonesia	Sekupang	Jurong Island	39	14		0	transportable		1	operable	Constructible	
Tello	0.017	Indonesia	Ujung Pandang	Ujung Pandang	599	8		0	transportable		4	operable	Constructible	

Padang	0.014	Indonesia	Teluk Bayur	Sibolga	14	14	transportable	0	transportable		3	operable	Constructible	connected
Khanom	0.051	Cambodia	Khanom	Map Ta Phut	367	4		0.1	transportable		10	operable	Constructible	
South Bangkok	0.275	Cambodia	Bangkok	Map Ta Phut	279	12		0.6	transportable		56		Constructible	
Calaca Semirara	0.212	Philippines	Nasugbu	Batangas City	6	25	transportable	0.4	transportable		43		Constructible	connected

km = kilometres, LNG = liquefied natural gas, MTPA = million tonnes per annum.

Source: Authors.

Table 14. List of Fuel Conversion Thermal Power Plants × Railway

Plant name	LNG	Country	Port name	Primary port	Distance to rail (km)	Distance to nearest port (km)	Railway connectivity at demand points (less than 15 km)	No. of train (1,300 tonnes/day equivalent)	Possibility of lorry supply (less than 700 km)	Impossibility of Lorry supply (more than 700 km)	Possibility of lorry operation	Lorry operability	Pipeline	Connectivity from port to rail
	(MTPA)													
Ninh Binh	0.063	Viet Nam	Hai Phong	Hai Phong	2	107	transportable	0.1	transportable		13	operable		connected
Bhadrachalam Mill	0.009	India	Machilipatnam	Kakinada Bay	6	320	transportable	0	transportable		2	operable		connected
Dr Narla Tata Rao	0.593	India	Machilipatnam	Kakinada Bay	4	86	transportable	1.2	transportable		120			connected
Bhilai Works	0.052	India	Vishakhapatnam	Vishakhapatnam	3	434	transportable	0.1	transportable		11	operable		connected
Korba Balco-I	0.191	India	Paradip	Paradip	2	472	transportable	0.4	transportable		39			connected
Korba East	0.311	India	Paradip	Paradip	7	471	transportable	0.7	transportable		63			connected
Korba Stps	1.482	India	Paradip	Paradip	8	474	transportable	3.1	transportable		301			connected
Korba West Hasdeo	0.593	India	Paradip	Paradip	12	475	transportable	1.2	transportable		120			connected
Badarpur	0.498	India	Dahej	Dahej	2	887	transportable	1		impossible	101			connected
Bharuch Gnfc	0.035	India	Dahej	Dahej	1	46	transportable	0.1	transportable		7	operable		connected
Dhuvaran	0.155	India	Dahej	Dahej	0	63	transportable	0.3	transportable		32			connected
Veraval Soda Ash	0.016	India	Veraval	Veraval	2	69	transportable	0	transportable		3	operable		connected
Faridabad	0.116	India	Dahej	Dahej	0	875	transportable	0.2		impossible	24	operable		connected
Panipat	0.459	India	Dahej	Dahej	1	951	transportable	1		impossible	93			connected
Panipat Works	0.021	India	Dahej	Dahej	1	954	transportable	0		impossible	4	operable		connected

Yamunanagar Mill	0.013	India	Navlakhi	Mandvi	3	1,029	transportable	0		impossible	3	operable		connected
Bhadravati Mill	0.018	India	New Mangalore	Kochi (Cochin)	5	138	transportable	0	transportable		4	operable		connected
Hnl Mill	0.021	India	Kochi (Cochin)	Kochi (Cochin)	4	52	transportable	0	transportable		4	operable		connected
Amarkantak	0.169	India	Paradip	Paradip	3	609	transportable	0.4	transportable		34			connected
Nagda Works	0.044	India	Dahej	Dahej	1	353	transportable	0.1	transportable		9	operable		connected
Bhigwan Mill	0.005	India	Jawaharlal Nehru Port (Nhava Shiva)	Jawaharlal Nehru Port (Nhava Shiva)	3	204	transportable	0	transportable		1	operable		connected
Nasik	0.642	India	Jawaharlal Nehru Port (Nhava Shiva)	Jawaharlal Nehru Port (Nhava Shiva)	5	151	transportable	1.4	transportable		130			connected
Parli	0.445	India	Jawaharlal Nehru Port (Nhava Shiva)	Jawaharlal Nehru Port (Nhava Shiva)	3	378	transportable	0.9	transportable		90			connected
South Bassein	0.018	India	Mumbai (Bombay)	Mumbai (Bombay)	7	47	transportable	0	transportable		4	operable		connected
Angul Smelter	0.424	India	Paradip	Paradip	9	169	transportable	0.9	transportable		86			connected
Brajragnagar Mill	0.006	India	Paradip	Paradip	0	334	transportable	0	transportable		1	operable		connected
Choudwar Imfa	0.076	India	Paradip	Paradip	5	87	transportable	0.2	transportable		15	operable		connected
Damanjodi Refinery	0.039	India	Vishakhapatnam	Vishakhapatnam	1	140	transportable	0.1	transportable		8	operable		connected

Rourkela Works	0.181	India	Paradip	Paradip	1	285	transportable	0.4	transportable		37			connected
Talcher	0.332	India	Paradip	Paradip	2	169	transportable	0.7	transportable		67			connected
Bhatinda Works	0.023	India	Navlakhi	Mandvi	2	915	transportable	0		impossible	5	operable		connected
Guru Nanak Dev	0.318	India	Navlakhi	Mandvi	1	914	transportable	0.7		impossible	64			connected
Ropar	0.593	India	Navlakhi	Mandvi	2	1,070	transportable	1.2		impossible	120			connected
Kota	0.452	India	Dahej	Dahej	10	507	transportable	1	transportable		92			connected
Mettur	0.593	India	Cuddalore	Ennur	7	215	transportable	1.2	transportable		120			connected
Neyveli	0.868	India	Cuddalore	Ennur	10	36	transportable	1.8	transportable		176			connected
Kothagudem	0.508	India	Machilipatnam	Kakinada Bay	2	173	transportable	1.1	transportable		103			connected
Ramagundam	1.526	India	Machilipatnam	Kakinada Bay	3	342	transportable	3.2	transportable		310			connected
Sirpur Mill	0.016	India	Machilipatnam	Kakinada Bay	1	480	transportable	0	transportable		3	operable		connected
Harduaganj	0.078	India	Dahej	Dahej	9	886	transportable	0.2		impossible	16	operable		connected
Muradnagar	0.001	India	Dahej	Dahej	4	922	transportable	0		impossible	0	operable		connected
Parichha	0.155	India	Dahej	Dahej	3	755	transportable	0.3		impossible	32			connected
Tanda	0.233	India	Dahej	Dahej	11	1,020	transportable	0.5		impossible	47			connected

