Rev-3				
Rev-2				
Rev-1				
Rev	Description	Date	Name	Check
Date	Drawn	Check	Appr.	Scale
MARCH 2019	O.Songur	O.Songur		NS

WHITE DOLPHIN SERVISE NEFT LLC

PAKPAS ENGINEERING AND CONSTRUCTION LTD

NATURAL GAS FACTS

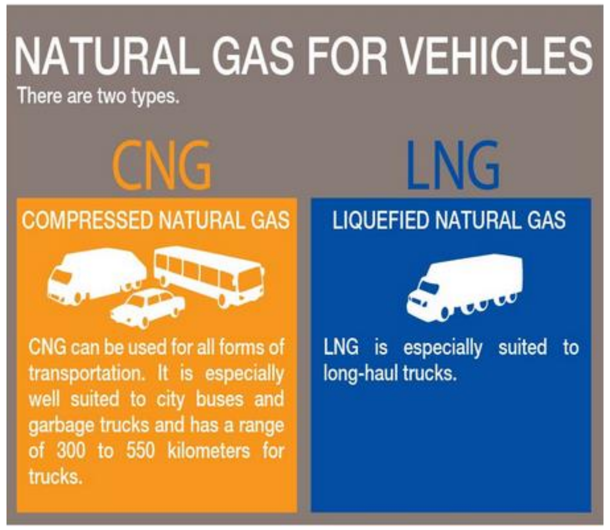
REAN COMMODITY DMCC

Job No	Page	Symbol	Unit No	Cat	Type+Format	Serial No	Rev
1715.75	1/1	DWG	00		UD	0100.0	6

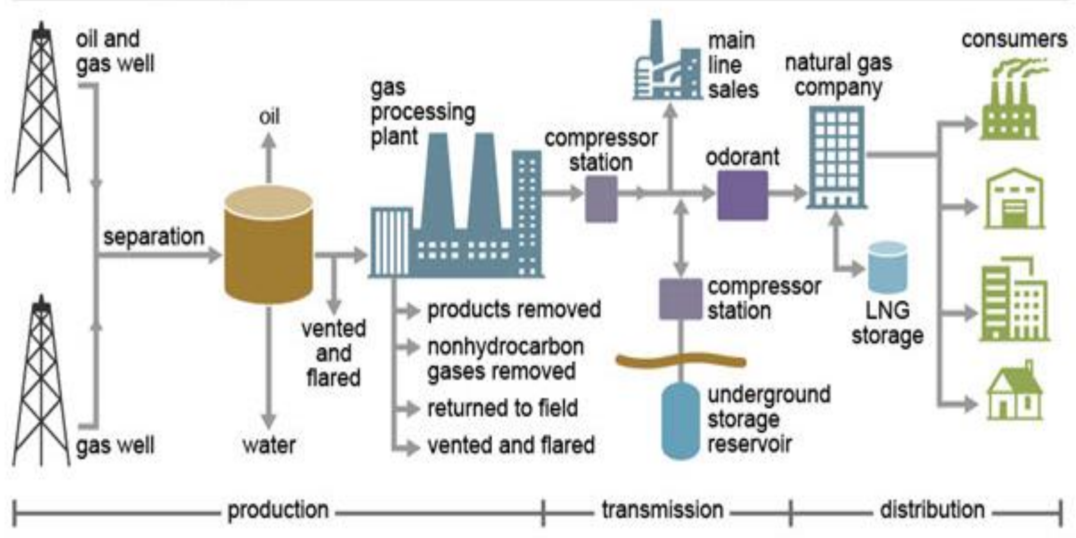
75

NATURAL GAS BASICS AND CHARECTERISTICS

Direct Energy Business



Natural gas production and delivery



Rev-3				
Rev-2				
Rev-1				
Rev	Description	Date	Name	Check
Date	Drawn	Check	Appr.	Scale
MARCH 2019	O.Songur	O.Songur		NS

ENGINEERING ENERGY PETROLEUM INVESTMENT LTD

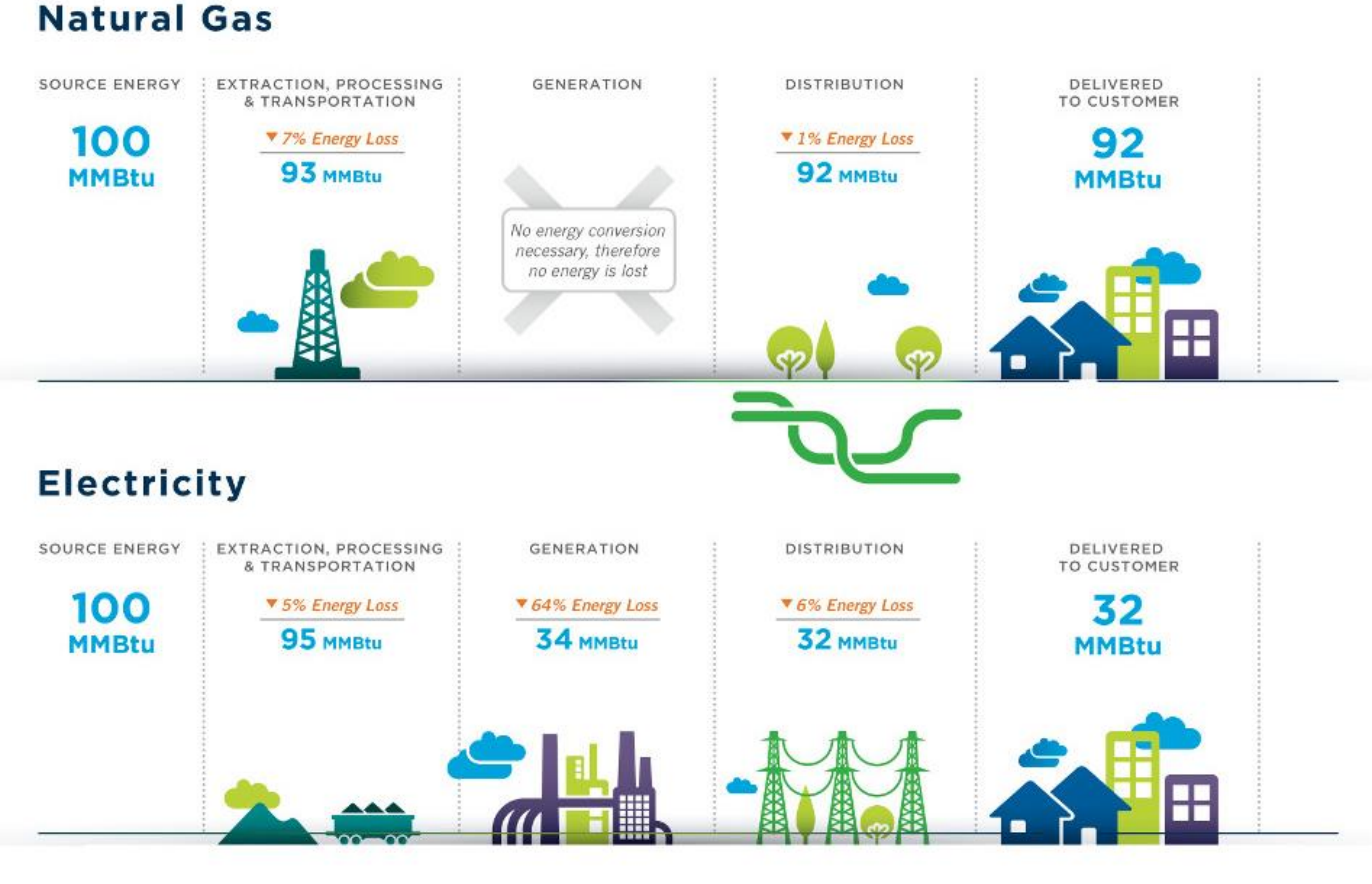
EEPI LLC

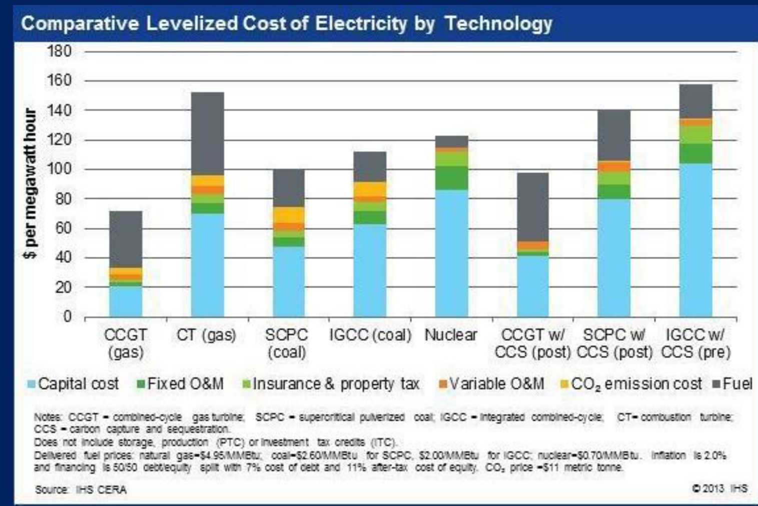
PAKPAS ENGINEERING AND CONSTRUCTION LTD

NATURAL GAS FACTS

REAN COMMODITY DMCC

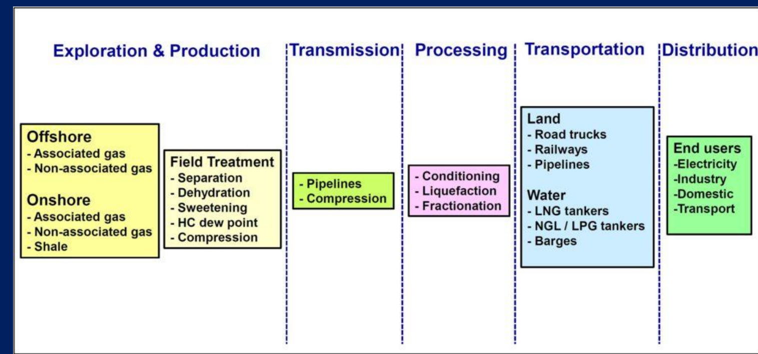
Job No	Page	Symbol	Unit No	Cat	Type+Format	Serial No	Rev
1715.75	1/1	DWG	00		UD	0100.1	6





Conversion of energy can exceed 90% efficiency, far greater than any other energy source.

Natural gas is the efficient and effective fuel into a low-carbon energy future. While the efficiency of renewable technology is constantly improving, it has yet to match the efficiency of natural gas in power generation. Natural gas enables renewables as it can be added to power generation facility at the right time and in the appropriate volumes needed.



Natural gas is the most efficient fossil fuel in a variety of applications, but especially in power generation.
Combined heat and power (CHP) installations enable the utilization of more than 80% of the energy content in natural gas. According to Black & Veatch, the average combined cycle natural gas plant is approximately 39 percent more efficient than the oldest 50 percent of existing coal generation capacity - and 58 percent more efficient than the oldest 10 percent of coal-fired plants. For the oldest power-generating facilities 60% more coal needs to be burned to generate the equivalent power of a natural gas power generation plant.

Rev-3				
Rev-2				
Rev-1				
Rev	Description	Date	Name	Check
Date	Drawn	Check	Appr.	Scale
MARCH 2019	O.Songur	O.Songur		NS

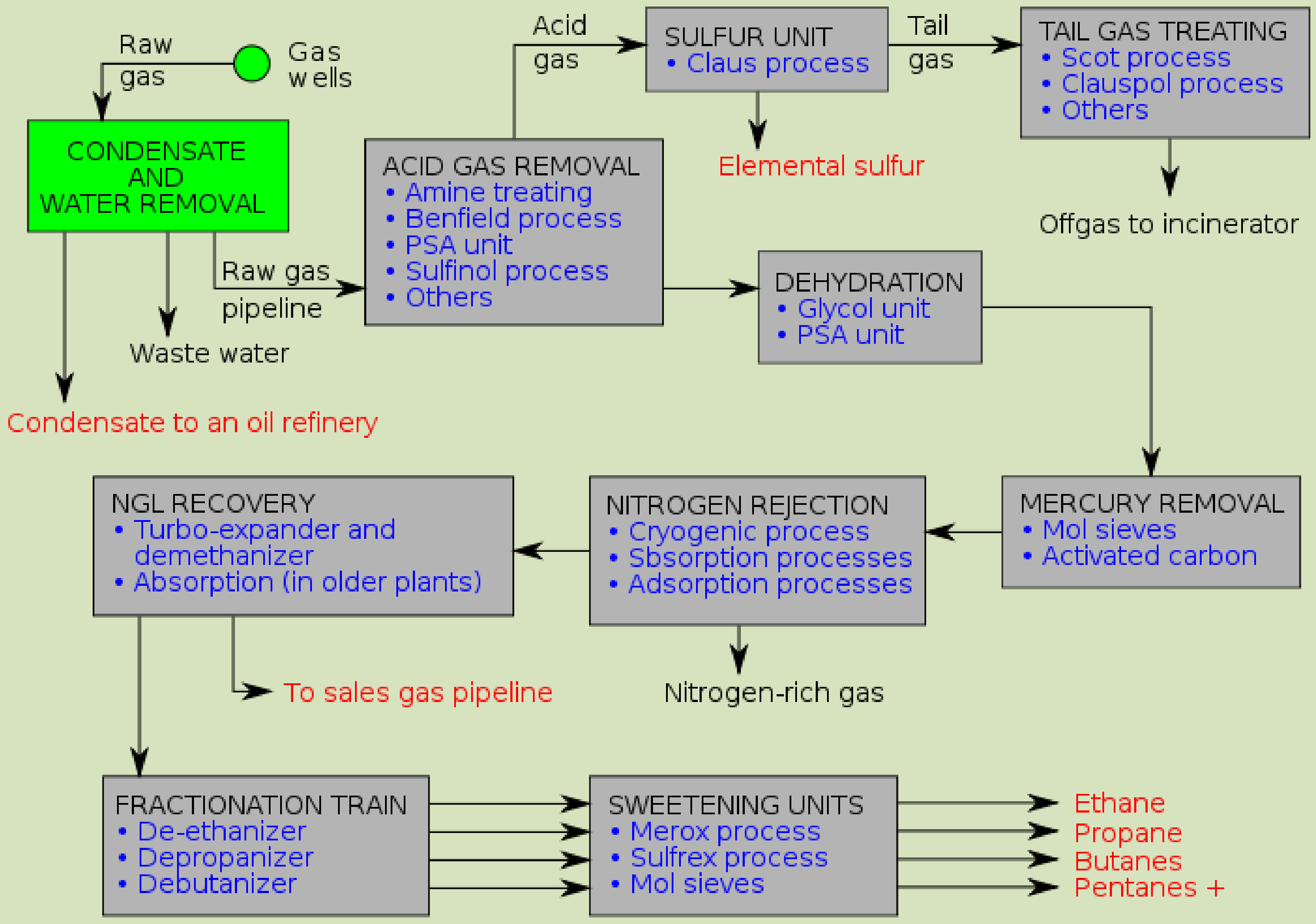
EEPI LLC — ENGINEERING ENERGY PETROLEUM INVESTMENT LTD

NATURAL GAS FACTS

PAKPAS ENGINEERING AND CONSTRUCTION LTD

REAN COMMODITY DMCC

Job No	Page	Symbol	Unit No	Cat	Type+Format	Serial No	Rev
1715.75	1/1	DWG	00		UD	0100.2	6



What are Ccf, Mcf, Btu, and therms? How do I convert natural gas prices in dollars per Ccf, or Mcf to dollars per Btu or therm?

C *— equals one hundred (100).*
Ccf *— equals the volume of 100 cubic feet (cf) of natural gas.*
M *— equals one thousand (1,000).*
MM *— equals one million (1,000,000).*
Mcf *— equals the volume of 1,000 cubic feet (cf) of natural gas.*
MMBtu *— equals 1,000,000 British thermal units (Btu). (One Btu is the heat required to raise the temperature of one pound of water by one degree Fahrenheit.)*
Therm *— One therm equals 100,000 Btu, or 0.10 MMBtu.*

How to Measure Natural Gas

Describing the amount of natural gas consumed by an entire country or a single residential appliance can be confusing, since natural gas can be measured in several different ways.

The energy content of natural gas and other forms of energy (i.e., the potential heat that can be generated from the fuel) is measured in Btus (British thermal units). The number of "therms" that residential natural gas customers consume each month is listed on their gas bills.

Quantities of natural gas are usually measured in cubic feet. For example, a typical natural gas futures contract is a financial instrument based on the value of about 10 million cubic feet (Mmcf) of natural gas.

Here are some frequently used units for measuring natural gas:

1 cubic foot (cf) = 1,027 Btu
100 cubic feet (1 ccf) = 1 therm (approximate)
1,000 cubic feet (1 Mcf) = 1,027,000 Btu (1 MMBtu)
1,000 cubic feet (1 Mcf) = 1 dekatherm (10 therms)
1 million (1,000,000) cubic feet (1 Mmcf) = 1,027,000,000 Btu
1 billion (1,000,000,000 cubic feet (1 bcf) = 1.027 trillion Btu
1 trillion (1,000,000,000,000) cubic feet (1Tcf) = 1.027 quadrillion Btu

- *1,000 cubic feet of natural gas is approximately enough to meet the natural gas needs of an average home (space-heating, water-heating, cooking, etc.) for four days.*
- *In 2009, the average American home consumed 70,500 cubic feet of natural gas (or 72.6 million Btu). On a daily basis, the average U.S. home used 193 cubic feet of natural gas.*
- *Most natural gas household bills display the amount of natural gas consumed by the 'therm' (100,000 Btu) or in hundreds of cubic feet (100 cubic feet - 1 Ccf).*
- *Looking at larger quantities, 1 billion cubic feet (Bcf) of natural gas is enough to meet the needs of approximately 10,000 - 11,000 American homes for one year.*

5 trillion cubic feet of natural gas is enough to meet the needs of 5 million households for 15 years.

Rev-3				
Rev-2				
Rev-1				
Rev	Description	Date	Name	Check
Date	Drawn	Check	Appr.	Scale
MARCH 2019	O.Songur	O.Songur		NS

ENGINEERING ENERGY PETROLEUM INVESTMENT LTD

EEPI LLC

NATURAL GAS FACTS

PAKPAS ENGINEERING AND CONSTRUCTION LTD

REAN COMMODITY DMCC

Job No	Page	Symbol	Unit No	Cat	Type+Format	Serial No	Rev
1715.75	1/1	DWG	00		UD	0100.2-A	6

What are Ccf, Mcf, Btu, and therms? How do I convert natural gas prices in dollars per Ccf or Mcf to dollars per Btu or therm?