Plant name	LNG (MTPA)	Country	Port name	Primary port	Distance to rail (km)	Distance to nearest port (km)	Railway connectivity at demand points (less than 15 km)	No. of train (1,300 tonnes/ day equivalent)	Possibility of lorry supply (less than 700 km)	Impossibility of Lorry supply (more than 700 km)	Possibility of lorry operation	Lorry operability	Pipeline	Connectivity from port to rail
Ninh Binh	0.063	Viet Nam	Hai Phong	Hai Phong	2	107	transportable	0.1	transportable		13	operable		connected
Bhadrachalam Mill	0.009	India	Machilipatnam	Kakinada Bay	6	320	transportable	0	transportable		2	operable		connected
Dr Naria Tata Rao	0.593	India	Machilipatnam	Kakinada Bay	4	86	transportable	1.2	transportable		120			connected
Bhilai Works	0.052	India	Vishakhapatnam	Vishakhapatnam	3	434	transportable	0.1	transportable		11	operable		connected
Korba Balco-I	0.191	India	Paradip	Paradip	2	472	transportable	0.4	transportable		39			connected
Korba East	0.311	India	Paradip	Paradip	7	471	transportable	0.7	transportable		63			connected
Korba Stps	1.482	India	Paradip	Paradip	8	474	transportable	3.1	transportable		301			connected
Korba West Hasdeo	0.593	India	Paradip	Paradip	12	475	transportable	1.2	transportable		120			connected
Badarpur	0.498	India	Dahej	Dahej	2	887	transportable	1		impossible	101			connected
Bharuch Gnfc	0.035	India	Dahej	Dahej	1	46	transportable	0.1	transportable		7	operable		connected
Dhuvaran	0.155	India	Dahej	Dahej	0	63	transportable	0.3	transportable		32			connected
Veraval Soda Ash	0.016	India	Veraval	Veraval	2	69	transportable	0	transportable		3	operable		connected
Faridabad	0.116	India	Dahej	Dahej	0	875	transportable	0.2		impossible	24	operable		connected
Panipat	0.459	India	Dahej	Dahej	1	951	transportable	1		impossible	93			connected
Panipat Works	0.021	India	Dahej	Dahej	1	954	transportable	0		impossible	4	operable		connected
Yamunanagar Mill	0.013	India	Navlakhi	Mandvi	3	1,029	transportable	0		impossible	3	operable		connected
Bhadravati Mill	0.018	India	New Mangalore	Kochi (Cochin)	5	138	transportable	0	transportable		4	operable		connected
Hnl Mill	0.021	India	Kochi (Cochin)	Kochi (Cochin)	4	52	transportable	0	transportable		4	operable		connected
Amarkantak	0.169	India	Paradip	Paradip	3	609	transportable	0.4	transportable		34			connected
Nagda Works	0.044	India	Dahej	Dahej	1	353	transportable	0.1	transportable		9	operable		connected
Bhigwan Mill	0.005	India	Jawaharlal Nehru Port (Nhava Shiva)	Jawaharlal Nehru Port (Nhava Shiva)	3	204	transportable	0	transportable		1	operable		connected

Nasik	0.642	India	Jawaharlal Nehru Port (Nhava Shiva)	Jawaharlal Nehru Port (Nhava Shiva)	5	151	transportable	1.4	transportable		130			connected
Parli	0.445	India	Jawaharlal Nehru Port (Nhava Shiva)	Jawaharlal Nehru Port (Nhava Shiva)	3	378	transportable	0.9	transportable		90			connected
South Bassein	0.018	India	Mumbai (Bombay)	Mumbai (Bombay)	7	47	transportable	0	transportable		4	operable		connected
Angul Smelter	0.424	India	Paradip	Paradip	9	169	transportable	0.9	transportable		86			connected
Brajragnagar Mill	0.006	India	Paradip	Paradip	0	334	transportable	0	transportable		1	operable		connected
Choudwar Imfa	0.076	India	Paradip	Paradip	5	87	transportable	0.2	transportable		15	operable		connected
Damanjodi Refinery	0.039	India	Vishakhapatnam	Vishakhapatnam	1	140	transportable	0.1	transportable		8	operable		connected
Rourkela Works	0.181	India	Paradip	Paradip	1	285	transportable	0.4	transportable		37			connected
Talcher	0.332	India	Paradip	Paradip	2	169	transportable	0.7	transportable		67			connected
Bhatinda Works	0.023	India	Navlakhi	Mandvi	2	915	transportable	0		impossible	5	operable		connected
Guru Nanak Dev	0.318	India	Navlakhi	Mandvi	1	914	transportable	0.7		impossible	64			connected
Ropar	0.593	India	Navlakhi	Mandvi	2	1,070	transportable	1.2		impossible	120			connected
Kota	0.452	India	Dahej	Dahej	10	507	transportable	1	transportable		92			connected
Mettur	0.593	India	Cuddalore	Ennur	7	215	transportable	1.2	transportable		120			connected
Neyveli	0.868	India	Cuddalore	Ennur	10	36	transportable	1.8	transportable		176			connected
Kothagudem	0.508	India	Machilipatnam	Kakinada Bay	2	173	transportable	1.1	transportable		103			connected
Ramagundam	1.526	India	Machilipatnam	Kakinada Bay	3	342	transportable	3.2	transportable		310			connected
Sirpur Mill	0.016	India	Machilipatnam	Kakinada Bay	1	480	transportable	0	transportable		3	operable		connected
Harduaganj	0.078	India	Dahej	Dahej	9	886	transportable	0.2		impossible	16	operable		connected
Muradnagar	0.001	India	Dahej	Dahej	4	922	transportable	0		impossible	0	operable		connected
Parichha	0.155	India	Dahej	Dahej	3	755	transportable	0.3		impossible	32			connected
Tanda	0.233	India	Dahej	Dahej	11	1,020	transportable	0.5		impossible	47			connected

km = kilometres, LNG = liquefied natural gas, MTPA = million tonnes per annum.

Source: Authors.