C *— equals one hundred (100).*
Ccf *— equals the volume of 100 cubic feet (cf) of natural gas.*
M *— equals one thousand (1,000).*
MM *— equals one million (1,000,000).*
Mcf *— equals the volume of 1,000 cubic feet (cf) of natural gas.*
MMBtu *— equals 1,000,000 British thermal units (Btu). (One Btu is the heat required to raise the temperature of one pound of water by one degree Fahrenheit.)*
Therm *— One therm equals 100,000 Btu, or 0.10 MMBtu.*

https://accessgas.com/learning-centre/natural-gas-conversion-tool/

https://www.rigzone.com/calculator/default.asp?catid=1&catname=Basic+Conversions#calc

http://www.cmegroup.com/tools-information/calc_refined.html

Rev-3				
Rev-2				
Rev-1				
Rev	Description	Date	Name	Check
Date	Drawn	Check	Appr.	Scale
MARCH 2019	O.Songur	O.Songur		NS

ENGINEERING ENERGY PETROLEUM INVESTMENT LTD

EEPI LLC

NATURAL GAS FACTS

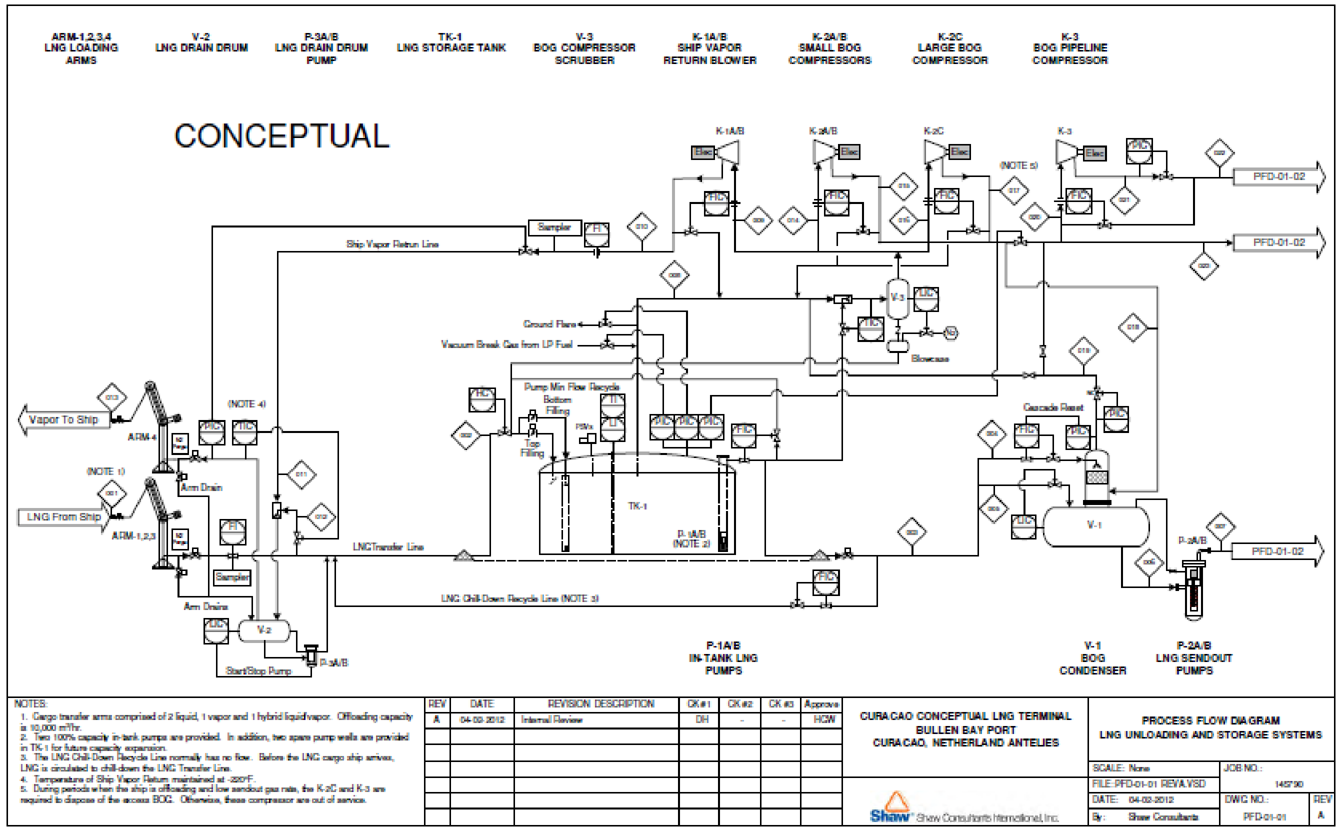
PAKPAS ENGINEERING AND CONSTRUCTION LTD

REAN COMMODITY DMCC

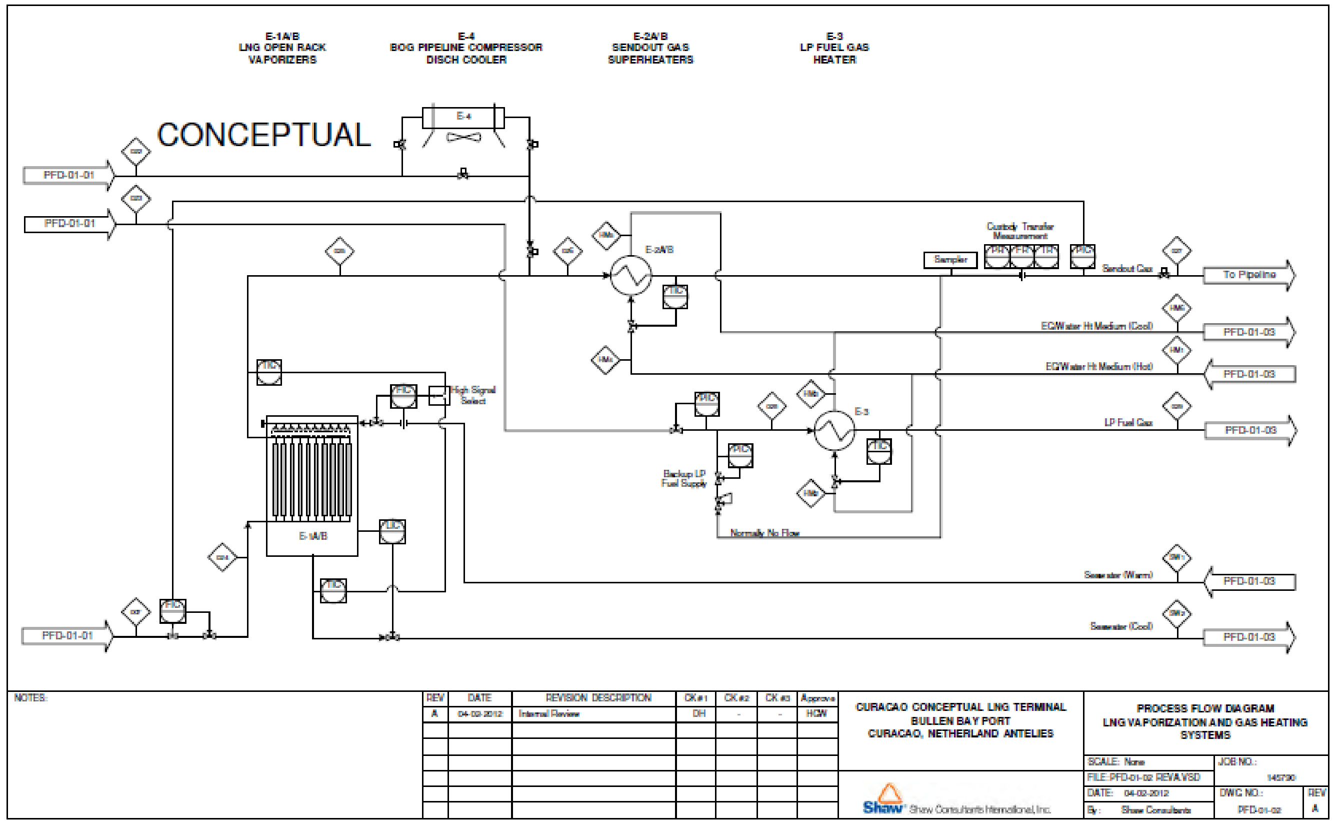
Job No	Page	Symbol	Unit No	Cat	Type+Format	Serial No	Rev
1715.75	1/1	DWG	00		UD	0100.3	6

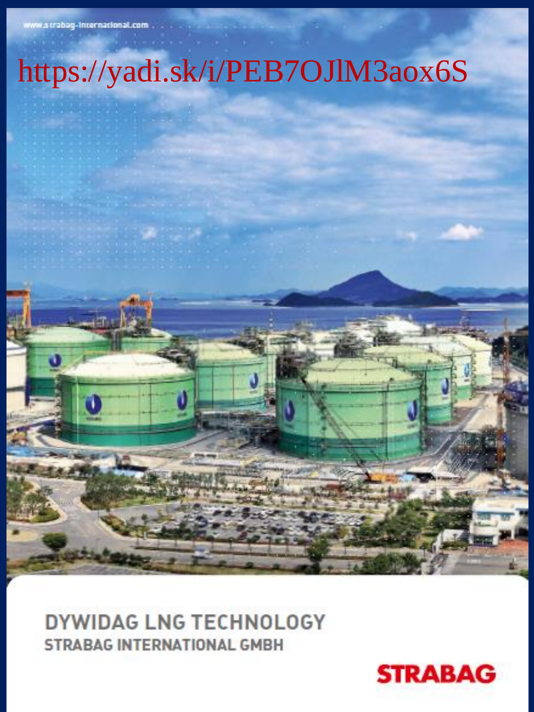
CONCEPTUAL DESIGN OF LNG FACILITIES-FLOW DIAGRAM AND EMB

https://yadi.sk/i/MU6EDVJC3aownL

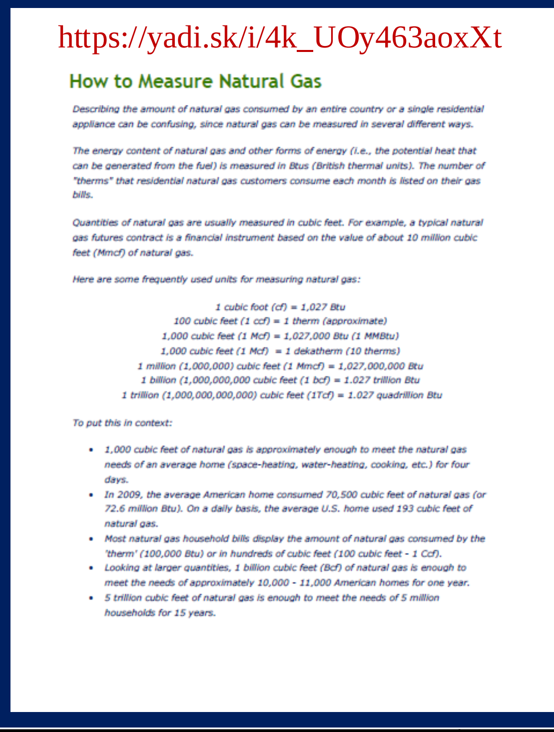


https://yadi.sk/i/MU6EDVJC3aownL





https://yadi.sk/i/4k_UOy463aoxXt



How to Measure Natural Gas

Describing the amount of natural gas consumed by an entire country or a single residential appliance can be confusing, since natural gas can be measured in several different ways.

The energy content of natural gas and other forms of energy (i.e., the potential heat that can be generated from the fuel) is measured in Btus (British thermal units). The number of "therms" that residential natural gas customers consume each month is listed on their gas bills.

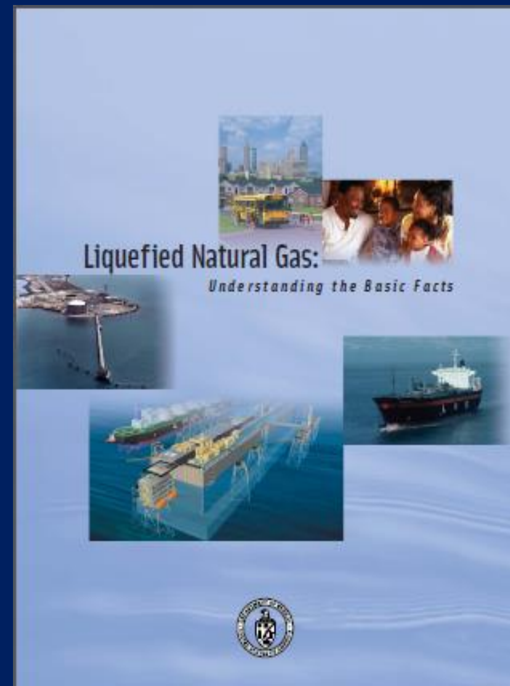
Quantities of natural gas are usually measured in cubic feet. For example, a typical natural gas futures contract is a financial instrument based on the value of about 10 million cubic feet (Mmcf) of natural gas.

Here are some frequently used units for measuring natural gas:

1 cubic foot (cf) = 1,027 Btu
100 cubic feet (1 ccf) = 1 therm (approximate)
1,000 cubic feet (1 Mcf) = 1,027,000 Btu (1 MMBtu)
1,000 cubic feet (1 Mcf) = 1 dekatherm (10 therms)
1 million (1,000,000) cubic feet (1 Mmcf) = 1,027,000,000 Btu
1 billion (1,000,000,000 cubic feet (1 bcf) = 1.027 trillion Btu
1 trillion (1,000,000,000,000) cubic feet (1Tcf) = 1.027 quadrillion Btu

To put this in context:

- *1,000 cubic feet of natural gas is approximately enough to meet the natural gas needs of an average home (space-heating, water-heating, cooking, etc.) for four days.*
- *In 2009, the average American home consumed 70,500 cubic feet of natural gas (or 72.6 million Btu). On a daily basis, the average U.S. home used 193 cubic feet of natural gas.*
- *Most natural gas household bills display the amount of natural gas consumed by the 'therm' (100,000 Btu) or in hundreds of cubic feet (100 cubic feet - 1 Ccf).*
- *Looking at larger quantities, 1 billion cubic feet (Bcf) of natural gas is enough to meet the needs of approximately 10,000 - 11,000 American homes for one year.*
- *5 trillion cubic feet of natural gas is enough to meet the needs of 5 million households for 15 years.*



Rev-3				
Rev-2				
Rev-1				
Rev	Description	Date	Name	Check
Date	Drawn	Check	Appr.	Scale
MARCH 2019	O.Songur	O.Songur		NS

EEPI LLC
ENGINEERING ENERGY PETROLEUM INVESTMENT LTD

NATURAL GAS FACTS

PAKPAS ENGINEERING AND CONSTRUCTION LTD

REAN COMMODITY DMCC

Job No	Page	Symbol	Unit No	Cat	Type+Format	Serial No	Rev
1715.75	1/1	DWG	00		UD	0100.4	6

Rev-3				
Rev-2				
Rev-1				
Rev	Description	Date	Name	Check
Date	Drawn	Check	Appr.	Scale
MARCH 2019	O.Songur	O.Songur		NS

EEPI LLC

ENGINEERING ENERGY PETROLEUM INVESTMENT LTD

PAKPAS ENGINEERING AND CONSTRUCTION LTD

NATURAL GAS FACTS

REAN COMMODITY DMCC

PAKPAS

Job No	Page	Symbol	Unit No	Cat	Type+Format	Serial No	Rev
1715.75	1/1	DWG	00		UD	0100.5	6

Rev-3				
Rev-2				
Rev-1				
Rev	Description	Date	Name	Check
Date	Drawn	Check	Appr.	Scale
MARCH 2019	O.Songur	O.Songur		NS

ENGINEERING ENERGY PETROLEUM INVESTMENT LTD

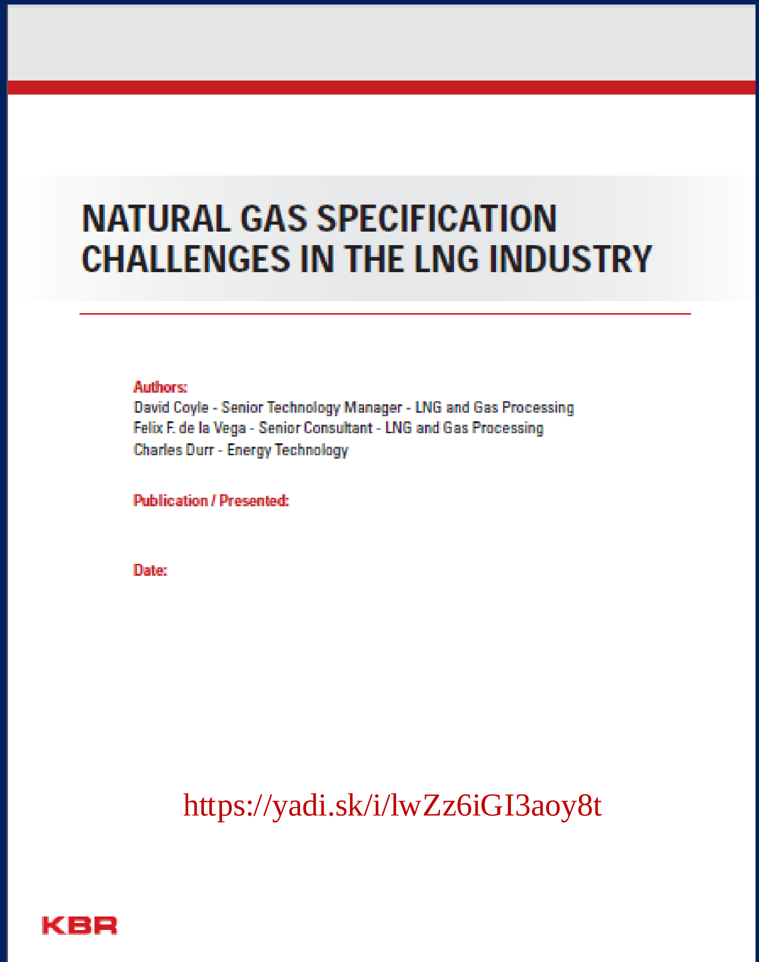
EEPI LLC

NATURAL GAS FACTS

PAKPAS ENGINEERING AND CONSTRUCTION LTD

REAN COMMODITY DMCC

Job No	Page	Symbol	Unit No	Cat	Type+Format	Serial No	Rev
1715.75	1/1	DWG	00		UD	0100.6	6


NATURAL GAS SPECIFICATION CHALLENGES IN THE LNG INDUSTRY

Authors:
David Coyle - Senior Technology Manager - LNG and Gas Processing
Felix F. de la Vega - Senior Consultant - LNG and Gas Processing
Charles Durr - Energy Technology

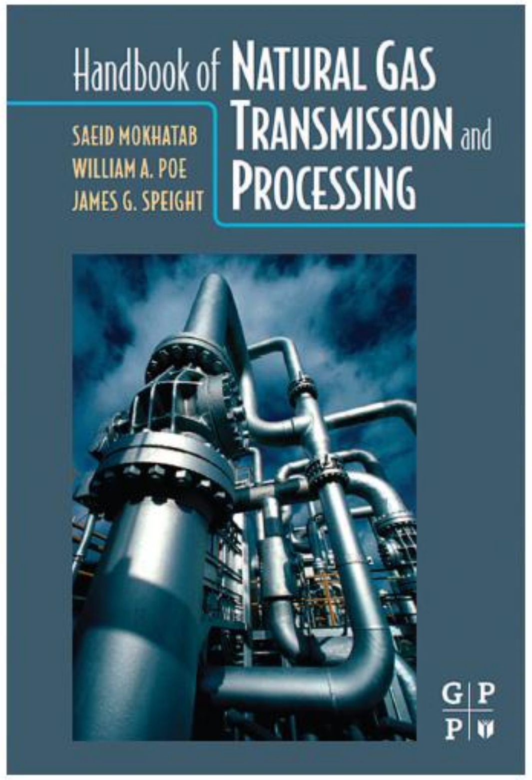
Publication / Presented:

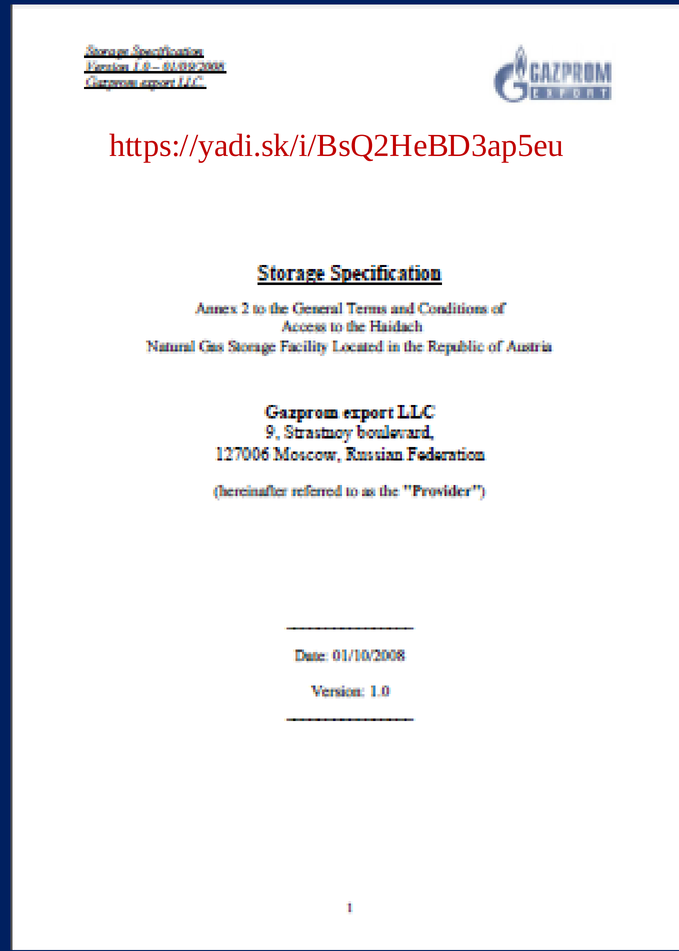
Date:

https://yadi.sk/i/lwZz6iGI3aoy8t

KBR

https://yadi.sk/i/u8fKkHPS3ap5Rs




Storage Specification
Version 1.0 – 01/09/2008
Gazprom export LLC

GAZPROM EXPORT

https://yadi.sk/i/BsQ2HeBD3ap5eu

Storage Specification

Annex 2 to the General Terms and Conditions of Access to the Haidach Natural Gas Storage Facility Located in the Republic of Austria

Gazprom export LLC
9, Strastnoy boulevard,
127006 Moscow, Russian Federation

(hereinafter referred to as the "Provider")

Date: 01/10/2008

Version: 1.0

1


NATURAL GAS SPECS SHEET

Fuel Providers and their large volume Customers (particularly Electric Utilities and possibly other End Users) are used to defining fuel requirements in the form of Spec Sheets. Attached, as an example, is a #6 Fuel Oil Quality Specifications table developed to conform to federal, state, and local regulations governing the generator (e.g., emissions compliance), operational requirements (e.g., type of generating and/or backend clean-up equipment), and/or any other constraints imposed on the generator. Other examples of Spec Sheets and standards lists are included. This document includes an excellent example of a Gas Quality Spec Sheet from Brazil (GasEnergia) and additionally, the regulatory standards behind it.