Table 15. List of Fuel Conversion Thermal Power Plants × Truck Transport with ISO Containers

Plant name	LNG	Country	Port name	Primary port	Distance to rail (km)	Distance to nearest port (km)	Railway connectivity at demand points (less than 15 km)	No. of train (1,300 tonnes/day equivalent)	Possibility of lorry supply (less than 700km)	Impossibility of lorry supply (more than 700 km)	Possibility of lorry operation	Lorry operability	Pipeline	Connectivity from port to rail
	(MTPA)													
Can Tho	0.009	Viet Nam	Cat Lai	Cat Lai	158	121		0	transportable		2	operable		
Thu Duc	0.051	Viet Nam	Cat Lai	Cat Lai	2	32	transportable	0.1	transportable		10	operable	Constructible	
Nellore	0.021	India	Ennur	Ennur	37	126		0	transportable		4	operable		connected
Bongaigaon Refinery	0.034	India	Chittagong	Chittagong	2	481	transportable	0.1	transportable		7	operable		
Cachar Mill	0.021	India	Chittagong	Chittagong	1	278	transportable	0	transportable		4	operable		
Guwahati Refinery	0.006	India	Chittagong	Chittagong	2	434	transportable	0	transportable		1	operable		
Nagaon Mill	0.021	India	Chittagong	Chittagong	7	434	transportable	0	transportable		4	operable		
Namrup Works	0.005	India	Chittagong	Chittagong	3	646	transportable	0	transportable		1	operable		
Bihar Cea	0.007	India	Haldia Port	Haldia Port	0	437	transportable	0	transportable		1	operable		
Karbigahiya	0.01	India	Haldia Port	Haldia Port	0	437	transportable	0	transportable		2	operable		
Kustore	0.002	India	Haldia Port	Haldia Port	0	437	transportable	0	transportable		0	operable		
Moonidih Washery	0.016	India	Haldia Port	Haldia Port	6	260	transportable	0	transportable		3	operable		
West Bokaro Colliery	0.007	India	Haldia Port	Haldia Port	1	292	transportable	0	transportable		1	operable		
Kutch Gsecl	0.049	India	Mandvi	Mandvi	231	109		0.1	transportable		10	operable		
Mithapur Plant	0.039	India	Navlakhi	Mandvi	39	157		0.1	transportable		8	operable		connected
Chaibasa Plant	0.004	India	Haldia Port	Haldia Port	3	342	transportable	0	transportable		1	operable		
Harihar Polyfibre	0.012	India	Belekeri	Ratnagiri	1	167	transportable	0	transportable		2	operable		

Rajashree Cement	0.013	India	Panaji	Ratnagiri	10	401	transportable	0	transportable		3	operable		
Wadi Cement Plant	0.018	India	Ratnagiri	Ratnagiri	5	379	transportable	0	transportable		4	operable		
Nagothane Complex	0.009	India	Mandwa	Jawaharlal Nehru Port (Nhava Shiva)	68	85		0	transportable		2	operable		
Khetri Mine	0.004	India	Navlakhi	Mandvi	17	585		0	transportable		1	operable		connected
Cpil Tamil Nadu	0	India	Nagappattinam	Ennur	59	132		0	transportable		0	operable		connected
Manuguru	0.064	India	Kakinada Bay	Kakinada Bay	85	204		0.1	transportable		13	operable		
Calcutta Works	0.001	India	Haldia Port	Haldia Port	1	68	transportable	0	transportable		0	operable		
Chinakuri Mine	0.014	India	Haldia Port	Haldia Port	3	139	transportable	0	transportable		3	operable		
Durgapur Sail-I	0.099	India	Haldia Port	Haldia Port	1	190	transportable	0.2	transportable		20	operable		
Gopalichuck Colliery	0.002	India	Haldia Port	Haldia Port	1	328	transportable	0	transportable		0	operable		
Haldia Refinery	0.022	India	Haldia Port	Haldia Port	2	90	transportable	0	transportable		5	operable		
Kesoram Rayon	0.003	India	Haldia Port	Haldia Port	3	103	transportable	0	transportable		1	operable		
Southern (Cesc)	0.095	India	Haldia Port	Haldia Port	7	63	transportable	0.2	transportable		19	operable		
Korat	0.004	Thailand	Bangkok	Map Ta Phut	196	228		0	transportable		1	operable		
Nakhon Ratchasima	0.004	Thailand	Bangkok	Map Ta Phut	196	228		0	transportable		1	operable		
Pesanggaran	0.006	Indonesia	Celukan Bawang	Celukan Bawang	121	72		0	transportable		1	operable		
Korat	0.004	Cambodia	Bangkok	Map Ta Phut	196	228		0	transportable		1	operable		
Nakhon Ratchasima	0.004	Cambodia	Bangkok	Map Ta Phut	196	228		0	transportable		1	operable		

Gt Barge 207	0.022	Philippines	Port Romblon	Batangas City	117	63		0	transportable		4	operable		
Navotas Barge	0.093	Philippines	Manila	Batangas City	19	35		0.2	transportable		19	operable		connected

km = kilometres, LNG = liquefied natural gas, MTPA = million tonnes per annum.

Source: Authors.

Table 16 shows the list of additional demand points that are supplied by pipelines. Delhi, Gujarat, Maharashtra, Singapore, Jakarta, West Java, and East Java already have existing pipeline connections. Therefore, additional demand is also supposed to use existing pipelines.

Table 16. List of Additional Demand Points × Pipeline

Province/City	NEW	Country	Label	Primary port name	Distance to port	Railway connectivity at demand port (less than 15 km)	No. of train (1,300 ton/day equivalent)	Possibility of lorry supply (less than 700km)	Impossibility of Lorry supply (more than 700km)	Possibility of lorry operation	Lorry operability	Pipeline	Construction of transmission gas pipeline (287000 ton/d)
	LNG									(less than 24 times)		within 32.5 km to ports)	
	Demand (MTPA)												
Delhi	12.3	India	Dahej	Dahej	890	connected	25.9		impossible	2,496		34	
Gujarat	25.7	India	Navlakhi	Mandvi	121	connected	54.2	transportable		5,216		70	
Maharashtra	17.6	India	Jawaharlal Nehru Port (Nhava Shiva)	Jawaharlal Nehru Port (Nhava Shiva)	336	connected	37.1	transportable		3,572		48	
Singapore	14.27	Singapore	Keppel (East Singapore)	Jurong Island	10	connected	30.1	transportable		2,896		39	
Jakarta Raya	5.801	Indonesia	Jakarta	Jakarta	12	connected	12.2	transportable		1,177		16	
West Java	9.137	Indonesia	Cirebon	Cirebon	108	connected	19.3	transportable		1,854		25	
East Java	5.9	Indonesia	Probolinggo	Gresik	53	connected	12.4	transportable		1,197		16	

km = kilometres, LNG = liquefied natural gas, MTPA = million tonnes per annum.

Source: Authors.

The following demand points do not have enough demand to justify construction of a new pipeline, but the distance is over 700 km. The railway transport with ISO containers is, therefore, assumed.

Table 17. List of Additional Demand Points × Railway

Province/City	NEW LNG Demand (MTPA)	Country	Label	Primary port name	Distance to port	Railway connectivity at demand port (less than 15 km)	No. of train (1,300 tonnes/day equivalent)	Possibility of lorry supply (less than 700 km)	Impossibility of Lorry supply (more than 700 km)	Possibility of lorry operation (less than 24 times)	Lorry operability	Pipeline within 32.5 km to ports	Construction of transmission gas pipeline (287,000 tonnes/day)
Chandigarh	0.000	India	Navlakhi	Mandvi	1,052	connected	0.0		impossible	0	operable	0	
Haryana	0.100	India	Navlakhi	Mandvi	897	connected	0.2		impossible	20	operable	0	
Himachal Pradesh	0.000	India	Navlakhi	Mandvi	1,182	connected	0.0		impossible	0	operable	0	
Jammu and Kashmir	0.000	India	Navlakhi	Mandvi	1,326	connected	0.0		impossible	0	operable	0	
Punjab	0.000	India	Navlakhi	Mandvi	993	connected	0.0		impossible	0	operable	0	
Uttaranchal	0.000	India	Dahej	Dahej	1,136	connected	0.0		impossible	0	operable	0	

km = kilometres, LNG = liquefied natural gas, MTPA = million tonnes per annum.

Source: authors.

Table 18 shows the additional demand points. When the demand size is too small, truck transport with ISO containers are assumed.

Table 18. List of Additional Demand Points × Truck Transport with ISO Containers

Province/City	NEW LNG Demand	Country	Label	primary port name	Distance to port	Possibility of lorry supply (less than 700 km)	Impossibility of Lorry supply (more than 700 km)	Possibility of lorry operation (less than 24 times)	Lorry operability
Da Nang City Da Nang	0.1	Viet Nam	Da Nang	Da Nang	17	transportable		20	operable
Dong Thap	0	Viet Nam	Cat Lai	Cat Lai	125	transportable		0	operable
Dac Nong	0	Viet Nam	Vinh Cam Ranh	Vinh Cam Ranh	165	transportable		0	operable
Dak Lak Dac Lac	0	Viet Nam	Nha Trang	Vinh Cam Ranh	128	transportable		0	operable
Dien Bien	0	Viet Nam	Hai Phong	Hai Phong	390	transportable		0	operable
An Giang	0	Viet Nam	Duong Dong	Map Ta Phut	138	transportable		0	operable
Ba Ria - VTau Ba Ria-Vung Tau	0.1	Viet Nam	Phu My	Cat Lai	28	transportable		20	operable
Binh Dinh	0	Viet Nam	Qui Nhon	Vinh Cam Ranh	50	transportable		0	operable
Binh Phuoc	0	Viet Nam	Cat Lai	Cat Lai	132	transportable		0	operable
Binh Thuan	0	Viet Nam	Phu My	Cat Lai	131	transportable		0	operable
Bac Lieu	0	Viet Nam	Cat Lai	Cat Lai	196	transportable		0	operable
Bac Giang	0.1	Viet Nam	Hai Phong	Hai Phong	52	transportable		20	operable
Bac Kan Bac Can	0	Viet Nam	Hai Phong	Hai Phong	172	transportable		0	operable
Ben Tre	0	Viet Nam	Cat Lai	Cat Lai	59	transportable		0	operable
Ca Mau	0	Viet Nam	Duong Dong	Map Ta Phut	177	transportable		0	operable
Cao Bang	0	Viet Nam	Hai Phong	Hai Phong	210	transportable		0	operable
Can Tho	0	Viet Nam	Cat Lai	Cat Lai	143	transportable		0	operable
Gia Lai	0	Viet Nam	Qui Nhon	Vinh Cam Ranh	115	transportable		0	operable
Ha Giang	0	Viet Nam	Hai Phong	Hai Phong	269	transportable		0	operable
Ha Nam	0.1	Viet Nam	Hai Phong	Hai Phong	88	transportable		20	operable
Ha Tinh	0	Viet Nam	Nghe Tinh	Hai Phong	53	transportable		0	operable
Hoa Binh	0	Viet Nam	Hai Phong	Hai Phong	145	transportable		0	operable
Hung Yen	0.1	Viet Nam	Hai Phong	Hai Phong	68	transportable		20	operable
Hai Duong	0.1	Viet Nam	Hai Phong	Hai Phong	35	transportable		20	operable
Hau Giang	0	Viet Nam	Cat Lai	Cat Lai	151	transportable		0	operable
Khanh Hoa	0	Viet Nam	Nha Trang	Vinh Cam Ranh	23	transportable		0	operable
Kien Giang	0	Viet Nam	Duong Dong	Map Ta Phut	112	transportable		0	operable

Province/City	NEW LNG Demand	Country	Label	primary port name	Distance to port	Possibility of lorry supply (less than 700 km)	Impossibility of Lorry supply (more than 700 km)	Possibility of lorry operation (less than 24 times)	Lorry operability
Kon Tum	0	Viet Nam	Da Nang	Da Nang	154	transportable		0	operable
Lao Cai	0	Viet Nam	Hai Phong	Hai Phong	310	transportable		0	operable
Lam Dong	0	Viet Nam	Vinh Cam Ranh	Vinh Cam Ranh	118	transportable		0	operable
Lai Chau	0	Viet Nam	Hai Phong	Hai Phong	393	transportable		0	operable
Lang Son	0	Viet Nam	Hai Phong	Hai Phong	100	transportable		0	operable
Nam Dinh	0	Viet Nam	Hai Phong	Hai Phong	90	transportable		0	operable
Nghe An	0.1	Viet Nam	Nghe Tinh	Hai Phong	101	transportable		20	operable
Ninh Binh	0	Viet Nam	Hai Phong	Hai Phong	115	transportable		0	operable
Ninh Thuan	0	Viet Nam	Vinh Cam Ranh	Vinh Cam Ranh	38	transportable		0	operable
Phu Tho	0	Viet Nam	Hai Phong	Hai Phong	170	transportable		0	operable
Phu Yen	0	Viet Nam	Qui Nhon	Vinh Cam Ranh	69	transportable		0	operable
Quang Binh	0	Viet Nam	Nghe Tinh	Hai Phong	148	transportable		0	operable
Quang Nam	0.1	Viet Nam	Da Nang	Da Nang	63	transportable		20	operable
Quang Ngai	0	Viet Nam	Da Nang	Da Nang	131	transportable		0	operable
Quang Ninh	0	Viet Nam	Cam Pha	Hai Phong	26	transportable		0	operable
Quang Tri	0	Viet Nam	Da Nang	Da Nang	155	transportable		0	operable
Soc Trang	0	Viet Nam	Cat Lai	Cat Lai	144	transportable		0	operable
Son La	0	Viet Nam	Hai Phong	Hai Phong	274	transportable		0	operable
Tay Ninh	0.1	Viet Nam	Cat Lai	Cat Lai	112	transportable		20	operable
Thai Binh	0	Viet Nam	Hai Phong	Hai Phong	58	transportable		0	operable
Thai Nguyen	0	Viet Nam	Hai Phong	Hai Phong	123	transportable		0	operable
Thua Thien - Hue	0	Viet Nam	Da Nang	Da Nang	81	transportable		0	operable
Thanh Hoa	0.1	Viet Nam	Nghe Tinh	Hai Phong	149	transportable		20	operable
Tien Giang	0	Viet Nam	Cat Lai	Cat Lai	52	transportable		0	operable
Tra Vinh	0	Viet Nam	Cat Lai	Cat Lai	98	transportable		0	operable
Tuyen Quang	0	Viet Nam	Hai Phong	Hai Phong	197	transportable		0	operable
Vinh Long	0	Viet Nam	Cat Lai	Cat Lai	98	transportable		0	operable
Vinh Phuc	0.1	Viet Nam	Hai Phong	Hai Phong	126	transportable		20	operable
Yen Bai	0	Viet Nam	Hai Phong	Hai Phong	239	transportable		0	operable
Andaman and	0	India	Port Blair	Lhokseumawe	56	transportable		0	operable