With other generation fuels, the quality of the delivered product is a result of an agreement between the provider and the customer (the transporter does not generally have a significant input, if any).

With Natural Gas, due to the nature of the product and the transportation mechanism, the quality of the delivered product is primarily determined by the pipeline.

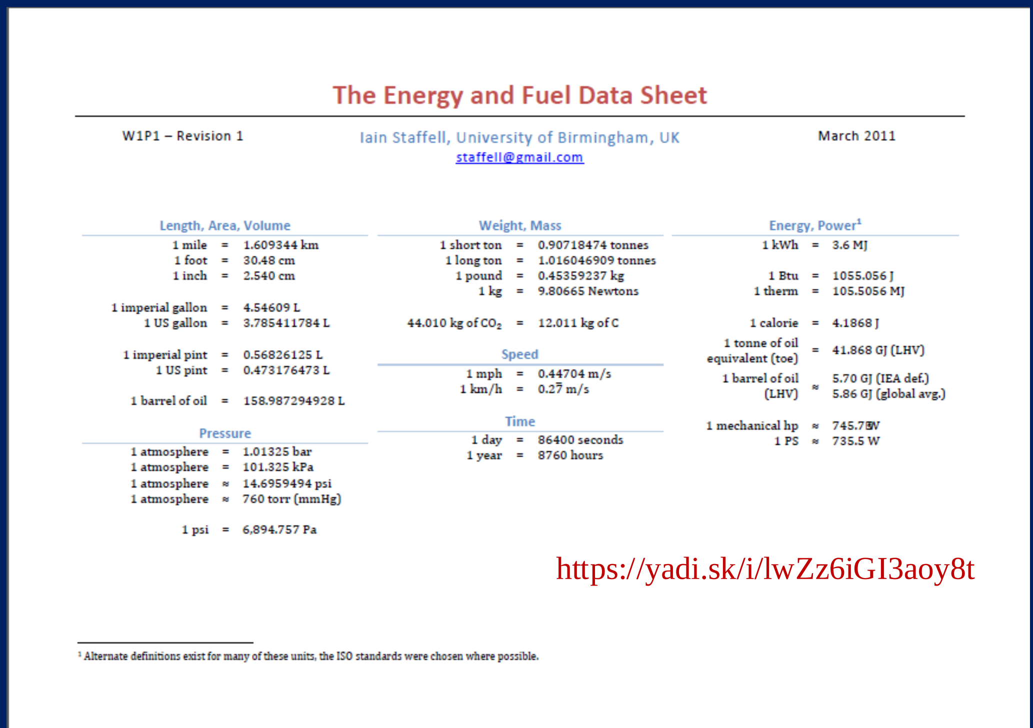
Utility generators have a need to know the expected range of quality of the fuel being delivered to them and ideally to have some control over the variability of that fuel to assure compliance with regulations, to protect their investment in generating equipment, and to be able to meet the needs of their customers in the most economic manner.

Not only is there a potential for great variability in the quality of Natural Gas delivered to Customers, the standards and specs defined in pipeline tariffs tend to be vague, difficult to locate or extract from pipeline tariffs, and often difficult to comprehend. These difficulties are compounded when generators try to deal with the differences across pipelines as there is not even a standard format for describing the quality specifications.

Customers would benefit from having access to clearly defined statements of pipeline quality (even though it varies from pipeline to pipeline) in the form of Natural Gas Spec Sheets (comparable to what the folks in Brazil have) provided in screen and downloadable format under Informational Postings on U.S. pipeline websites.

https://yadi.sk/i/ytwN4Lu_3ap8TC

https://yadi.sk/i/ytwN4Lu_3ap8TC


The Energy and Fuel Data Sheet

W1P1 – Revision 1 | Iain Staffell, University of Birmingham, UK staffell@gmail.com | March 2011

Length, Area, Volume

1 mile	=	1.609344 km
1 foot	=	30.48 cm
1 inch	=	2.540 cm
1 imperial gallon	=	4.54609 L
1 US gallon	=	3.785411784 L
1 imperial pint	=	0.56826125 L
1 US pint	=	0.473176473 L
1 barrel of oil	=	158.987294928 L

Pressure

1 atmosphere	=	1.01325 bar
1 atmosphere	=	101.325 kPa
1 atmosphere	≈	14.6959494 psi
1 atmosphere	≈	760 torr (mmHg)
1 psi	=	6,894.757 Pa

Weight, Mass

1 short ton	=	0.90718474 tonnes
1 long ton	=	1.016046909 tonnes
1 pound	=	0.45359237 kg
1 kg	=	9.80665 Newtons
44.010 kg of CO_2	=	12.011 kg of C

Speed

1 mph	=	0.44704 m/s
1 km/h	=	$0.2\overline{7}$ m/s

Time

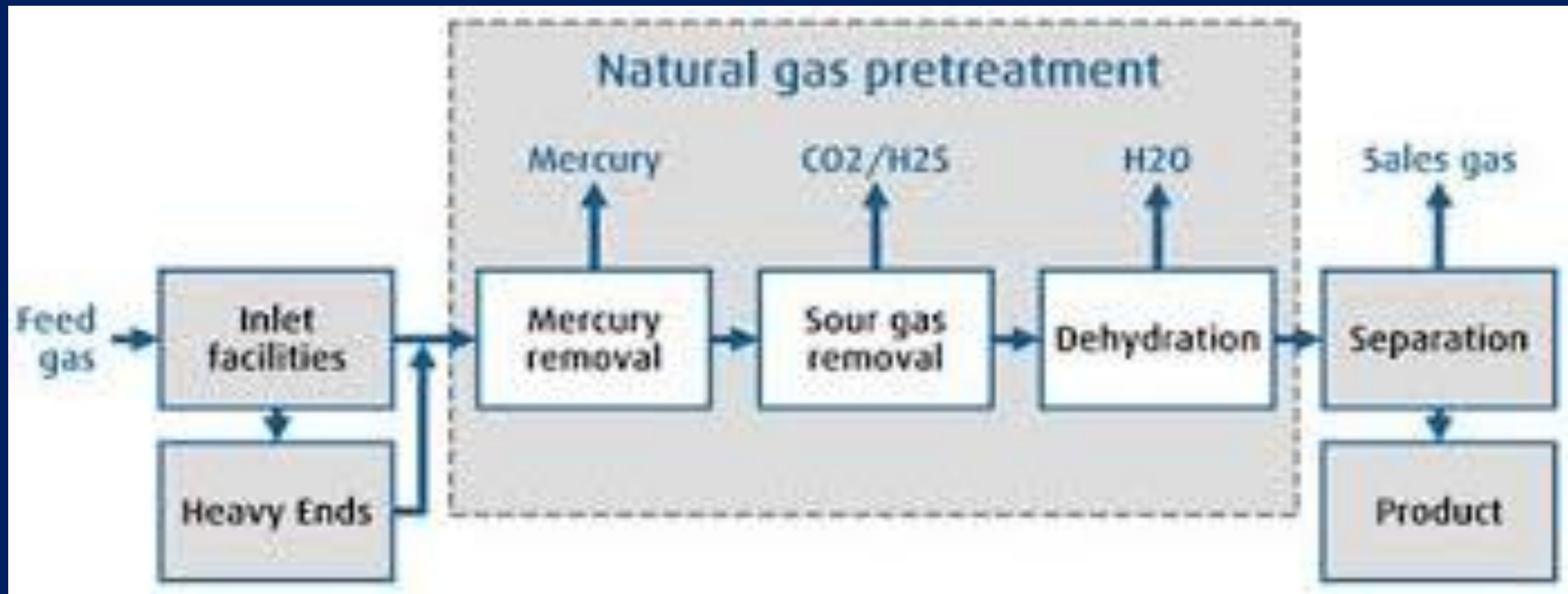
1 day	=	86400 seconds
1 year	=	8760 hours

Energy, Power[1]

1 kWh	=	3.6 MJ
1 Btu	=	1055.056 J
1 therm	=	105.5056 MJ
1 calorie	=	4.1868 J
1 tonne of oil equivalent (toe)	=	41.868 GJ (LHV)
1 barrel of oil (LHV)	≈	5.70 GJ (IEA def.) 5.86 GJ (global avg.)
1 mechanical hp	≈	745.7 W
1 PS	≈	735.5 W

https://yadi.sk/i/lwZz6iGI3aoy8t

[1] Alternate definitions exist for many of these units, the ISO standards were chosen where possible.



Rev-3				
Rev-2				
Rev-1				
Rev	Description	Date	Name	Check
Date	Drawn	Check	Appr.	Scale
MARCH 2019	O.Songur	O.Songur		NS

EEPI LLC — ENGINEERING ENERGY PETROLEUM INVESTMENT LTD

NATURAL GAS FACTS

PAKPAS ENGINEERING AND CONSTRUCTION LTD

REAN COMMODITY DMCC

This document containing confidential information and is the property of PAKPAS and can not be reproduced or used without PAKPAS's written consent.

Job No	Page	Symbol	Unit No	Cat	Type+Format	Serial No	Rev
1715.75	1/1	DWG	00		UD	0100.7	6

A compressor station is a facility which helps the transportation process of natural gas from one location to another. Natural gas, while being transported through a gas pipeline, needs to be constantly pressurized at intervals of 40 to 100 miles.[1] Siting is dependent on terrain, and the number of gas wells in the vicinity. Frequent elevation changes and a greater number of gas wells will require more compressor stations. The gas in compressor stations is normally pressurized by special turbines, motors and engines.
The compressor station, also called a pumping station, is the "engine" that powers an interstate natural gas pipeline. As the name implies, the compressor station compresses the natural gas (increasing its pressure) thereby providing energy to move the gas through the pipeline.[3]

Pipeline companies install compressor stations along a pipeline route. The size of the station and the number of compressors (pumps) varies, based on the diameter of the pipe and the volume of gas to be moved. Nevertheless, the basic components of a station are similar.

Rev-3				
Rev-2				
Rev-1				
Rev	Description	Date	Name	Check
Date	Drawn	Check	Appr.	Scale
MARCH 2019	O.Songur	O.Songur		NS

ENGINEERING ENERGY PETROLEUM INVESTMENT LTD

PAKPAS ENGINEERING AND CONSTRUCTION LTD

NATURAL GAS FACTS

Job No	Page	Symbol	Unit No	Cat	Type+Format	Serial No	Rev
1715.75	1/1	DWG	00		UD	0100.8	5

Component	Typical Analysis (mole %)	Range (mole %)
Methane	94.9	87.0 - 96.0
Ethane	2.5	1.8 - 5.1
Propane	0.2	0.1 - 1.5
iso - Butane	0.03	0.01 - 0.3
normal - Butane	0.03	0.01 - 0.3
iso - Pentane	0.01	trace - 0.14
normal - Pentane	0.01	trace - 0.04
Hexanes plus	0.01	trace - 0.06
Nitrogen	1.6	1.3 - 5.6
Carbon Dioxide	0.7	0.1 - 1.0
Oxygen	0.02	0.01 - 0.1
Hydrogen	trace	trace - 0.02
Specific Gravity	0.585	0.57 - 0.62
Gross Heating Value (MJ/m^3), dry basis *	37.8	36.0 - 40.2

CLICK

Linde's LNG storage & loading units are safe, easy to operate and cost effective.

Truck loading at Kwinana LNG plant

NATURAL GAS SPECS SHEET

Fuel Providers and their large volume Customers (particularly Electric Utilities and possibly other End Users) are used to defining fuel requirements in the form of Spec Sheets. Attached, as an example, is a #6 Fuel Oil Quality Specifications table developed to conform to federal, state, and local regulations governing the generator (e.g., emissions compliance), operational requirements (e.g., type of generating and/or backend clean-up equipment), and/or any other constraints imposed on the generator. Other examples of Spec Sheets and standards lists are included. This document includes an excellent example of a Gas Quality Spec Sheet from Brazil (GasEnergia) and additionally, the regulatory standards behind it.

With other generation fuels, the quality of the delivered product is a result of an agreement between the provider and the customer (the transporter does not generally have a significant input, if any).

With Natural Gas, due to the nature of the product and the transportation mechanism, the quality of the delivered product is primarily determined by the pipeline.

Utility generators have a need to know the expected range of quality of the fuel being delivered to them and ideally to have some control over the variability of that fuel to assure compliance with regulations, to protect their investment in generating equipment, and to be able to meet the needs of their customers in the most economic manner.

Not only is there a potential for great variability in the quality of Natural Gas delivered to Customers, the standards and specs defined in pipeline tariffs tend to be vague, difficult to locate or extract from pipeline tariffs, and often difficult to comprehend. These difficulties are compounded when generators try to deal with the differences across pipelines as there is not even a standard format for describing the quality specifications.

Customers would benefit from having access to clearly defined statements of pipeline quality (even though it varies from pipeline to pipeline) in the form of Natural Gas Spec Sheets (comparable to what the folks in Brazil have) provided in screen and downloadable format under Informational Postings on U.S. pipeline websites.

CLICK

QUALITY SPECIFICATIONS *(NOTE 1)*		TEST METHOD *(NOTE 2)*	DELIVERY LOCATIONS		
CHARACTERISTIC –OR– PROPERTY	UNITS / CONDITIONS		MANATEE (TMT/PMT) PORT EVERGLADES (TPE/PPE) SANFORD (TJS/PSN)	MIAMI -FISHER ISLAND (TFI/PTF) CANAVERAL (TCC/PCC)	PALM BEACH (TMR/PMR/PRV)
SULFUR	WEIGHT %	D-4294 *(NOTE 3)*	1.0 MAX	1.0 MAX	MAX As Ordered (.70% -OR- 1.0%)
HEATING VALUE	MMBTU/BBL	D-240	6.340 MIN *(NOTE 4)*	6.340 MIN *(NOTE 4)*	6.340 MIN *(NOTE 4)*
WATER & SEDIMENT (W&S)	VOLUME %	D-95 & D-473	1.0 MAX *(NOTE 5)*	1.0 MAX *(NOTE 5)*	1.0 MAX *(NOTE 5)*
SEDIMENT	WEIGHT %	D-473	0.20 MAX	0.20 MAX	0.20 MAX
FLASH POINT-PENSKY	°F	D-93	150 MIN	150 MIN	150 MIN
POUR POINT	°F	D-97	60 MAX	60 MAX	60 MAX
ASH	WEIGHT %	D-482	0.10 MAX	0.10 MAX	0.05 MAX for .70% S for PMR 0.07 MAX for 1.0% S for PMR 0.10 MAX for PRV
VISCOSITY	SSF@ 122°F	D-445 *(NOTE 6)*	25 MIN / 225 MAX	75 MIN / 225 MAX	25 MIN / 140 MAX for PMR 75 MIN / 225 MAX for PRV
GRAVITY	API	D-287 or D-4052	8.0 MIN for PPE & PMT 6.0 MIN for PSN	6.0 MIN	6.0 MIN
VANADIUM	PPM	D-5863 A or B/ D-5708 A or B	200 MAX	200 MAX	200 MAX
NITROGEN	WEIGHT %	D-5762	.40 MAX for PPE & PMT .50 MAX for PSN	.40 MAX for PTF .50 MAX for PCC	.30 MAX for .70% S for PMR .40 MAX for 1.0% S for PMR .50 MAX for 1.0% S for PRV
ALUMINUM + SILICON	PPM	D-5184	120 MAX	120 MAX	120 MAX
CALCIUM	PPM	D-5863 A or B/ D-5708 A or B	50 MAX	50 MAX	50 MAX
ASPHALTENES	WEIGHT %	BRITISH STANDARD BS-4676; IP-143.	8.0 MAX	8.0 MAX	8.0 MAX
DELIVERY TEMPERATURE	°F	N/A	105 MIN / 140 MAX	105 MIN / 140 MAX	105 MIN / 140 MAX

Ignition Point:	593 °C *
Flammability Limits	4% - 16% (volume % in air) *
Theoretical Flame Temperature (stoichiometric air/fuel ratio)	1960 °C (3562 °F) †
Maximum Flame Velocity	0.3 m/s †
Relative density (specific gravity)	0.585 ‡
Wobbe Index (Btu/scf)	1328 ‡

Comparison between Natural Gas and other Gases

	NATURAL GAS	LPG	STREET GAS (MANUFACTURED)	REFINERY GAS
ORIGIN	UNASSOCIATED PETROLEUM AND GAS RESERVOIRS	PETROLEUM DISTILLATION AND GAS PROCESSING	THERMOCATALYTIC REFORM OF NATURAL GAS OR PETROCHEMICAL NAPHTHA	OIL REFINING PROCESSES (CATALYTIC CRACKING, DISTILLATION, REFORMING AND DELAYED COKING)
MOLECULAR WEIGHT	17 TO 21	44 TO 56	16	24
SUPERIOR HEATING POWER (KCAL/M3)	RICH: 10.900 PROCESSED: 9.300	24.000 TO 32.000	4.300	10.000
RELATIVE DENSITY	0.58 TO 0.72	1.50 TO 2.0	0.55	0.82
PRINCIPLE COMPONENTS	METHANE, ETHANE	PROPANE, BUTANE	HYDROGEN, METHANE, NITROGEN, CARBON MONOXIDE, CARBON DIOXIDE	HYDROGEN, NITROGEN, METHANE, ETHANEV
PRINCIPLE USES	RESIDENTIAL, COMMERCIAL, AUTOMOTIVE AND HERMOELECTRIC GENERATION: (FUEL) INDUSTRIAL: (FUEL, PETROCHEMICAL AND METALLURGICAL)	INDUSTRIAL, RESIDENTIAL AND COMMERCIAL (FUEL)	RESIDENTIAL AND COMMERCIAL (FUEL)	INDUSTRIAL (FUEL AND PETROCHEMICAL)
STORAGE PRESSURE	200 ATM	15 ATM	- - - -	- - - -