Province/City	NEW LNG Demand	Country	Label	primary port name	Distance to port	Possibility of lorry supply (less than 700 km)	Impossibility of Lorry supply (more than 700 km)	Possibility of lorry operation (less than 24 times)	Lorry operability
Nicobar									
Arunachal Pradesh	0	India	Chittagong	Chittagong	698	transportable		0	operable
Bihar	0	India	Haldia Port	Haldia Port	476	transportable		0	operable
Chhattisgarh	0	India	Vishakhapatnam	Vishakhapatnam	418	transportable		0	operable
Dadra and Nagar Haveli	0	India	Hazira	Hazira	109	transportable		0	operable
Daman and Diu	0	India	Veraval	Veraval	52	transportable		0	operable
Goa	0	India	Marmagao	Ratnagiri	29	transportable		0	operable
Jharkhand	0	India	Haldia Port	Haldia Port	315	transportable		0	operable
Kerala	0	India	Kochi (Cochin)	Kochi (Cochin)	57	transportable		0	operable
Madhya Pradesh	0	India	Dahej	Dahej	622	transportable		0	operable
Manipur	0	India	Chittagong	Chittagong	343	transportable		0	operable
Meghalaya	0	India	Chittagong	Chittagong	366	transportable		0	operable
Mizoram	0	India	Chittagong	Chittagong	155	transportable		0	operable
Nagaland	0	India	Chittagong	Chittagong	497	transportable		0	operable
Orissa	0	India	Paradip	Paradip	238	transportable		0	operable
Puducherry	0	India	Cuddalore	Ennur	102	transportable		0	operable
Rajasthan	0	India	Navlakhi	Mandvi	524	transportable		0	operable
Sikkim	0	India	Haldia Port	Haldia Port	617	transportable		0	operable
West Bengal	0	India	Haldia Port	Haldia Port	199	transportable		0	operable
Amnat Charoen	0	Thailand	Nghe Tinh	Hai Phong	337	transportable		0	operable
Ang Thong	0	Thailand	Bangkok	Map Ta Phut	125	transportable		0	operable
Bueng Kan	0	Thailand	Nghe Tinh	Hai Phong	228	transportable		0	operable
Buri Ram	0	Thailand	Bangkok	Map Ta Phut	292	transportable		0	operable
Chai Nat	0	Thailand	Bangkok	Map Ta Phut	189	transportable		0	operable
Chaiyaphum	0	Thailand	Bangkok	Map Ta Phut	307	transportable		0	operable
Chanthaburi	0	Thailand	Rayong Tpi Terminal	Map Ta Phut	94	transportable		0	operable
Chiang Mai	0.1	Thailand	Moulmein Harbor	Chittagong	281	transportable		20	operable

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Chiang Rai	0	Thailand	Moulmein Harbor	Chittagong	441	transportable		0	operable
Chumphon	0	Thailand	Bang Saphan	Map Ta Phut	110	transportable		0	operable
Kalasin	0	Thailand	Nghe Tinh	Hai Phong	329	transportable		0	operable
Kamphaeng Phet	0	Thailand	Moulmein Harbor	Chittagong	206	transportable		0	operable
Kanchanaburi	0.1	Thailand	Petchburi Terminal	Map Ta Phut	196	transportable		20	operable
Khon Kaen	0.1	Thailand	Bangkok	Map Ta Phut	383	transportable		20	operable
Krabi	0	Thailand	Krabi	Butterworth	14	transportable		0	operable
Lampang	0	Thailand	Moulmein Harbor	Chittagong	286	transportable		0	operable
Loei	0	Thailand	Moulmein Harbor	Chittagong	439	transportable		0	operable
Lop Buri	0	Thailand	Bangkok	Map Ta Phut	178	transportable		0	operable
Mae Hong Son	0	Thailand	Moulmein Harbor	Chittagong	261	transportable		0	operable
Maha Sarakham	0	Thailand	Bangkok	Map Ta Phut	388	transportable		0	operable
Mukdahan	0	Thailand	Nghe Tinh	Hai Phong	278	transportable		0	operable
Nakhon Nayok	0	Thailand	Bangkok	Map Ta Phut	99	transportable		0	operable
Nakhon Pathom	0	Thailand	Bangkok	Map Ta Phut	70	transportable		0	operable
Nakhon Phanom	0	Thailand	Nghe Tinh	Hai Phong	208	transportable		0	operable
Nakhon Sawan	0	Thailand	Bangkok	Map Ta Phut	244	transportable		0	operable
Nakhon Si Thammarat	0	Thailand	Khanom	Map Ta Phut	91	transportable		0	operable
Nan	0	Thailand	Moulmein Harbor	Chittagong	428	transportable		0	operable
Narathiwat	0	Thailand	Songkhla Harbor	Kuala Trengganu	170	transportable		0	operable
Nong Bua Lam Phu	0	Thailand	Nghe Tinh	Hai Phong	408	transportable		0	operable
Nong Khai	0	Thailand	Nghe Tinh	Hai Phong	325	transportable		0	operable

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Nonthaburi	0	Thailand	Bangkok	Map Ta Phut	50	transportable		0	operable
Pattani	0.1	Thailand	Songkhla Harbor	Kuala Trengganu	101	transportable		20	operable
Phangnga	0	Thailand	Krabi	Butterworth	88	transportable		0	operable
Phatthalung	0	Thailand	Kantang Harbor	Butterworth	62	transportable		0	operable
Phayao	0	Thailand	Moulmein Harbor	Chittagong	407	transportable		0	operable
Phetchabun	0	Thailand	Bangkok	Map Ta Phut	309	transportable		0	operable
Phichit	0.1	Thailand	Moulmein Harbor	Chittagong	293	transportable		20	operable
Phitsanulok	0	Thailand	Moulmein Harbor	Chittagong	317	transportable		0	operable
Phrae	0	Thailand	Moulmein Harbor	Chittagong	321	transportable		0	operable
Phuket	0	Thailand	Phuket	Lhokseumawe	16	transportable		0	operable
Prachuap Khiri Khan	0.1	Thailand	Bang Saphan	Map Ta Phut	84	transportable		20	operable
Ranong	0	Thailand	Khanom	Map Ta Phut	156	transportable		0	operable
Roi Et	0	Thailand	Nghe Tinh	Hai Phong	378	transportable		0	operable
Sa Kaeo	0	Thailand	Rayong Tpi Terminal	Map Ta Phut	169	transportable		0	operable
Sakon Nakhon	0	Thailand	Nghe Tinh	Hai Phong	256	transportable		0	operable
Samut Songkhram	0	Thailand	Petchburi Terminal	Map Ta Phut	33	transportable		0	operable
Satun	0	Thailand	Port Langkawi	Butterworth	47	transportable		0	operable
Si Sa Ket	0	Thailand	Rayong Tpi Terminal	Map Ta Phut	412	transportable		0	operable
Sing Buri	0.1	Thailand	Bangkok	Map Ta Phut	157	transportable		20	operable
Sukhothai	0	Thailand	Moulmein Harbor	Chittagong	239	transportable		0	operable

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Suphan Buri	0	Thailand	Bangkok	Map Ta Phut	142	transportable		0	operable
Surat Thani	0	Thailand	Khanom	Map Ta Phut	91	transportable		0	operable
Surin	0	Thailand	Rayong Tpi Terminal	Map Ta Phut	356	transportable		0	operable
Tak	0	Thailand	Moulmein Harbor	Chittagong	128	transportable		0	operable
Trang	0	Thailand	Katang Harbor	Butterworth	15	transportable		0	operable
Trat	0	Thailand	Rayong Tpi Terminal	Map Ta Phut	138	transportable		0	operable
Ubon Ratchathani	0.1	Thailand	Da Nang	Da Nang	349	transportable		20	operable
Udon Thani	0.1	Thailand	Nghe Tinh	Hai Phong	342	transportable		20	operable
Uthai Thani	0	Thailand	Bangkok	Map Ta Phut	235	transportable		0	operable
Uttaradit	0	Thailand	Moulmein Harbor	Chittagong	338	transportable		0	operable
Yala	0	Thailand	Penang Port	Butterworth	130	transportable		0	operable
Yasothon	0	Thailand	Nghe Tinh	Hai Phong	352	transportable		0	operable
Banteay Meanchey	0	Cambodia	Rayong Tpi Terminal	Map Ta Phut	220	transportable		0	operable
Battambang	0	Cambodia	Rayong Tpi Terminal	Map Ta Phut	199	transportable		0	operable
Kampot	0	Cambodia	Duong Dong	Map Ta Phut	73	transportable		0	operable
Kampong Cham	0	Cambodia	Cat Lai	Cat Lai	235	transportable		0	operable
Kampong Chhnang	0	Cambodia	Kampong Saom	Map Ta Phut	205	transportable		0	operable
Kampong Speu	0	Cambodia	Kampong Saom	Map Ta Phut	133	transportable		0	operable
Kampong Thom	0	Cambodia	Kampong Saom	Map Ta Phut	295	transportable		0	operable
Kandal	0.05	Cambodia	Duong Dong	Map Ta Phut	175	transportable		10	operable
Koh Kong	0	Cambodia	Kampong	Map Ta Phut	92	transportable		0	operable

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			Saom						
Kep	0	Cambodia	Duong Dong	Map Ta Phut	53	transportable		0	operable
Kratie	0	Cambodia	Cat Lai	Cat Lai	236	transportable		0	operable
Pailin	0	Cambodia	Rayong Tpi Terminal	Map Ta Phut	147	transportable		0	operable
Preah Sihanouk	0	Cambodia	Phsar Ream	Map Ta Phut	26	transportable		0	operable
Mondulkiri	0	Cambodia	Cat Lai	Cat Lai	244	transportable		0	operable
Oddar Meanchey	0	Cambodia	Rayong Tpi Terminal	Map Ta Phut	312	transportable		0	operable
Pursat	0	Cambodia	Kampong Saom	Map Ta Phut	192	transportable		0	operable
Preah Vihear	0	Cambodia	Kampong Saom	Map Ta Phut	386	transportable		0	operable
Prey Veng	0	Cambodia	Cat Lai	Cat Lai	171	transportable		0	operable
Ratanakiri	0	Cambodia	Qui Nhon	Vinh Cam Ranh	232	transportable		0	operable
Siem Reap	0	Cambodia	Rayong Tpi Terminal	Map Ta Phut	312	transportable		0	operable
Stung Treng	0	Cambodia	Qui Nhon	Vinh Cam Ranh	331	transportable		0	operable
Svay Rieng	0	Cambodia	Cat Lai	Cat Lai	116	transportable		0	operable
Takeo	0	Cambodia	Duong Dong	Map Ta Phut	122	transportable		0	operable
Tbong Khmum	0	Cambodia	Cat Lai	Cat Lai	178	transportable		0	operable
Ayeyarwady	0.1	Myanmar	Rangoon	Chittagong	112	transportable		20	operable
Bago	0	Myanmar	Rangoon	Chittagong	170	transportable		0	operable
Chin	0	Myanmar	Chittagong	Chittagong	175	transportable		0	operable
Kachin	0	Myanmar	Chittagong	Chittagong	695	transportable		0	operable
Kayah	0	Myanmar	Rangoon	Chittagong	301	transportable		0	operable
Kayin	0	Myanmar	Moulmein Harbor	Chittagong	75	transportable		0	operable
Magway	0.1	Myanmar	Sittwe	Chittagong	206	transportable		20	operable
Mandalay	0.1	Myanmar	Sittwe	Chittagong	344	transportable		20	operable
Mon	0	Myanmar	Moulmein Harbor	Chittagong	8	transportable		0	operable