Rev-3				
Rev-2				
Rev-1				
Rev	Description	Date	Name	Check
Date	Drawn	Check	Appr.	Scale
MARCH 2019	O.Songur	O.Songur		NS

EEPI LLC

ENGINEERING ENERGY PETROLEUM INVESTMENT LTD

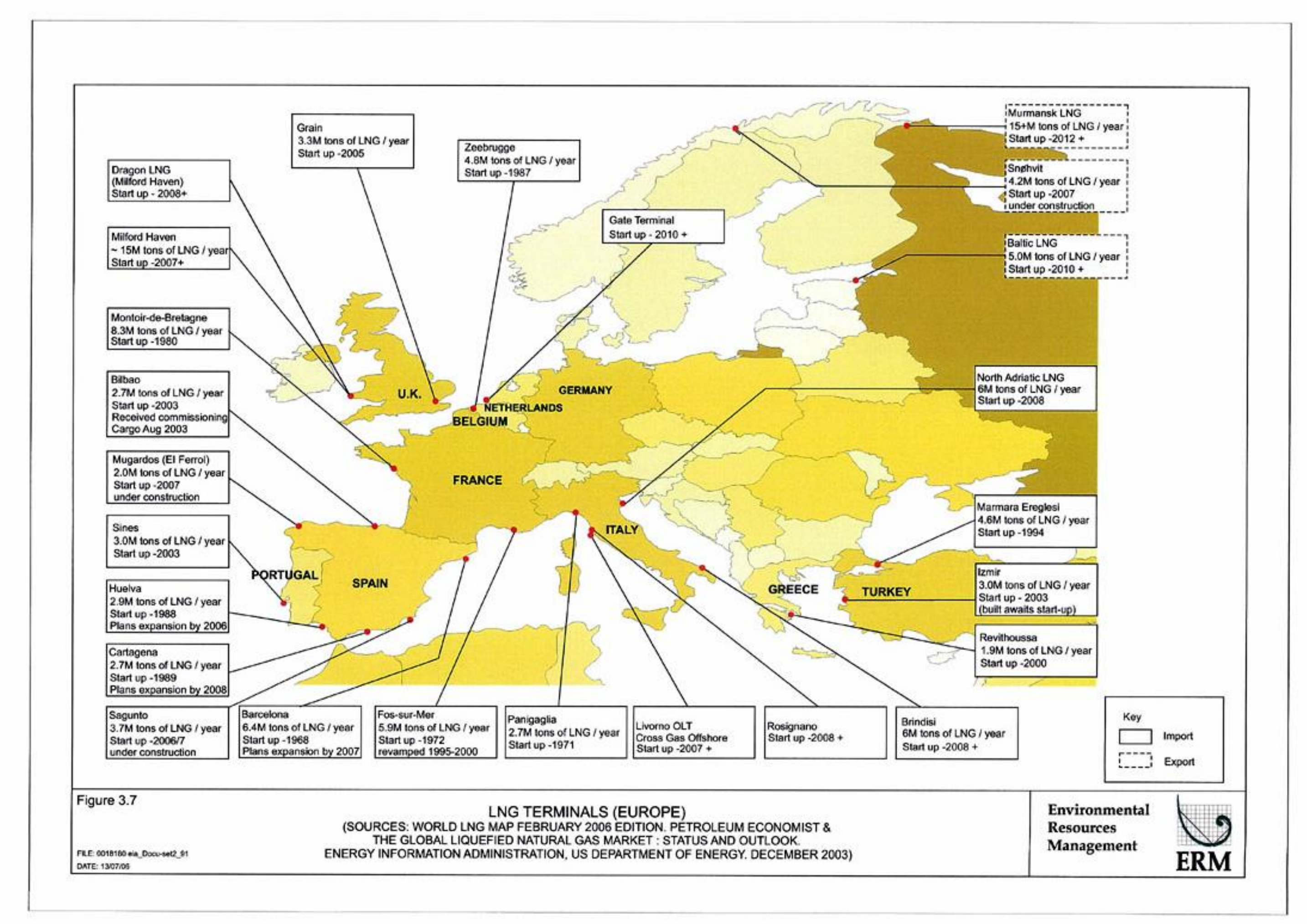
NATURAL GAS FACTS

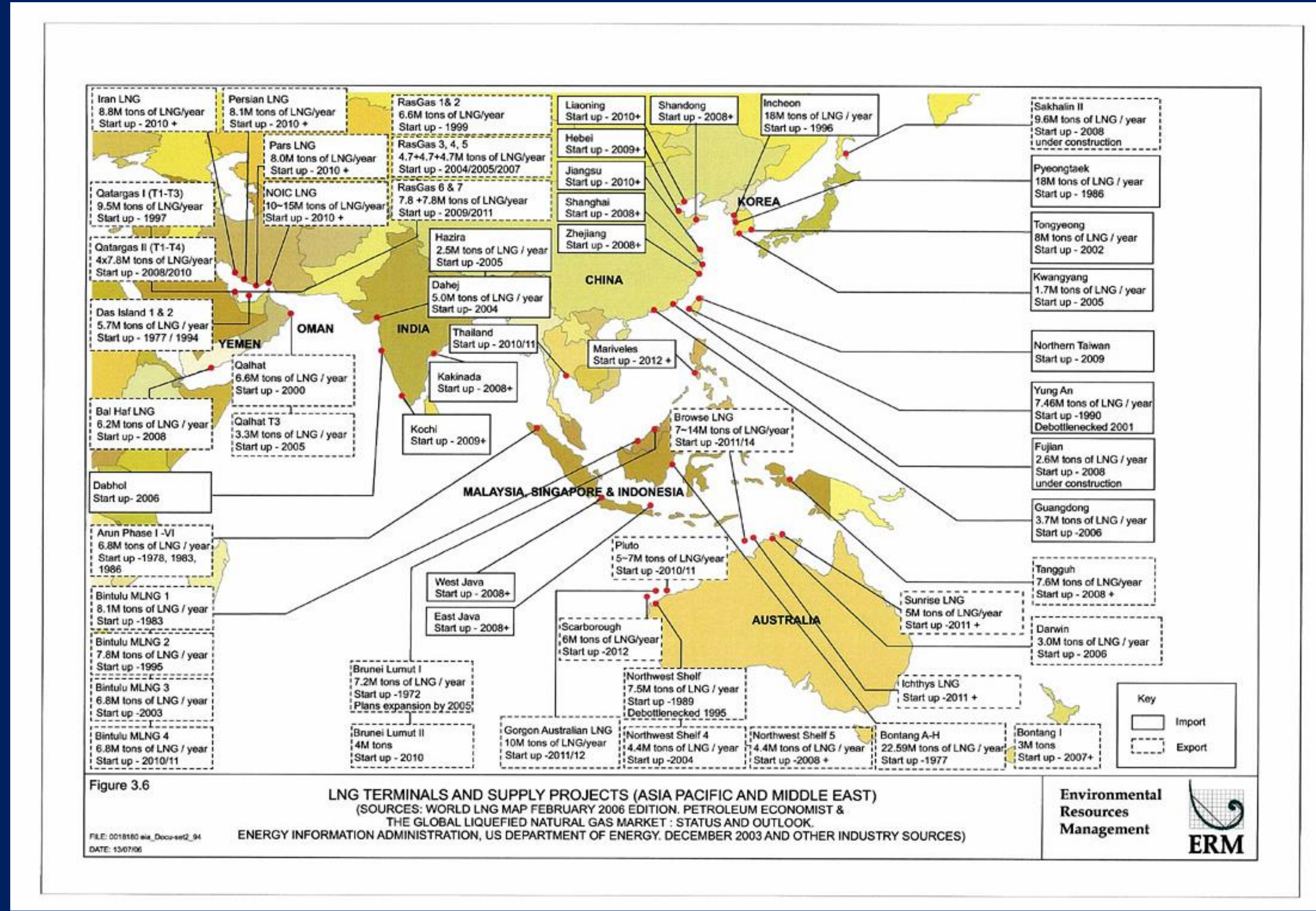
PAKPAS ENGINEERING AND CONSTRUCTION LTD

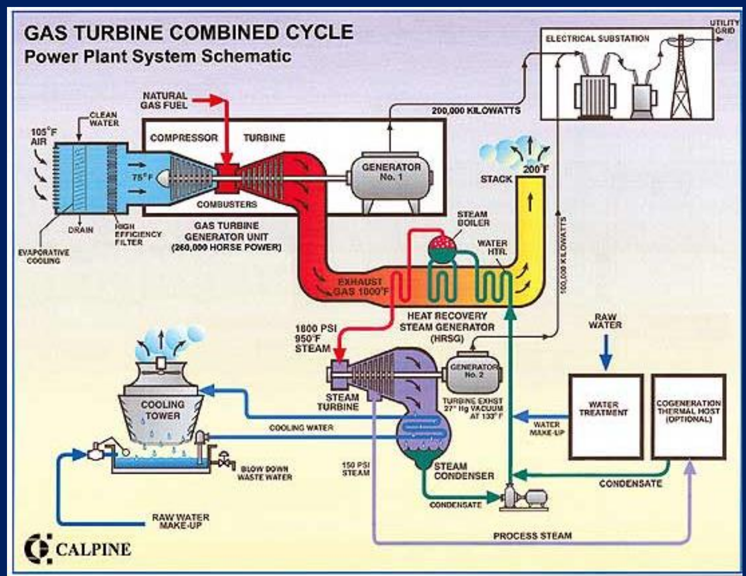
REAN COMMODITY DMCC

Job No	Page	Symbol	Unit No	Cat	Type+Format	Serial No	Rev
1715.75	1/1	DWG	00		UD	0100.9	5

LNG TERMINALS-EUROPE AND FAR EAST



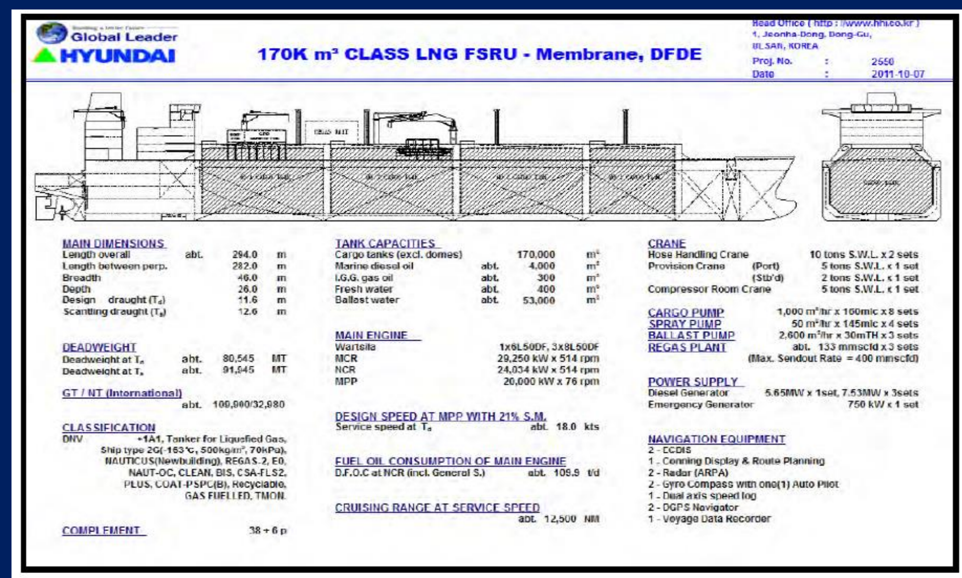




Component		Volume Percentage
Methane	CH_4	93.9
Ethane	C_2H_6	3.2
Propane	C_3H_8	0.7
n-Butane	C_4H_{10}	0.4
Carbon Dioxide	CO_2	1.0
Nitrogen	N_2	0.8
Total		100.0

	LHV	HHV
kJ/kg	47.764	52,970
MJ/scm (1)	35	39
Btu/lb	20,552	22,792
Btu/scf (2)	939	1,040

(1) Mega joules per standard cubic meter ("MJ/scm").
(2) Standard cubic feet ("scf").



Rev-3				
Rev-2				
Rev-1				
Rev	Description	Date	Name	Check
Date	Drawn	Check	Appr.	Scale
MARCH 2019	O.Songur	O.Songur		NS

EEPI LLC — ENGINEERING ENERGY PETROLEUM INVESTMENT LTD

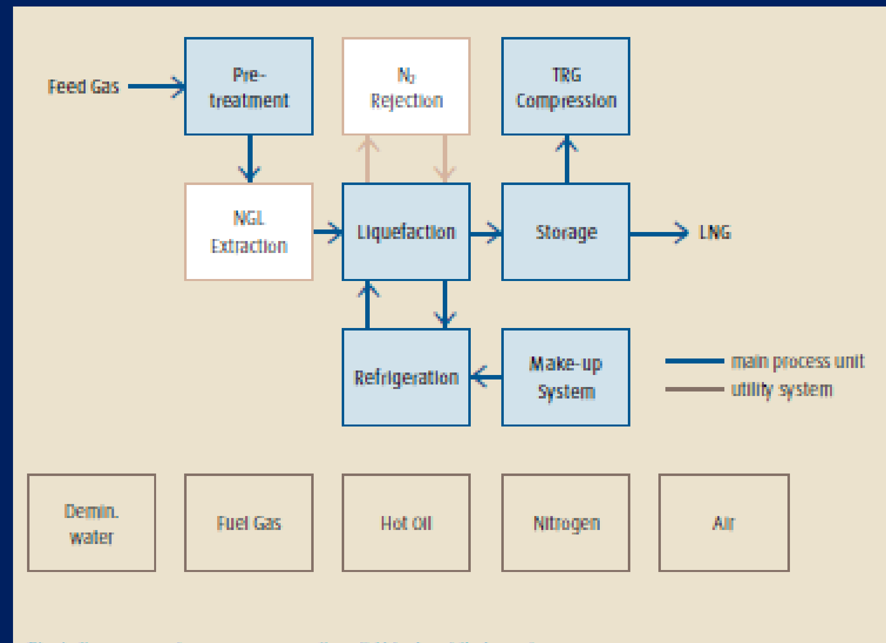
NATURAL GAS FACTS

PAKPAS ENGINEERING AND CONSTRUCTION LTD

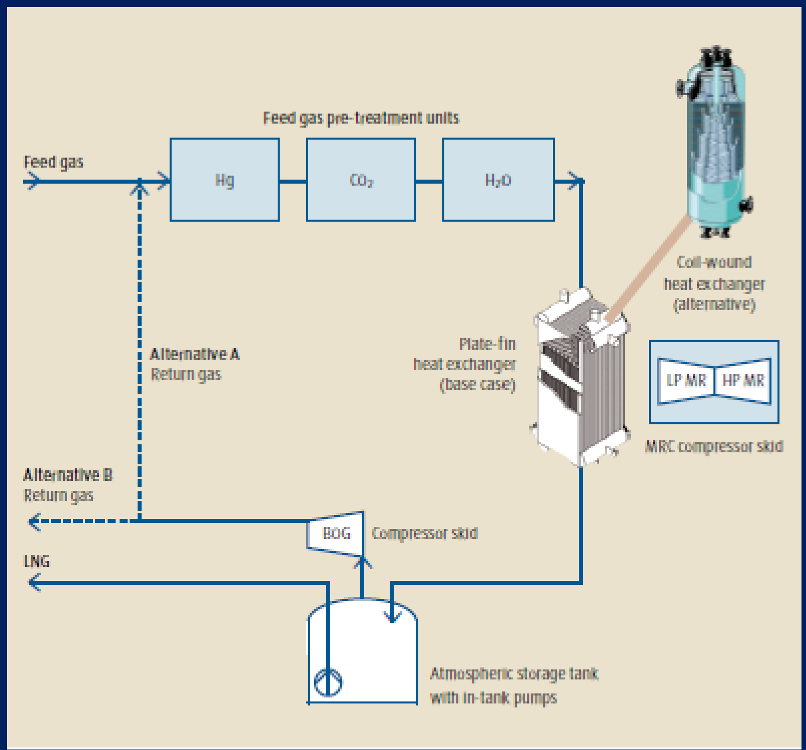
REAN COMMODITY DMCC

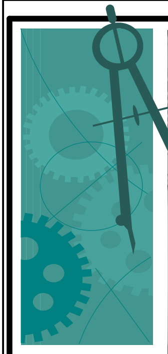
Job No	Page	Symbol	Unit No	Cat	Type+Format	Serial No	Rev
1715.75	1/1	DWG	00		UD	0100.10	6

LNG PLANTS



Block diagram - main process groups (in solid black, white boxes) refer to optional steps, grey boxes refer to utility systems.





Rev-3				
Rev-2				
Rev-1				
Rev	Description	Date	Name	Check

Date	Drawn	Check	Appr.	Scale
MARCH 2019	O.Songur	O.Songur		NS

EEPI LLC
ENGINEERING ENERGY PETROLEUM INVESTMENT LTD

NATURAL GAS FACTS

PAKPAS ENGINEERING AND CONSTRUCTION LTD

REAN COMMODITY DMCC

Job No	Page	Symbol	Unit No	Cat	Type+Format	Serial No	Rev
1715.75	1/1	DWG	00		UD	0100.11	6

LNG PLANTS SKID MOUNTED READY FOR DELIVERY

Rev-3				
Rev-2				
Rev-1				
Rev	Description	Date	Name	Check
Date	Drawn	Check	Appr.	Scale
MARCH 2019	O.Songur	O.Songur		NS

ENGINEERING ENERGY PETROLEUM INVESTMENT LTD

EEPI LLC

NATURAL GAS FACTS

PAKPAS ENGINEERING AND CONSTRUCTION LTD

REAN COMMODITY DMCC

Job No	Page	Symbol	Unit No	Cat	Type+Format	Serial No	Rev
1715.75	1/1	DWG	00		UD	0100.12	6

LNG PLANTS SKID MOUNTED READY FOR DELIVERY-900 TPD

Rev-3				
Rev-2				
Rev-1				
Rev	Description	Date	Name	Check
Date	Drawn	Check	Appr.	Scale
MARCH 2019	O.Songur	O.Songur		NS

ENGINEERING ENERGY PETROLEUM INVESTMENT LTD

EEPI LLC

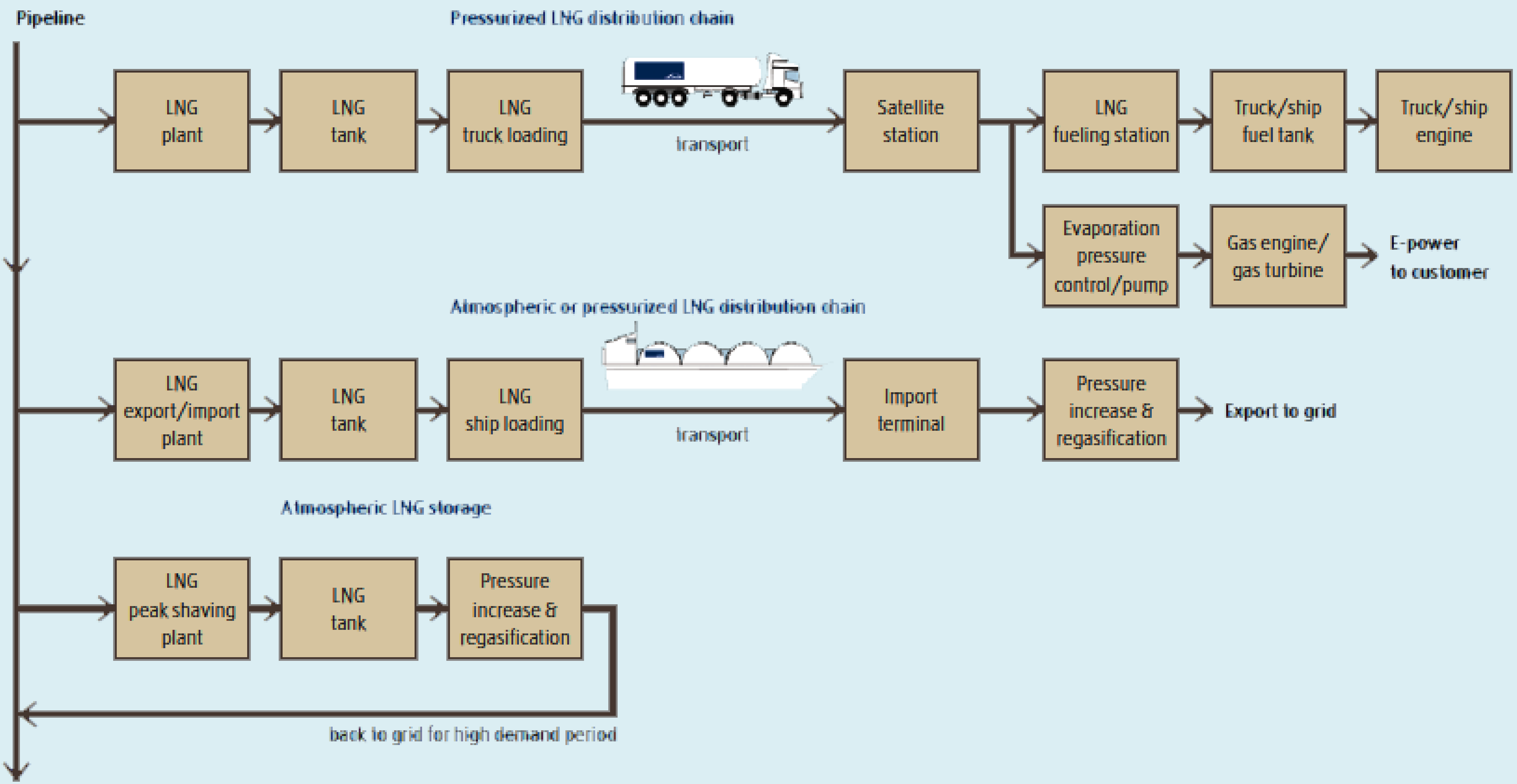
NATURAL GAS FACTS

PAKPAS ENGINEERING AND CONSTRUCTION LTD

REAN COMMODITY DMCC

Job No	Page	Symbol	Unit No	Cat	Type+Format	Serial No	Rev
1715.75	1/1	DWG	00		UD	0100.13	6

LNG SUPPLY CHAIN



Rev	Description	Date	Name	Check
Rev-3				
Rev-2				
Rev-1				

Date	Drawn	Check	Appr.	Scale
MARCH 2019	O.Songur	O.Songur		NS

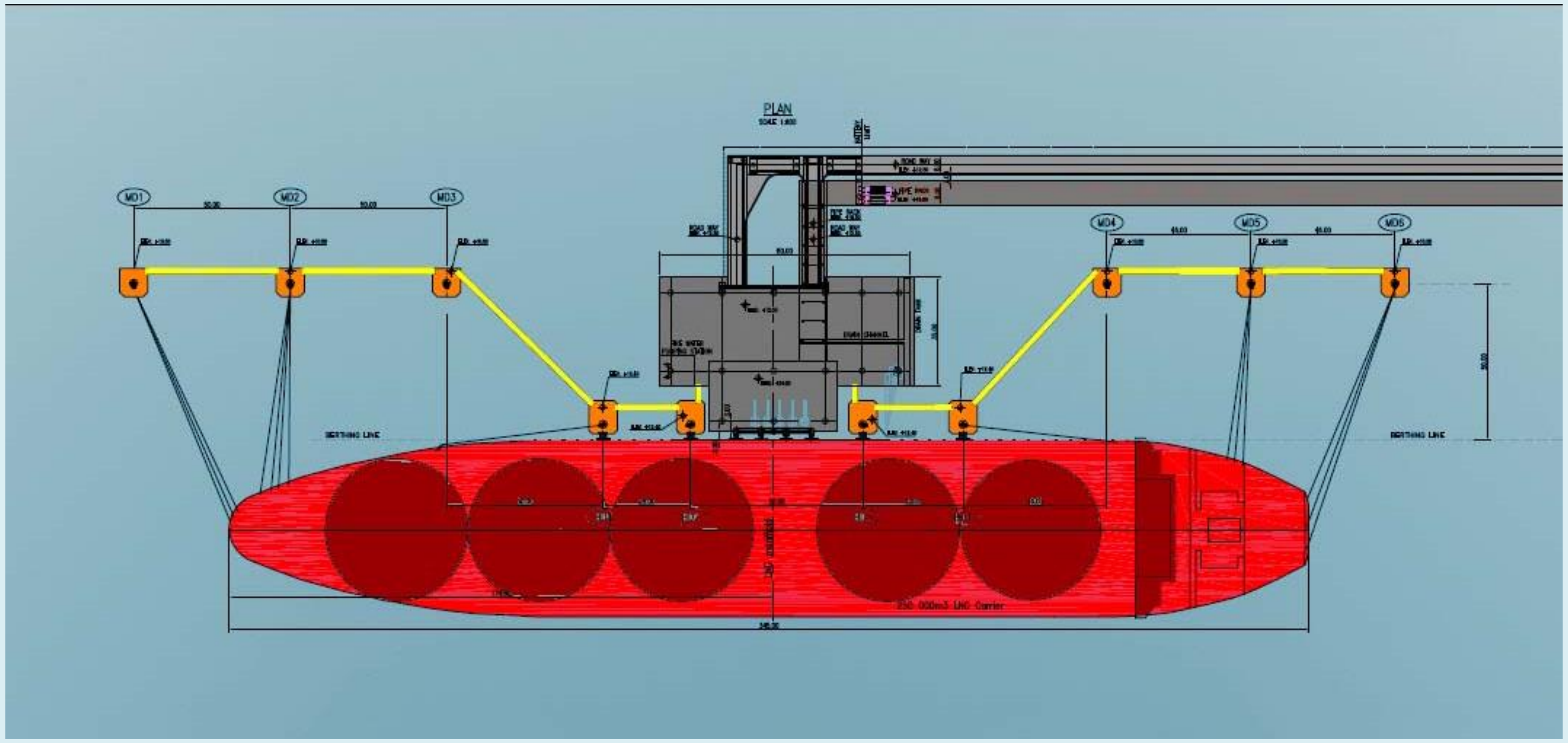
EEPI LLC — **ENGINEERING ENERGY PETROLEUM INVESTMENT LTD**

NATURAL GAS FACTS

PAKPAS ENGINEERING AND CONSTRUCTION LTD

REAN COMMODITY DMCC

Job No	Page	Symbol	Unit No	Cat	Type+Format	Serial No	Rev
1715.75	1/1	DWG	00		UD	0100.14	6



LNG

Rev-3				
Rev-2				
Rev-1				
Rev	Description	Date	Name	Check
Date	Drawn	Check	Appr.	Scale
MARCH 2019	O.Songur	O.Songur		NS

ENGINEERING ENERGY PETROLEUM INVESTMENT LTD

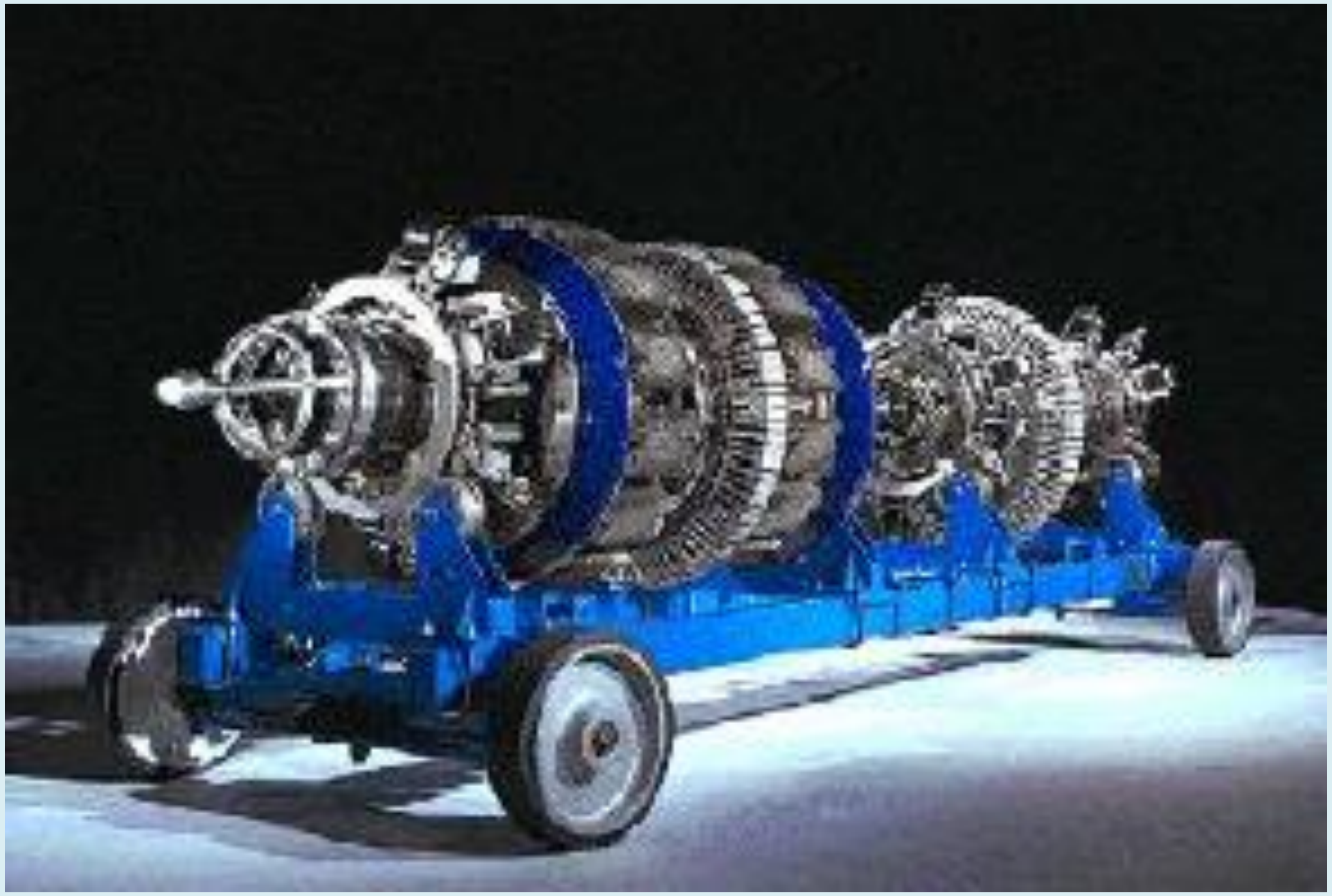
EEPI LLC

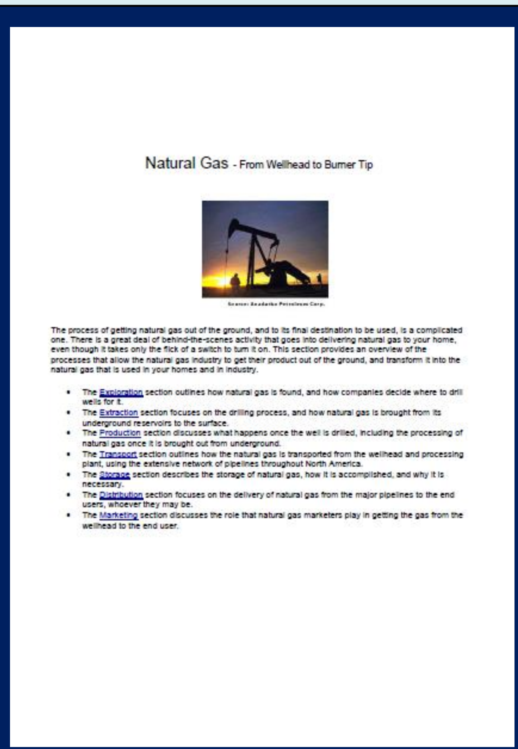
PAKPAS ENGINEERING AND CONSTRUCTION LTD

NATURAL GAS FACTS

REAN COMMODITY DMCC

Job No	Page	Symbol	Unit No	Cat	Type+Format	Serial No	Rev
1715.75	1/1	DWG	00		UD	0100.15	6





Natural Gas - From Wellhead to Burner Tip

The process of getting natural gas out of the ground, and to its final destination to be used, is a complicated one. There is a great deal of behind-the-scenes activity that goes into delivering natural gas to your home, even though it takes only the flick of a switch to turn it on. This section provides an overview of the processes that allow the natural gas industry to get their product out of the ground, and transform it into the natural gas that is used in your homes and in industry.

- The Exploration section outlines how natural gas is found, and how companies decide where to drill wells for it.
- The Extraction section focuses on the drilling process, and how natural gas is brought from its underground reservoirs to the surface.
- The Production section discusses what happens once the well is drilled, including the processing of natural gas once it is brought out from underground.
- The Transport section outlines how the natural gas is transported from the wellhead and processing plant, using the extensive network of pipelines throughout North America.
- The Storage section describes the storage of natural gas, how it is accomplished, and why it is necessary.
- The Distribution section focuses on the delivery of natural gas from the major pipelines to the end users, whoever they may be.
- The Marketing section discusses the role that natural gas marketers play in getting the gas from the wellhead to the end user.

Rev-3				
Rev-2				
Rev-1				
Rev	Description	Date	Name	Check
Date	Drawn	Check	Appr.	Scale
MARCH 2019	O.Songur	O.Songur		NS

EEPI LLC
ENGINEERING ENERGY PETROLEUM INVESTMENT LTD

NATURAL GAS FACTS

PAKPAS ENGINEERING AND CONSTRUCTION LTD

REAN COMMODITY DMCC

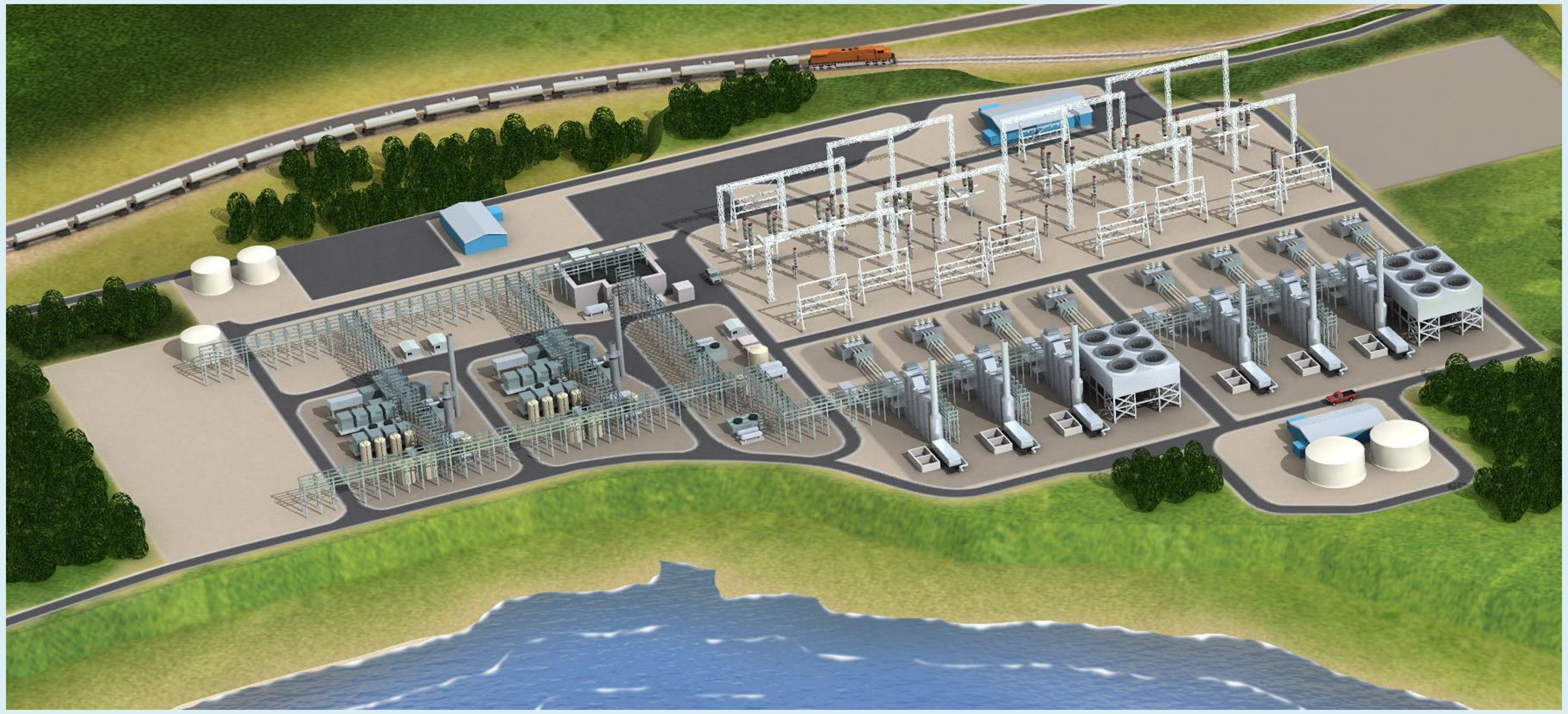
PAKPAS

Job No	Page	Symbol	Unit No	Cat	Type+Format	Serial No	Rev
1715.75	1/1	DWG	00		UD	0100.16	6

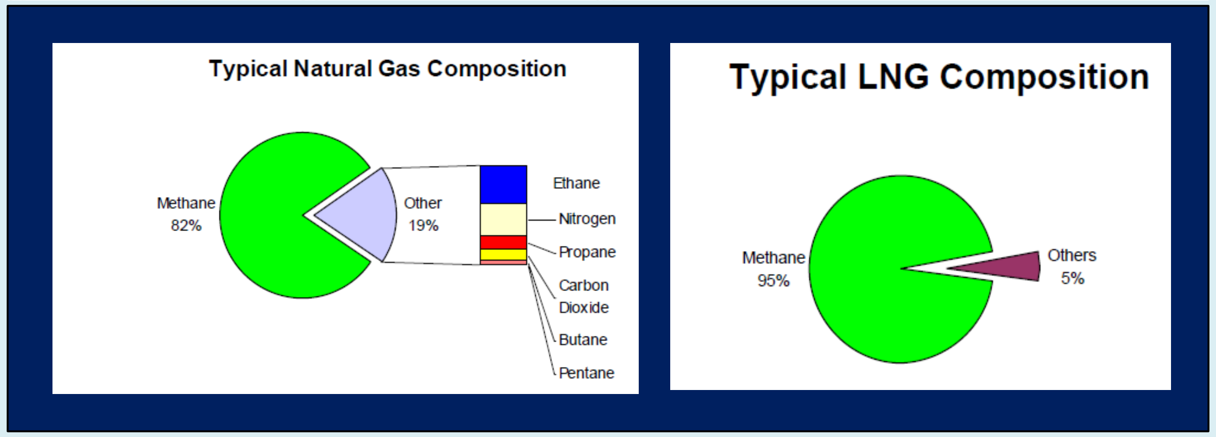
NATURAL GAS VERSUS LNG COMPOSITION AND CONVERSION