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Naypyitaw	0	Myanmar	Rangoon	Chittagong	327	transportable		0	operable
Rakhine	0	Myanmar	Sittwe	Chittagong	98	transportable		0	operable
Sagaing	0.1	Myanmar	Chittagong	Chittagong	413	transportable		20	operable
Shan	0	Myanmar	Sittwe	Chittagong	569	transportable		0	operable
Tanintharyi	0	Myanmar	Mergui	Lhokseumawe	30	transportable		0	operable
Aceh	0.1	Indonesia	Lhokseumawe	Lhokseumawe	110	transportable		20	operable
Bangka Belitung	0.093	Indonesia	Pangkalpinang	Muntok	61	transportable		19	operable
Bengkulu	0.077	Indonesia	Bengkulu	Anyer Lor	28	transportable		16	operable
Gorontalo	0.038	Indonesia	Gorontalo	Ujung Pandang	78	transportable		8	operable
West Papua	0.038	Indonesia	Fakfak	Ujung Pandang	125	transportable		8	operable
West Kalimantan	0.1	Indonesia	Pontianak	Muntok	205	transportable		20	operable
Centre Kalimantan	0.096	Indonesia	Banjarmasin	Gresik	230	transportable		19	operable
North Kalimantan	0.029	Indonesia	Lingkas	Bontang Lng Terminal	158	transportable		6	operable
North Maluku	0.025	Indonesia	Ternate	Bontang Lng Terminal	66	transportable		5	operable
Maluku	0.043	Indonesia	Bula	Ujung Pandang	195	transportable		9	operable
East Nusa Tenggara	0.078	Indonesia	Maumere	Ujung Pandang	70	transportable		16	operable
Papua	0.06	Indonesia	Amamapare	Ujung Pandang	193	transportable		12	operable
West Sulawesi	0.023	Indonesia	Parepare	Ujung Pandang	173	transportable		5	operable
Centre Sulawesi	0.083	Indonesia	Poso	Ujung Pandang	65	transportable		17	operable
South east Sulawesi	0.069	Indonesia	Pomalaa	Ujung Pandang	54	transportable		14	operable
Abra	0.002	Philippines	San Fernando Harbor	Batangas City	119	transportable		0	operable
Agusan del Norte	0.008	Philippines	Butuan City	Batangas City	6	transportable		2	operable
Agusan del Sur	0.007	Philippines	Hinatuan	Batangas City	64	transportable		1	operable
Aklan	0.007	Philippines	Port Capiz	Batangas City	51	transportable		1	operable
Albay	0.013	Philippines	Legazpi Port	Batangas City	16	transportable		3	operable
Antique	0.006	Philippines	Iloilo	Batangas City	74	transportable		1	operable

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Apayao	0.001	Philippines	Aparri	Batangas City	55	transportable		0	operable
Aurora	0.002	Philippines	San Fernando Harbor	Batangas City	168	transportable		0	operable
Basilan	0.003	Philippines	Basilian City (Isabela)	Batangas City	16	transportable		1	operable
Bataan	0.064	Philippines	Subic Bay	Batangas City	25	transportable		13	operable
Batanes	0	Philippines	Basco	Batangas City	14	transportable		0	operable
Batangas	0.029	Philippines	Batangas City	Batangas City	15	transportable		6	operable
Benguet	0.009	Philippines	San Fernando Harbor	Batangas City	43	transportable		2	operable
Biliran	0.002	Philippines	Catbalogan	Batangas City	48	transportable		0	operable
Bohol	0.013	Philippines	Tubigan	Batangas City	28	transportable		3	operable
Bukidnon	0.014	Philippines	Bugo	Batangas City	61	transportable		3	operable
Bulacan	0.039	Philippines	Manila	Batangas City	44	transportable		8	operable
Cagayan	0.013	Philippines	Aparri	Batangas City	33	transportable		3	operable
Camarines Norte	0.006	Philippines	Jose Panganiban	Batangas City	16	transportable		1	operable
Camarines Sur	0.02	Philippines	Tabaco	Batangas City	63	transportable		4	operable
Camiguin	0.001	Philippines	Gingoog	Batangas City	55	transportable		0	operable
Capiz	0.007	Philippines	Port Capiz	Batangas City	27	transportable		1	operable
Catanduanes	0.003	Philippines	Virac	Batangas City	22	transportable		1	operable
Cavite	0.061	Philippines	Nasugbu	Batangas City	33	transportable		12	operable
Cebu	0.066	Philippines	Toledo	Batangas City	14	transportable		13	operable
Compostela Valley	0.007	Philippines	Mati	Batangas City	72	transportable		1	operable
Davao del Norte	0.011	Philippines	Davao	Bontang Lng Terminal	57	transportable		2	operable
Davao del Sur	0.028	Philippines	Davao	Bontang Lng Terminal	46	transportable		6	operable
Davao Oriental	0.008	Philippines	Mati	Batangas City	35	transportable		2	operable
Dinagat Islands	0.001	Philippines	Surigao City	Batangas City	44	transportable		0	operable

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Eastern Samar	0.005	Philippines	Port Borongan	Batangas City	8	transportable		1	operable
Guimaras	0.002	Philippines	Jordan	Batangas City	11	transportable		0	operable
Ifugao	0.002	Philippines	San Fernando Harbor	Batangas City	100	transportable		0	operable
Ilocos Norte	0.006	Philippines	Claveria	Batangas City	62	transportable		1	operable
Ilocos Sur	0.007	Philippines	San Fernando Harbor	Batangas City	72	transportable		1	operable
Iloilo	0.023	Philippines	Iloilo	Batangas City	34	transportable		5	operable
Isabela	0.015	Philippines	Aparri	Batangas City	157	transportable		3	operable
Kalinga	0.002	Philippines	Aparri	Batangas City	109	transportable		0	operable
La Union	0.009	Philippines	San Fernando Harbor	Batangas City	13	transportable		2	operable
Laguna	0.035	Philippines	Manila	Batangas City	52	transportable		7	operable
Lanao del Norte	0.01	Philippines	Port Ozamis	Batangas City	25	transportable		2	operable
Lanao del Sur	0.01	Philippines	Iligan	Batangas City	48	transportable		2	operable
Leyte	0.022	Philippines	Ormoc	Batangas City	17	transportable		4	operable
Maguindanao	0.011	Philippines	Polloc (Cotabato)	Bontang Lng Terminal	39	transportable		2	operable
Marinduque	0.002	Philippines	Santa Cruz (Marinduque Isl)	Batangas City	17	transportable		0	operable
Masbate	0.009	Philippines	Masbate	Batangas City	13	transportable		2	operable
Misamis Occidental	0.015	Philippines	Jimenez	Batangas City	20	transportable		3	operable
Misamis Oriental	0.009	Philippines	Villanueva	Batangas City	7	transportable		2	operable
Mountain Province	0.001	Philippines	San Fernando Harbor	Batangas City	103	transportable		0	operable
Negros Occidental	0.03	Philippines	Pulupandan	Batangas City	32	transportable		6	operable
Negros Oriental	0.013	Philippines	Bais	Batangas City	9	transportable		3	operable
North Cotabato	0.013	Philippines	Polloc (Cotabato)	Bontang Lng Terminal	72	transportable		3	operable