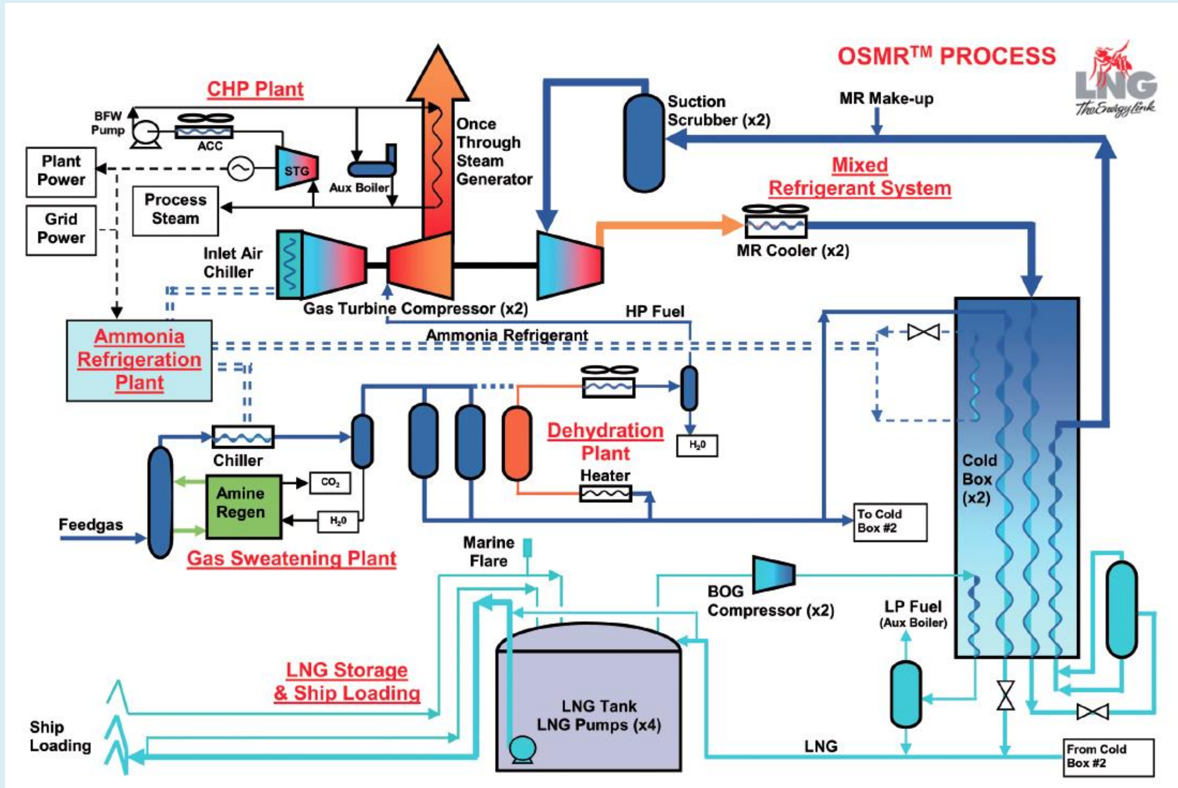
Appendix 1: Conversion Table

Conversion Units	*Source: BP Statistical Review of U.S. Energy June 2002*					
Natural gas (NG) and LNG	**To:** 1 billion cubic meters NG	1 billion cubic feet NG	1 million tons oil equivalent	1 million tons LNG	1 trillion British thermal units (Btus)	1 million barrels oil equivalent (Boe)
From:	**Multiply by:**					
1 billion cubic meters NG	1	35.3	0.90	0.73	36	6.29
1 billion cubic feet NG	0.028	1	0.026	0.021	1.03	0.18
1 million tons oil equivalent	1.111	39.2	1	0.81	40.4	7.33
1 million tons LNG	1.38	48.7	1.23	1	52.0	8.68
1 trillion British thermal units (Btus)	0.028	0.98	0.025	0.02	1	0.17
1 million barrels oil equivalent (Boe)	0.16	5.61	0.14	0.12	5.8	1



EXPLORATION & PRODUCTION | LIQUEFACTION | SHIPPING | REGASIFICATION & STORAGE





Rev-3				
Rev-2				
Rev-1				
Rev	Description	Date	Name	Check
Date	Drawn	Check	Appr.	Scale
MARCH 2019	O.Songur	O.Songur		NS

ENGINEERING ENERGY PETROLEUM INVESTMENT LTD

EEPI LLC

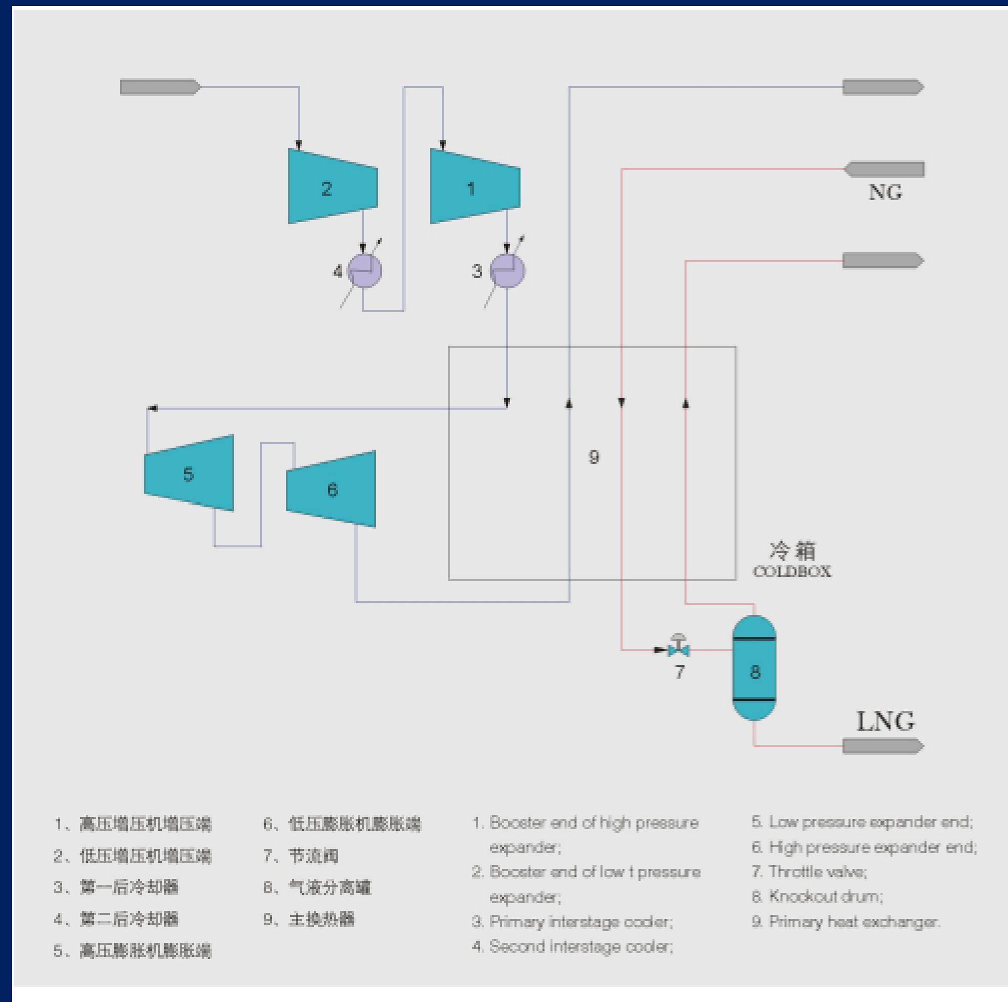
NATURAL GAS FACTS

PAKPAS ENGINEERING AND CONSTRUCTION LTD

REAN COMMODITY DMCC

Job No	Page	Symbol	Unit No	Cat	Type+Format	Serial No	Rev
1715.75	1/1	DWG	00		UD	0100.17	6

COOL FUEL-LNG PROCESS PROPOSALS-LARGEST 1600 TPD



Design& Manufacture

FORTUNE GAS has successfully designed, manufactured and delivered more than 500 sets of air separation units and LNG plants , Etc.

Global Network

Our products are exported to Japan, the Middle East, Central and South America, Southeast Asia, Central Asia, Africa and other countries and regions.

Rev-3				
Rev-2				
Rev-1				
Rev	Description	Date	Name	Check
Date	Drawn	Check	Appr.	Scale
MARCH 2019	O.Songur	O.Songur		NS

ENGINEERING ENERGY PETROLEUM INVESTMENT LTD

EEPI LLC

NATURAL GAS FACTS

PAKPAS ENGINEERING AND CONSTRUCTION LTD

REAN COMMODITY DMCC

Job No	Page	Symbol	Unit No	Cat	Type+Format	Serial No	Rev
1715.75	1/1	DWG	00		UD	0100.18	6

COOL FUEL-LNG PROCESS PROPOSALS

THE LINDE GROUP

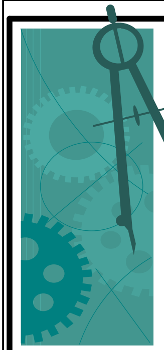
Liquefied Natural Gas (LNG)
Natural gas is converted to Liquefied Natural Gas (LNG) by harnessing innovative cryogenic technologies that make it available both for worldwide transport as well as for local markets. This conversion can also contribute to increased use of biogas.
Cooling to minus 162 degrees Celsius

Just like crude oil, most natural gas deposits are located far away from their actual point of use. At present, over 90 percent of natural gas is fed through long pipelines to power plants, industrial facilities and homes. But once the distance in relation to the volume of gas to be transported becomes too high, this ceases to be economically viable due to the high costs of construction, materials and compressor stations. To efficiently transport natural gas, it is liquefied by cooling it to minus 162 degrees Celsius. This reduces its volume some 600-fold.

Globally, there are circa 70 so-called world-scale plants with a capacity of some ten million tonnes per year. They are directly connected to large natural gas deposits and produce LNG for export purposes. In addition to the globally oriented LNG trade, construction of regional and local infrastructures is becoming increasingly significant, just as is the development of deposits that are difficult to access.

Liquid natural gas can be transported from coastal LNG terminals by truck, or it can be re-evaporated and fed into a regional pipeline network to thus reach the consumer. Linde offers efficient technologies and innovative complete solutions both for LNG transport as well as for the development of LNG infrastructures – from natural gas cleanup to storage tanks and vaporisation equipment for port facilities and ships all the way to regional distribution and customer applications.

https://youtu.be/Xzf9rB2lBOM



Rev-3				
Rev-2				
Rev-1				
Rev	Description	Date	Name	Check
Date	Drawn	Check	Appr.	Scale
MARCH 2019	O.Songur	O.Songur		NS

EEPI LLC — ENGINEERING ENERGY PETROLEUM INVESTMENT LTD

NATURAL GAS FACTS

PAKPAS ENGINEERING AND CONSTRUCTION LTD

REAN COMMODITY DMCC

Job No	Page	Symbol	Unit No	Cat	Type+Format	Serial No	Rev
1715.75	1/1	DWG	00		UD	0100.19	6

LIQUID NATURAL GAS TRADE ROUTES

As of distances of several thousand kilometres, natural gas transport is only economically viable via ship, i.e. special LNG tankers. Approximately 200 of these tankers now distribute liquefied natural gas all around the world.

Rev-3				
Rev-2				
Rev-1				
Rev	Description	Date	Name	Check
Date	Drawn	Check	Appr.	Scale
MARCH 2019	O.Songur	O.Songur		NS

ENGINEERING ENERGY PETROLEUM INVESTMENT LTD

PAKPAS ENGINEERING AND CONSTRUCTION LTD

NATURAL GAS FACTS

REAN COMMODITY DMCC

Job No	Page	Symbol	Unit No	Cat	Type+Format	Serial No	Rev
1715.75	1/1	DWG	00		UD	0100.20	6

WORLD SCALE LNG PLANTS

THE LINDE GROUP

Linde Engineering has the know-how and experience to individually design and build highly efficient base load plants for even the largest world-scale LNG plants.
World-scale liquefied natural gas (LNG) plants contribute the majority of liquefied natural gas products traded globally today. They range in capacity between a few million tonnes per annum (tpa) and more than 10 million tpa. Typically the liquefied natural gas from these plants is transported by ship from export to import terminals, and then evaporated into pipelines for supply to the end user.

We established our cryogenic liquefaction technology for world-scale LNG plants at the world's northernmost natural gas liquefaction plant, Hammerfest. It is located 800 km north of the Arctic Circle on the Melkøya island off Norway.

Our patented Mixed Fluid Cascade (MFC®) process, jointly developed with Statoil for base load LNG plants, is designed for highest efficiency and reliability in any environment and climate.

The MFC® process features three independent refrigeration cycles. The intermediate liquefaction cycle and the coldest (sub-cooling) cycle always use mixed refrigerants, while the warmest (pre-cooling) cycle can vary its refrigerant depending on the ambient temperature. MFC® stands for propane pre-cooling, with load balancing between the three refrigeration cycles so the shaft power of all three compressor trains is identical. This unique configuration enables the largest LNG capacities with a given set of main compressor drives.

In a moderate or cold climate, propane pre-cooling and perfect load balancing across the three refrigeration cycles is no longer feasible. Under these circumstances, the 'arctic' version of our MFC® process – as implemented in Hammerfest, Norway – with three mixed refrigerant cycles is the preferred solution.

MODULAR SOLUTIONS

Rev-3				
Rev-2				
Rev-1				
Rev	Description	Date	Name	Check
Date	Drawn	Check	Appr.	Scale
MARCH 2019	O.Songur	O.Songur		NS

ENGINEERING ENERGY PETROLEUM INVESTMENT LTD

EEPI LLC

NATURAL GAS FACTS

PAKPAS ENGINEERING AND CONSTRUCTION LTD

REAN COMMODITY DMCC

Job No	Page	Symbol	Unit No	Cat	Type+Format	Serial No	Rev
1715.75	1/1	DWG	00		UD	0100.21	6

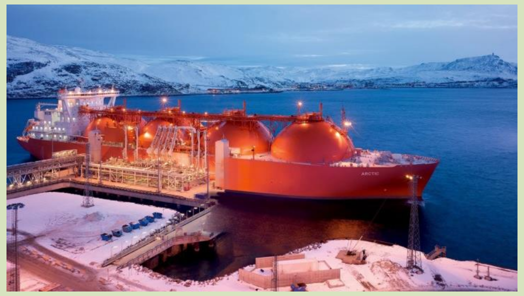
WORLD SCALE LNG PLANTS

THE LINDE GROUP

Making our world more productive

Linde

Linde has been optimising gas processing technologies for 140 years, successfully delivering more than 4,000 plant engineering projects around the globe. Favouring trusted, lasting business relationships, the company collaborates closely with customers to enhance plant lifecycle productivity and innovate process flows. The company's proven gas processing expertise play an indispensable role in the success of customers across multiple industries – from natural gas and oil refining through petrochemicals and fertilizers to electronics and metal processing.



Rev-3				
Rev-2				
Rev-1				
Rev	Description	Date	Name	Check
Date	Drawn	Check	Appr.	Scale
MARCH 2019	O.Songur	O.Songur		NS

ENGINEERING ENERGY PETROLEUM INVESTMENT LTD

EEPI LLC

NATURAL GAS FACTS

PAKPAS ENGINEERING AND CONSTRUCTION LTD

REAN COMMODITY DMCC

Job No	Page	Symbol	Unit No	Cat	Type+Format	Serial No	Rev
1715.75	1/1	DWG	00		UD	0100.22	6

THE LINDE GROUP

WORLD SCALE LNG PLANTS-200 TPD-70,000 TPA

Making our world more productive

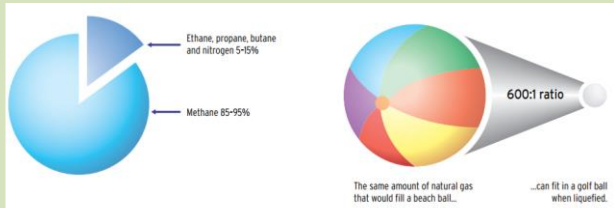
Linde

Linde's pre-engineered solution for the small-scale LNG supply chain.

	base case, Vol. %
N_2	0.85
CO_2	4.80
CH_4	88.71
C_2H_6	5.25
C_3H_8	0.36
C_4H_{10}	0.02
C_5H_{12}	0.00
C_{6+}	0.01
total	**100.00**

Main design features:

- LNG production capacity: 200 tpd liquefaction capacity
- Product storage capacity: 4.000 m³
- LNG load-out rate: 2 x 50 m³/h (by truck) - 1000 m³/h (by ship)



Rev-3				
Rev-2				
Rev-1				
Rev	Description	Date	Name	Check

Date	Drawn	Check	Appr.	Scale
MARCH 2019	O.Songur	O.Songur		NS

EEPI LLC — ENGINEERING ENERGY PETROLEUM INVESTMENT LTD

PAKPAS ENGINEERING AND CONSTRUCTION LTD

NATURAL GAS FACTS

REAN COMMODITY DMCC

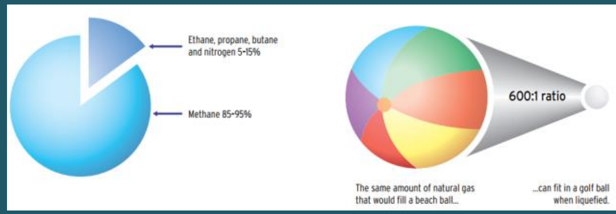
Job No	Page	Symbol	Unit No	Cat	Type+Format	Serial No	Rev
1715.75	1/1	DWG	00		UD	0100.23	6

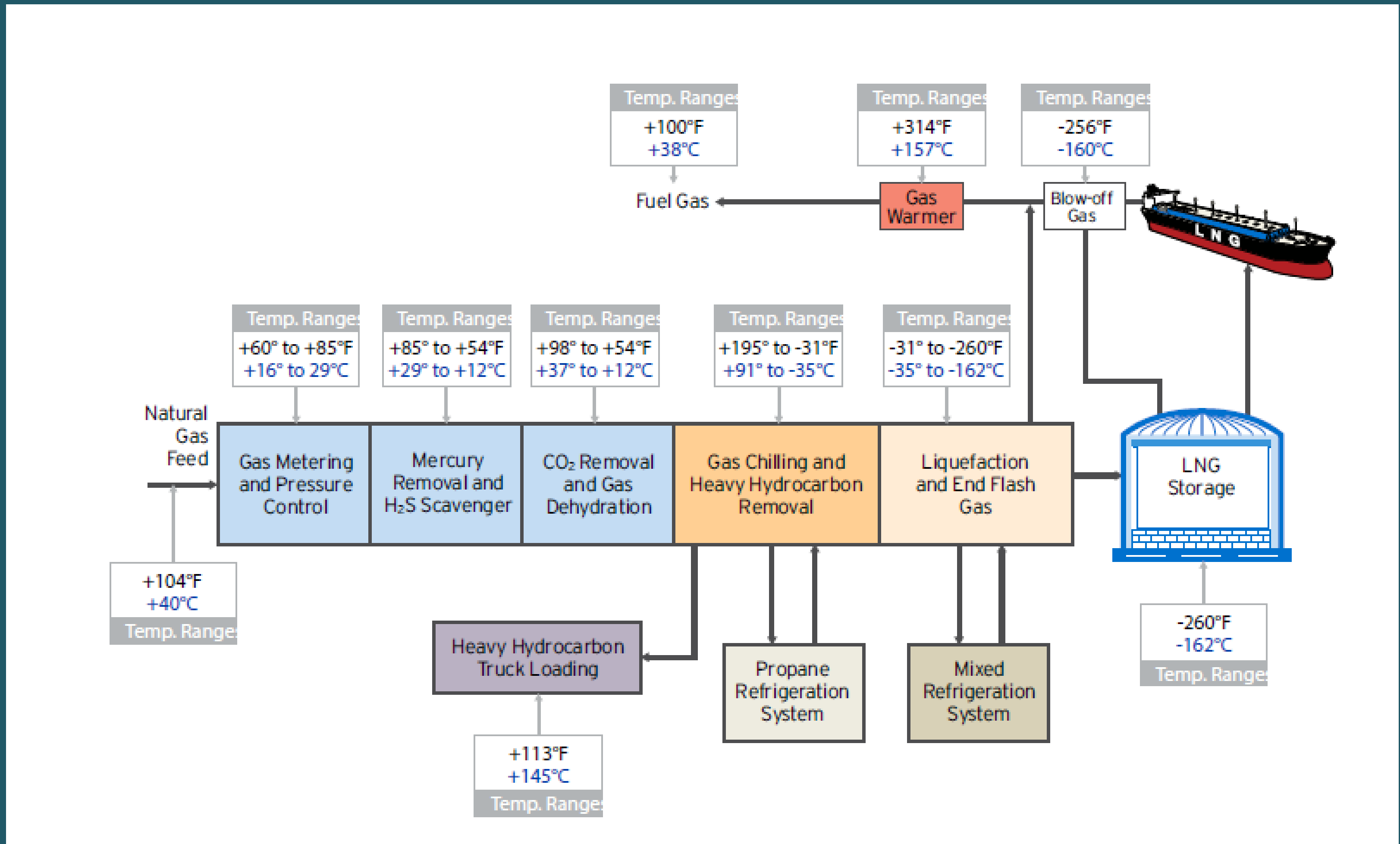
WORLD SCALE LNG PLANTS-200 TPD-70,000 TPA

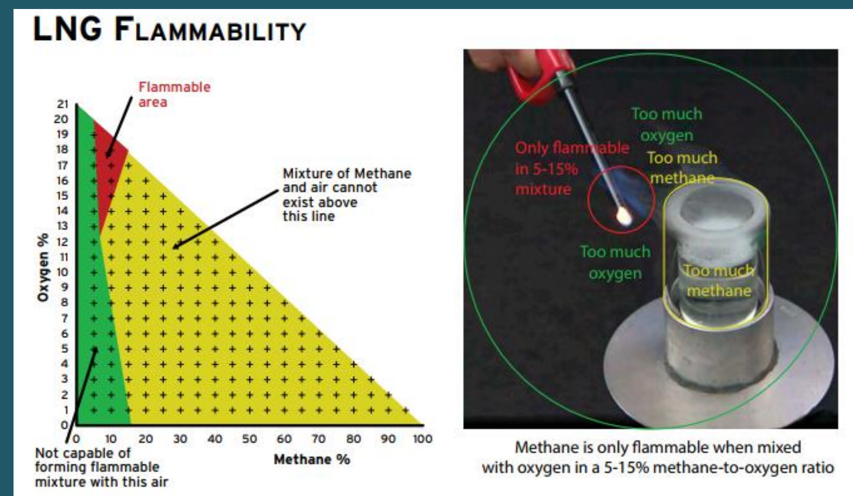
THE LINDE GROUP

Making our world more productive

Linde







Rev-3				
Rev-2				
Rev-1				
Rev	Description	Date	Name	Check
Date	Drawn	Check	Appr.	Scale
MARCH 2019	O.Songur	O.Songur		NS

ENGINEERING ENERGY PETROLEUM INVESTMENT LTD (EEPI LLC)

NATURAL GAS FACTS

PAKPAS ENGINEERING AND CONSTRUCTION LTD

REAN COMMODITY DMCC

Job No	Page	Symbol	Unit No	Cat	Type+Format	Serial No	Rev
1715.75	1/1	DWG	00		UD	0100.24	6

THE LINDE GROUP

WORLD SCALE LNG PLANTS-200 TPD-70,000 TPA

Making our world more productive

Linde

Site layout

The 200 tpd base case LNG plant including pre-treatment, utilities and LNG storage tank features a required plot space of only approx.135 x 150m at the same time fulfilling all safety requirements.

Battery limit/interfaces:
- Civil (drainage, sewer system, roads)
- Piping (feed gas, utility water)
- Electrical power

2 hA

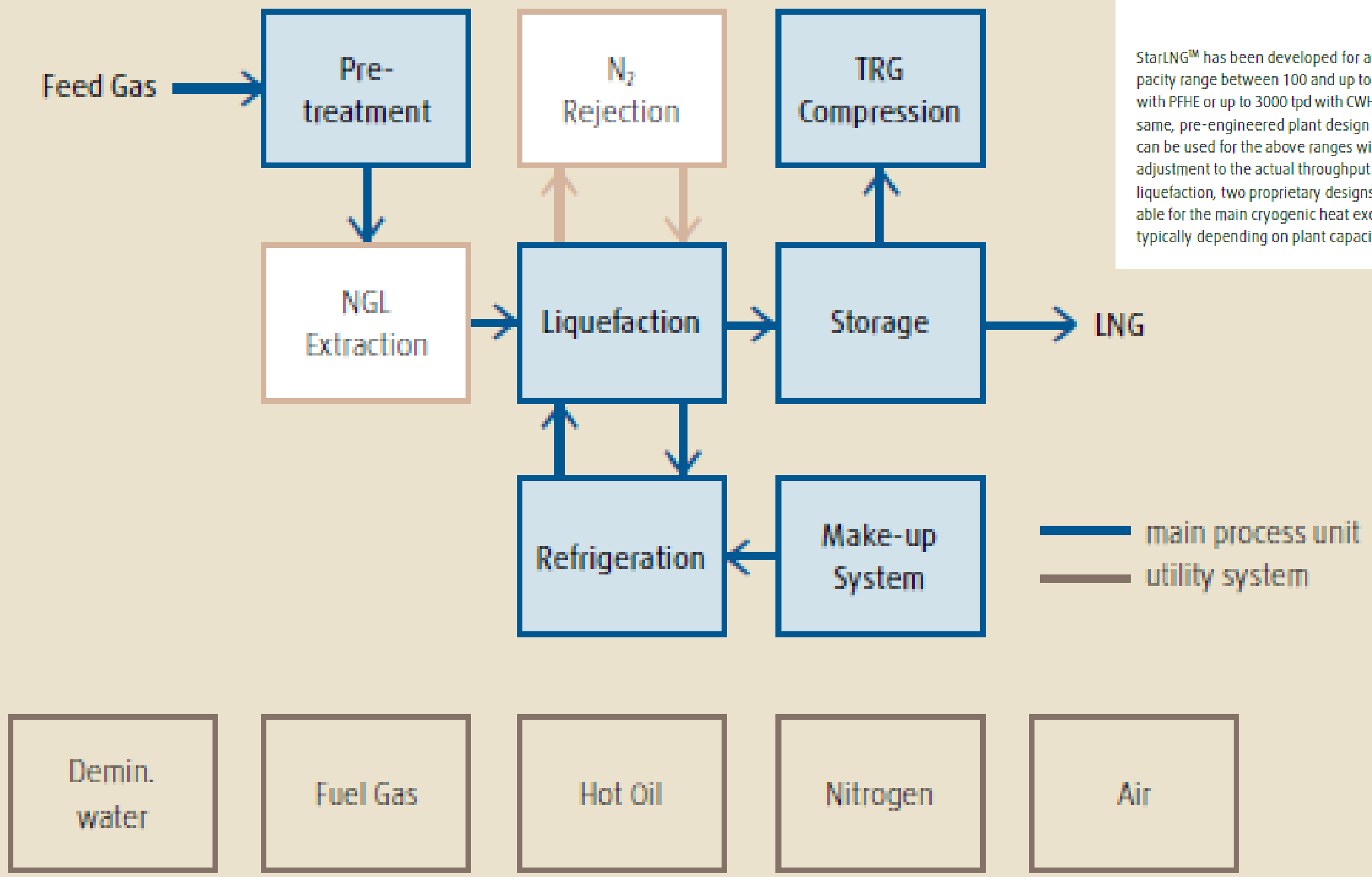
Basis of design, assumptions for codes & standards

Applied codes, standards and safety requirements (excerpt):
- “Installation and equipment for liquefied natural gas” EN 1473
- “Standard for the production, storage and handling of LNG” NFPA 59
- Design codes for pressure bearing parts and piping ASME, EN, GB
- E&I design codes IEC, ANSI, NEC , NEMA
- Structural materials EN, ASTM
- Process safety API, NFPA

3,000 TPD

Capacity range.

StarLNG™ has been developed for an LNG capacity range between 100 and up to 1600 tpd with PFHE or up to 3000 tpd with CWHE; i.e. the same, pre-engineered plant design concept can be used for the above ranges with a simple adjustment to the actual throughput. For the liquefaction, two proprietary designs are available for the main cryogenic heat exchanger, typically depending on plant capacity.



BLOCK DIAGRAM

900 TPD

Rev-3				
Rev-2				
Rev-1				
Rev	Description	Date	Name	Check
Date	Drawn	Check	Appr.	Scale
MARCH 2019	O.Songur	O.Songur		NS

ENGINEERING ENERGY PETROLEUM INVESTMENT LTD

EEPI LLC

PAKPAS ENGINEERING AND CONSTRUCTION LTD

NATURAL GAS FACTS

REAN COMMODITY DMCC

Job No	Page	Symbol	Unit No	Cat	Type+Format	Serial No	Rev
1715.75	1/1	DWG	00		UD	0100.25	6

WORLD SCALE LNG PLANTS-200 TPD-70,000 TPA

THE LINDE GROUP

Making our world more productive

Linde

Site layout

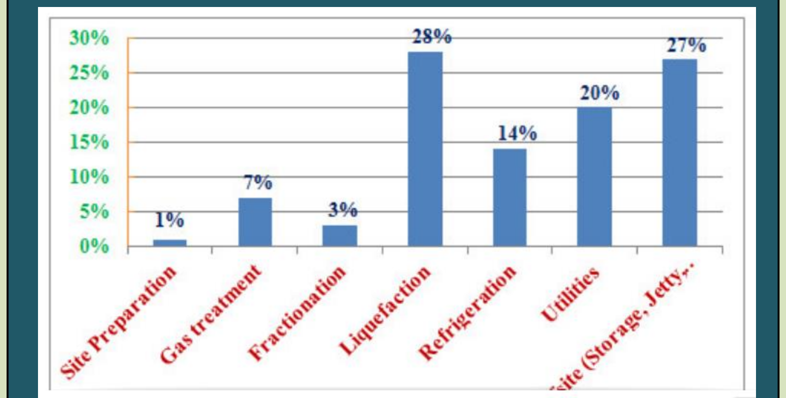
The 200 tpd base case LNG plant including pre-treatment, utilities and LNG storage tank features a required plot space of only approx.135 x 150m at the same time fulfilling all safety requirements.

Battery limit/interfaces:
- Civil (drainage, sewer system, roads)
- Piping (feed gas, utility water)
- Electrical power

2 hA

Basis of design, assumptions for codes & standards

Applied codes, standards and safety requirements (excerpt):
- "Installation and equipment for liquefied natural gas" EN 1473
- "Standard for the production, storage and handling of LNG" NFPA 59
- Design codes for pressure bearing parts and piping ASME, EN, GB
- E&I design codes IEC, ANSI, NEC , NEMA
- Structural materials EN, ASTM
- Process safety API, NFPA



As the investment decisions will be materialized in the near future, the fiscal and economic aspects of the LNG projects are coming to spotlight. Hence, the aim of this study is to provide an overview of global LNG project development costs which could then provide a benchmark for a specific LNG project in Canada. This article provides an insight into the process cycle for an LNG export facility followed by a high level assessment of the development costs for a complete LNG plant.

https://www.linkedin.com/pulse/overview-global-lng-plant-develepment-costs-reza-naghash-cpm-p-e-/

The demand for LNG in the beginning of new millennium in importing regions and the development of new supply source around the world allow LNG to compete in markets formerly dominated by pipeline gas. The rationale for liquefying natural gas is that at atmospheric pressure, the liquid density at normal boiling point of methane is approximately 610 times greater than that of the gas at ambient temperature and pressure. As a result, a given volume of liquefied natural gas contains over 600 times the heating value as the same volume of ambient gas. This density increase at ambient pressure makes it attractive to liquefy, transport and store natural gas in large quantities. Liquefaction and transport become economically feasible when the size of the reserves justify the capital investment of a baseload LNG plant. Storage applications include storage at LNG terminals, and storage for gas utility peak shaving operations. In recent years, LNG has also become a means of gas supply in remote parts of the world where the gas pipeline infrastructure is not well developed.

Gas production costs account for 15 – 20%, liquefaction costs are in the rage of 30 – 40%, shipping costs account for 10 – 30% and receiving costs are in the rage of 15 – 25%. All are based on the total LNG costs. In light of current LNG export development projects in Asia, Australia and USA, LNG global market could yield to sustainable hub prices (based on today's development costs) of US: 4.75 – $5.7/GJ; Europe: 9.5 – $10.5/GJ; and Asia: 11.4 - $12.4/GJ (to convert to $/MMBtu multiply by 1.05).

Today there are over 40 liquefaction plants worldwide producing about 300MM tonnes per annum (mtpa) and the production is expected to double around 600 mtpa by 2025. The largest trains are constructed in Qatar at the capacity of 8 mtpa although current and planned plants are typically in the range of 4 – 5 mtpa per train.

For the purpose of clarity, liquefaction plant refers to the complete facility to treat and liquefy the gas, store the produced LNG and export it via a jetty together with the required utility systems and other necessary infrastructure. A liquefaction train refers solely to the liquefaction process.

Most often the liquefaction plant cost is expressed as a metric cost of $US/tonne per annum ($/tpa). For instance, at the price of $US400/tpa, a 8 mtpa liquefaction plant will cost $US3.2B. Figure 1 shows the metric cost for LNG plants over the past 5 decades. The year stated is the start-up date. As a general role, from concept to production including 4 years of site construction, the liquefaction plants typically take 10 years to develop. The date in the Figure indicates that the metric cost for early plants in the period of 70's – 90's averaged $US600/tpa. The price decreased to an average of $US400/tpa in the period 1990 -2000 as the plants increase in size reflecting on economy of scale. However, from 2008 the metric cost increased dramatically to an average $US1200/tpa for projects executed in the period 2011 – 2015. Over the period 2000 to 2012, this represents a 300% increase in cost.

Rev	Description	Date	Name	Check
Rev-3				
Rev-2				
Rev-1				

Date	Drawn	Check	Appr.	Scale
MARCH 2019	O.Songur	O.Songur		NS

ENGINEERING ENERGY PETROLEUM INVESTMENT LTD

EEPI LLC

NATURAL GAS FACTS

PAKPAS ENGINEERING AND CONSTRUCTION LTD

REAN COMMODITY DMCC

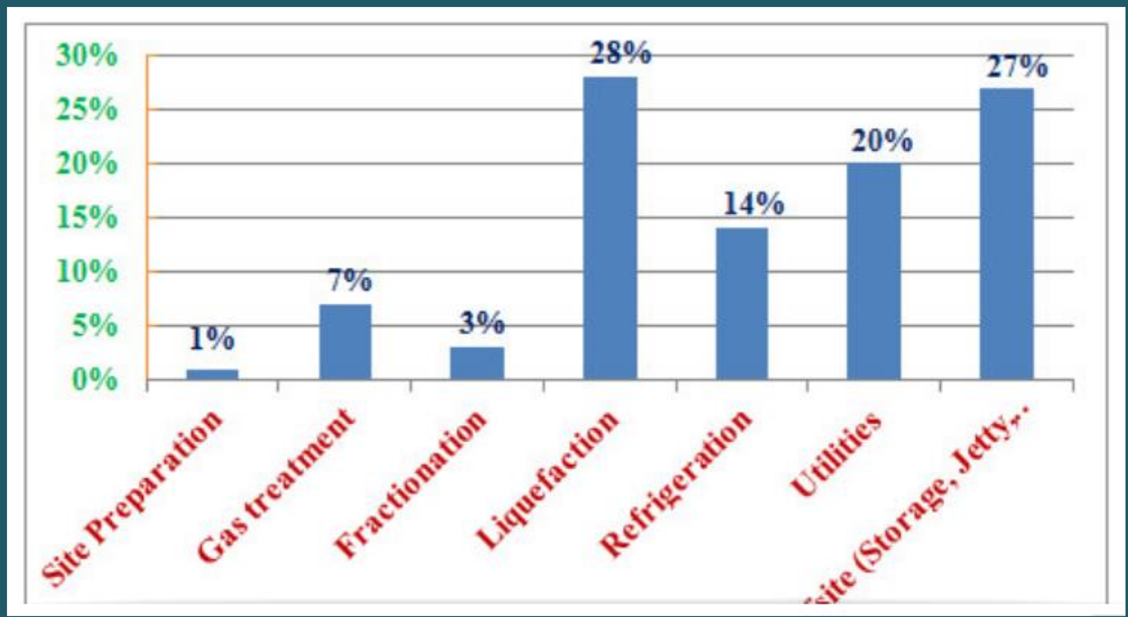
Job No	Page	Symbol	Unit No	Cat	Type+Format	Serial No	Rev
1715.75	1/1	DWG	00		UD	0100.26	6

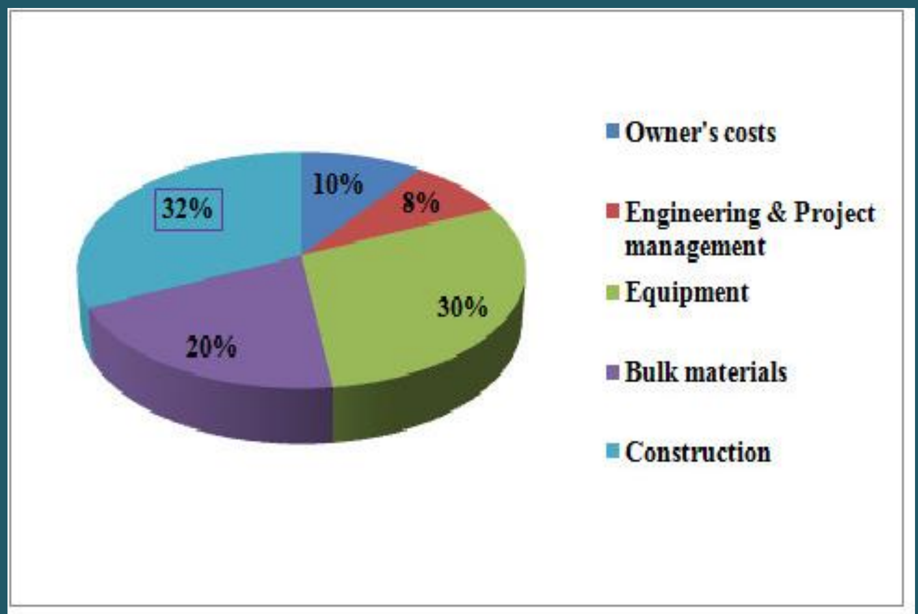
WORLD SCALE LNG PLANTS-200 TPD-70,000 TPA