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Northern Samar	0.006	Philippines	Laoang	Batangas City	29	transportable		1	operable
Nueva Ecija	0.021	Philippines	Manila	Batangas City	114	transportable		4	operable
Nueva Vizcaya	0.004	Philippines	San Fernando Harbor	Batangas City	96	transportable		1	operable
Occidental Mindoro	0.005	Philippines	Calapan	Batangas City	58	transportable		1	operable
Oriental Mindoro	0.008	Philippines	Calapan	Batangas City	51	transportable		2	operable
Palawan	0.011	Philippines	Puerto Princesa	Batangas City	28	transportable		2	operable
Pampanga	0.039	Philippines	Subic Bay	Batangas City	51	transportable		8	operable
Pangasinan	0.032	Philippines	Masinloc	Batangas City	63	transportable		6	operable
Quezon	0.021	Philippines	Hondagua	Batangas City	38	transportable		4	operable
Quirino	0.002	Philippines	San Fernando Harbor	Batangas City	142	transportable		0	operable
Rizal	0.028	Philippines	Manila	Batangas City	34	transportable		6	operable
Romblon	0.003	Philippines	Port Romblon	Batangas City	16	transportable		1	operable
Samar	0.008	Philippines	Catbalogan	Batangas City	12	transportable		2	operable
Sarangani	0.005	Philippines	General Santos	Bontang Lng Terminal	9	transportable		1	operable
Siquijor	0.001	Philippines	Lazi	Batangas City	8	transportable		0	operable
Sorsogon	0.008	Philippines	Sorsogon	Batangas City	15	transportable		2	operable
South Cotabato	0.015	Philippines	General Santos	Bontang Lng Terminal	40	transportable		3	operable
Southern Leyte	0.004	Philippines	Maasin	Batangas City	26	transportable		1	operable
Sultan Kudarat	0.008	Philippines	General Santos	Bontang Lng Terminal	91	transportable		2	operable
Sulu	0.008	Philippines	Jolo	Bandar Seri Begawan	12	transportable		2	operable
Surigao del Norte	0.006	Philippines	Surigao City	Batangas City	29	transportable		1	operable
Surigao del Sur	0.006	Philippines	Hinatuan	Batangas City	56	transportable		1	operable
Tarlac	0.016	Philippines	Masinloc	Batangas City	59	transportable		3	operable

Province/City	NEW LNG Demand	Country	Label	primary port name	Distance to port	Possibility of lorry supply (less than 700 km)	Impossibility of Lorry supply (more than 700 km)	Possibility of lorry operation (less than 24 times)	Lorry operability
Tawi-Tawi	0.004	Philippines	Siasi	Bontang Lng Terminal	110	transportable		1	operable
Zambales	0.008	Philippines	Masinloc	Batangas City	37	transportable		2	operable
Zamboanga del Norte	0.01	Philippines	Santa Clara	Bontang Lng Terminal	33	transportable		2	operable
Zamboanga del Sur	0.018	Philippines	Margosatubig	Bontang Lng Terminal	22	transportable		4	operable
Zamboanga Sibugay	0.006	Philippines	Santa Clara	Bontang Lng Terminal	12	transportable		1	operable

km = kilometres, LNG = liquefied natural gas, MTPA = million tonnes per annum.

Source: Authors.

The following demand points are exceptional cases because the frequency of truck transport with ISO containers is beyond operability (more than 24 times per day). On the other hand, it is considered that the truck transport might be the most efficient because there is no demand intensity to construct middle-pressure gas pipelines. Of course, railway transport is possible when considering urban agglomeration, but direct transport from the ports is assumed.

Table 19. List of Additional Demand Points x Truck Transport with ISO Containers (expansion)

Province/City	NEW LNG Demand (MTPA)	Country	Label	Primary port name	Distance to port	Railway connectivity at demand port (less than 15km)	No. of train (1,300 tonnes/day equivalent)	Possibility of lorry supply (less than 700 km)	Impossibility of Lorry supply (more than 700 km)	Possibility of lorry operation (less than 24 times)	Lorry operability	Pipeline transport volume (1000 ton/day)	Construction of transmission gas pipeline(287,000 tonnes/day)
Bac Ninh	0.200	Viet Nam	Hai Phong	Hai Phong	64	connected	0.4	transportable		41		1	
Ha Noi City Hanoi	1.200	Viet Nam	Hai Phong	Hai Phong	104	connected	2.5	transportable		244		3	
Hai Phong City Haiphong	0.300	Viet Nam	Hai Phong	Hai Phong	16	connected	0.6	transportable		61		1	
Andhra Pradesh	0.200	India	Machilipatnam	Kakinada Bay	143	connected	0.4	transportable		41		1	
Lakshadweep	0.200	India	Azhikal (Azhikkal)	Kochi (Cochin)	305	connected	0.4	transportable		41		1	
Tamil Nadu	0.200	India	Nagappattinam	Ennur	157	connected	0.4	transportable		41		1	
Telangana	0.300	India	Machilipatnam	Kakinada Bay	291	connected	0.6	transportable		61		1	
Negeri Sembilan	0.500	Malaysia	Port Dickson	Pelabuhan Sungai Udang	53	connected	1.1	transportable		101		1	
Perak	0.400	Malaysia	Teluk Anson	Port Klang	99	connected	0.8	transportable		81		1	
Pulau Pinang	0.600	Malaysia	Butterworth	Butterworth	5	connected	1.3	transportable		122		2	
Selangor	2.100	Malaysia	Port Klang	Port Klang	33	connected	4.4	transportable		426		6	
Lamphun	0.400	Thailand	Moulmein Harbor	Chittagong	230	connected	0.8	transportable		81		1	
Yangon	0.700	Myanmar	Rangoon	Chittagong	22	connected	1.5	transportable		142		2	
Banten	2.298	Indonesia	Anyer Lor	Anyer Lor	49	connected	4.8	transportable		466		6	
Central Java	3.296	Indonesia	Semarang	Semarang	41	connected	6.9	transportable		669		9	
Lampung	0.635	Indonesia	Panjang	Anyer Lor	69	connected	1.3	transportable		129		2	

West Sumatera	0.645	Indonesia	Teluk Bayur	Sibolga	20	connected	1.4	transportable		131		2	
Yogyakarta	0.302	Indonesia	Semarang	Semarang	104	connected	0.6	transportable		61		1	
Metropolitan Manila	0.288	Philippines	Manila	Batangas City	8	connected	0.6	transportable		58		1	

km = kilometres, LNG = liquefied natural gas, MTPA = million tonnes per annum.

Source: Authors.