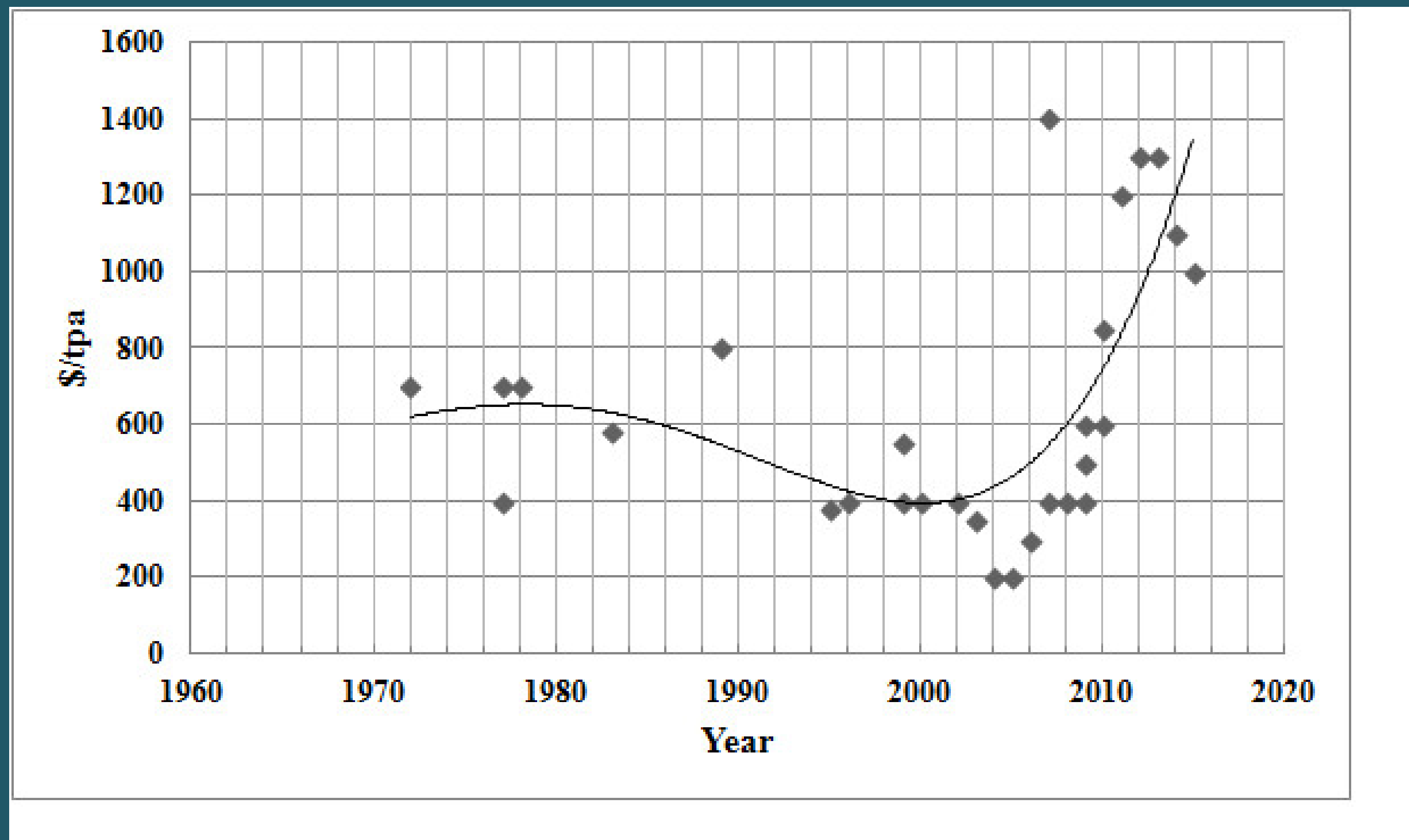
THE LINDE GROUP

Making our world more productive

Most often the liquefaction plant cost is expressed as a metric cost of $US/tonne per annum ($/tpa). For instance, at the price of $US400/tpa, a 8 mtpa liquefaction plant will cost $US3.2B. Figure 1 shows the metric cost for LNG plants over the past 5 decades. The year stated is the start-up date. As a general role, from concept to production including 4 years of site construction, the liquefaction plants typically take 10 years to develop. The date in the Figure indicates that the metric cost for early plants in the period of 70's – 90's averaged $US600/tpa. The price decreased to an average of $US400/tpa in the period 1990 -2000 as the plants increase in size reflecting on economy of scale. However, from 2008 the metric cost increased dramatically to an average $US1200/tpa for projects executed in the period 2011 – 2015. Over the period 2000 to 2012, this represents a 300% increase in cost.







Rev-3				
Rev-2				
Rev-1				
Rev	Description	Date	Name	Check
Date	Drawn	Check	Appr.	Scale
MARCH 2019	O.Songur	O.Songur		NS

EEPI LLC ENGINEERING ENERGY PETROLEUM INVESTMENT LTD

NATURAL GAS FACTS

PAKPAS ENGINEERING AND CONSTRUCTION LTD

REAN COMMODITY DMCC

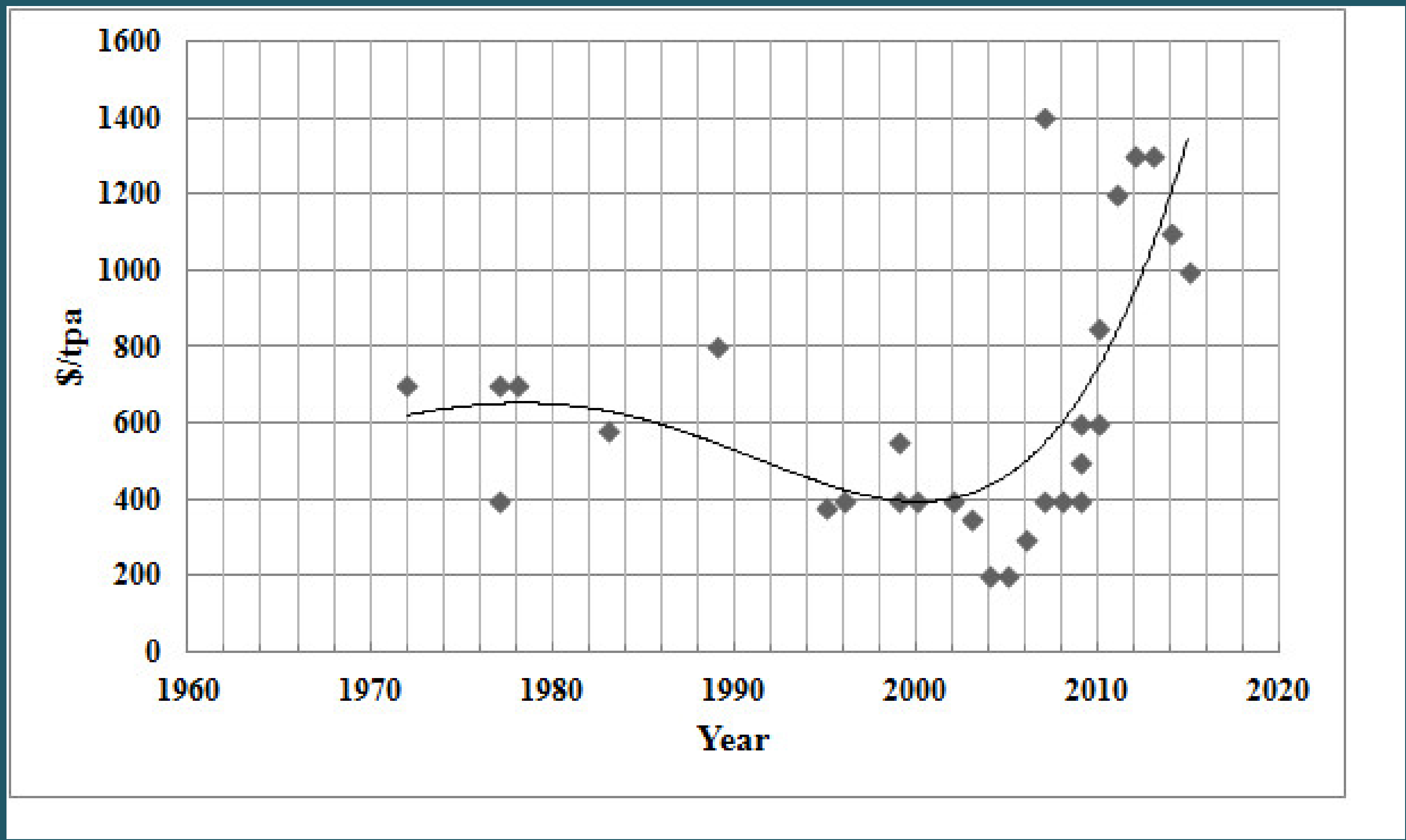
Job No	Page	Symbol	Unit No	Cat	Type+Format	Serial No	Rev
1715.75	1/1	DWG	00		UD	0100.27	6

WORLD SCALE LNG PLANTS-200 TPD-70,000 TPA

THE LINDE GROUP

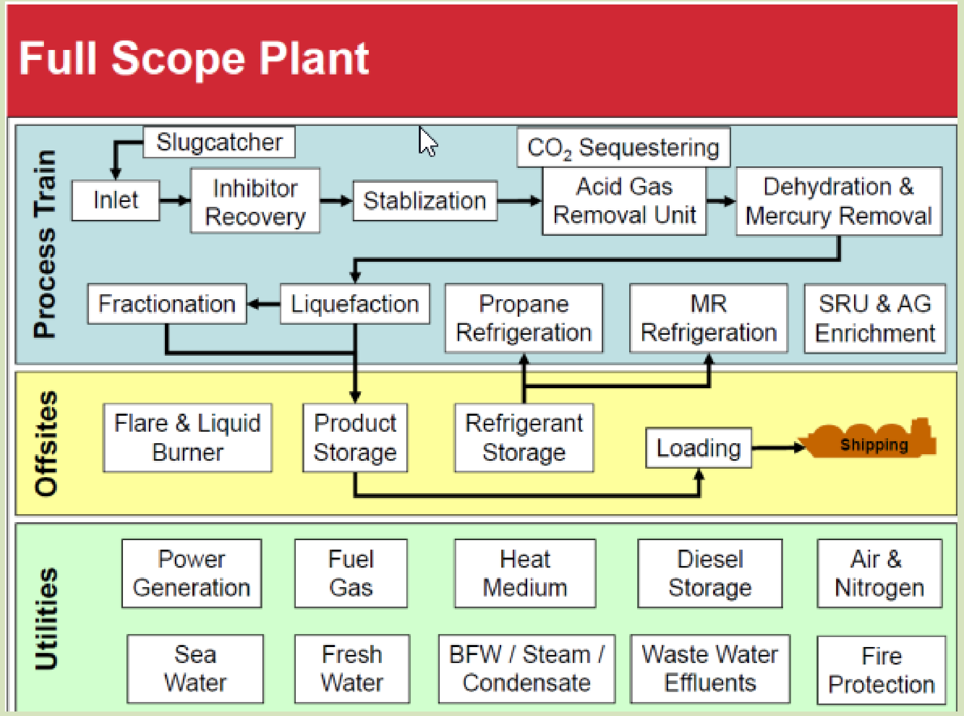
Making our world more productive

Linde



As stated earlier, liquefaction plants range from a simple liquefaction train added to an existing plant through to a complete new facility requiring all necessary infrastructure, including possibly an air strip, construction camp, township, roll-on/roll-off deck, breakwater and dredging. Some projects even include carbon capture and storage. Therefore, depending on project scope, the plant costs could be doubled or trebled for the same capacity and thus increase the metric cost dramatically.

The future of Canada's LNG mega projects is dependent on LNG market dynamics, such as demand and supply and overall global economy. As demand for energy will increase in the next decade and the time span for developing a complete LNG facility is between 6 to 10 years, Canadian LNG proponents must have a clear plan as to where they have to position themselves in global LNG markets. LNG plant metric costs are essentially driven by two factors: 1. the scope (liquefaction only or complete facility), 2. location where local costs are the major factor driver. Plant scope, as typically measured by equipment count, can increase by a factor 4 from a simple base liquefaction train to a complete facility including storage, utilities and export jetty.



Rev-3				
Rev-2				
Rev-1				
Rev	Description	Date	Name	Check
Date	Drawn	Check	Appr.	Scale
MARCH 2019	O.Songur	O.Songur		NS

ENGINEERING ENERGY PETROLEUM INVESTMENT LTD (EEPI LLC)

NATURAL GAS FACTS

PAKPAS ENGINEERING AND CONSTRUCTION LTD

REAN COMMODITY DMCC

Job No	Page	Symbol	Unit No	Cat	Type+Format	Serial No	Rev
1715.75	1/1	DWG	00		UD	0100.28	6

WORLD SCALE LNG PLANTS MAP-QATARGAS

QATARGAS

GLOBAL ENERGY SUPPLIER

SETTING HIGHER STANDARDS OF EXCELLENCE

Qatargas is a unique global energy operator in terms of size, service and reliability. The Company operates 14 Liquefied Natural Gas (LNG) trains with a total annual production capacity of 77 million tonnes. This makes Qatargas the largest LNG producer in the world. Established in 1984, Qatargas develops, produces, and markets hydrocarbons from the world's largest non-associated natural gas field. In addition to producing LNG, Qatargas is also a leading exporter of natural gas, helium, condensate and associated products. Today, Qatargas continues to set the benchmark in the LNG industry as it safely and reliably supplies energy to customers all over the world.

THE TRAINS

QATARGAS 1

Qatargas 1, established in 1984, consists of three trains, which, after a debottlenecking project in 2005, now produce approximately 10 million tonnes per annum (mtpa) of LNG. Twenty production wells have been drilled and completed to supply 1,600 million standard cubic feet (45 million cubic metres) of raw natural gas per day from the North Field, the largest single non-associated gas reservoir in the world.

The first shipment of LNG was delivered to Chubu Electric, our foundation customer, in January 1997.

Next Page

QATARGAS 2

The Qatargas 2 (QG2) project was the world's first fully integrated value chain LNG venture. It includes two world class LNG mega trains (Train 4 and Train 5) each with a capacity of 7.8 mtpa of LNG and 0.85 mtpa liquefied petroleum gas (LPG), condensate production of 90,000 barrels per day (bpd), a fleet of 14 Q-Flex and Q-Max ships and Europe's largest LNG receiving terminal, the South Hook LNG Terminal, in Milford Haven, Wales.

QG2 includes 30 offshore wells and three onshore injection wells for waste water disposal. There are three unmanned offshore platforms in Qatar's North Field which produce 2.9 billion cubic feet of gas per day. Total production is piped to shore via two wet-gas pipelines. The Liquefied Natural Gas is processed using Air Product's proprietary APX process technology. LNG production from Train 4 started in March 2009, while Train 5 became operational in September 2009.

As part of the expansion of Ras Laffan's capacity, QG2 also led to the construction of facilities for expanded LNG storage and loading, including five 145,000-cubic metre tanks and three LNG berths, a 12,000 tonne per day common sulphur system serving all Ras Laffan ventures, and an export pipeline and mooring buoy for loading condensate ships some 55 kilometres offshore.

Rev-3				
Rev-2				
Rev-1				
Rev	Description	Date	Name	Check
Date	Drawn	Check	Appr.	Scale
MARCH 2019	O.Songur	O.Songur		NS

ENGINEERING ENERGY PETROLEUM INVESTMENT LTD (EEPI LLC)

NATURAL GAS FACTS

PAKPAS ENGINEERING AND CONSTRUCTION LTD

REAN COMMODITY DMCC

Job No	Page	Symbol	Unit No	Cat	Type+Format	Serial No	Rev
1715.75	1/1	DWG	00		UD	0100.30	6

WORLD SCALE LNG PLANTS MAP

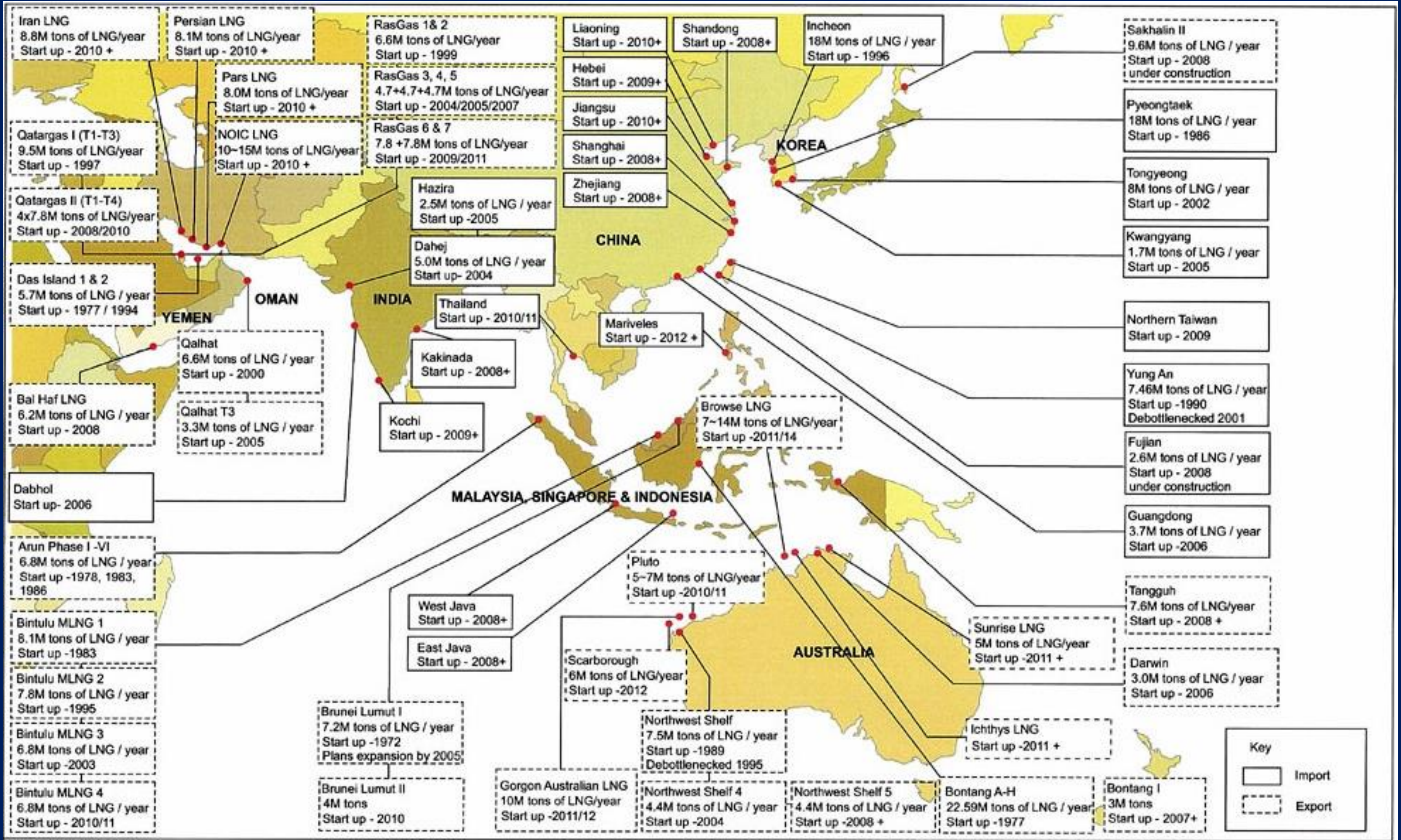
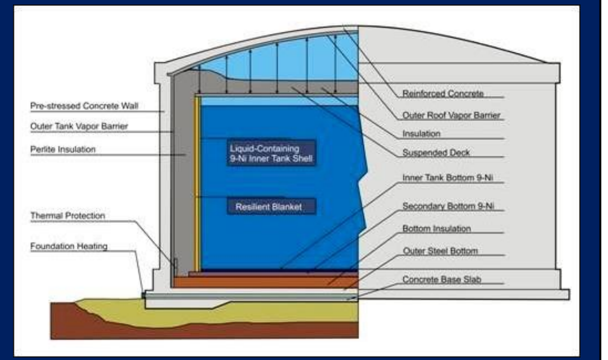


Figure 3.6

LNG TERMINALS AND SUPPLY PROJECTS (ASIA PACIFIC AND MIDDLE EAST)
(SOURCES: WORLD LNG MAP FEBRUARY 2006 EDITION. PETROLEUM ECONOMIST & THE GLOBAL LIQUEFIED NATURAL GAS MARKET : STATUS AND OUTLOOK. ENERGY INFORMATION ADMINISTRATION, US DEPARTMENT OF ENERGY. DECEMBER 2003 AND OTHER INDUSTRY SOURCES)

FILE: 0018180 eia_Docu-set2_94
DATE: 13/07/06

Environmental Resources Management
ERM



Rev-3				
Rev-2				
Rev-1				
Rev	Description	Date	Name	Check
Date	Drawn	Check	Appr.	Scale
MARCH 2019	O.Songur	O.Songur		NS

ENGINEERING ENERGY PETROLEUM INVESTMENT LTD
EEPI LLC

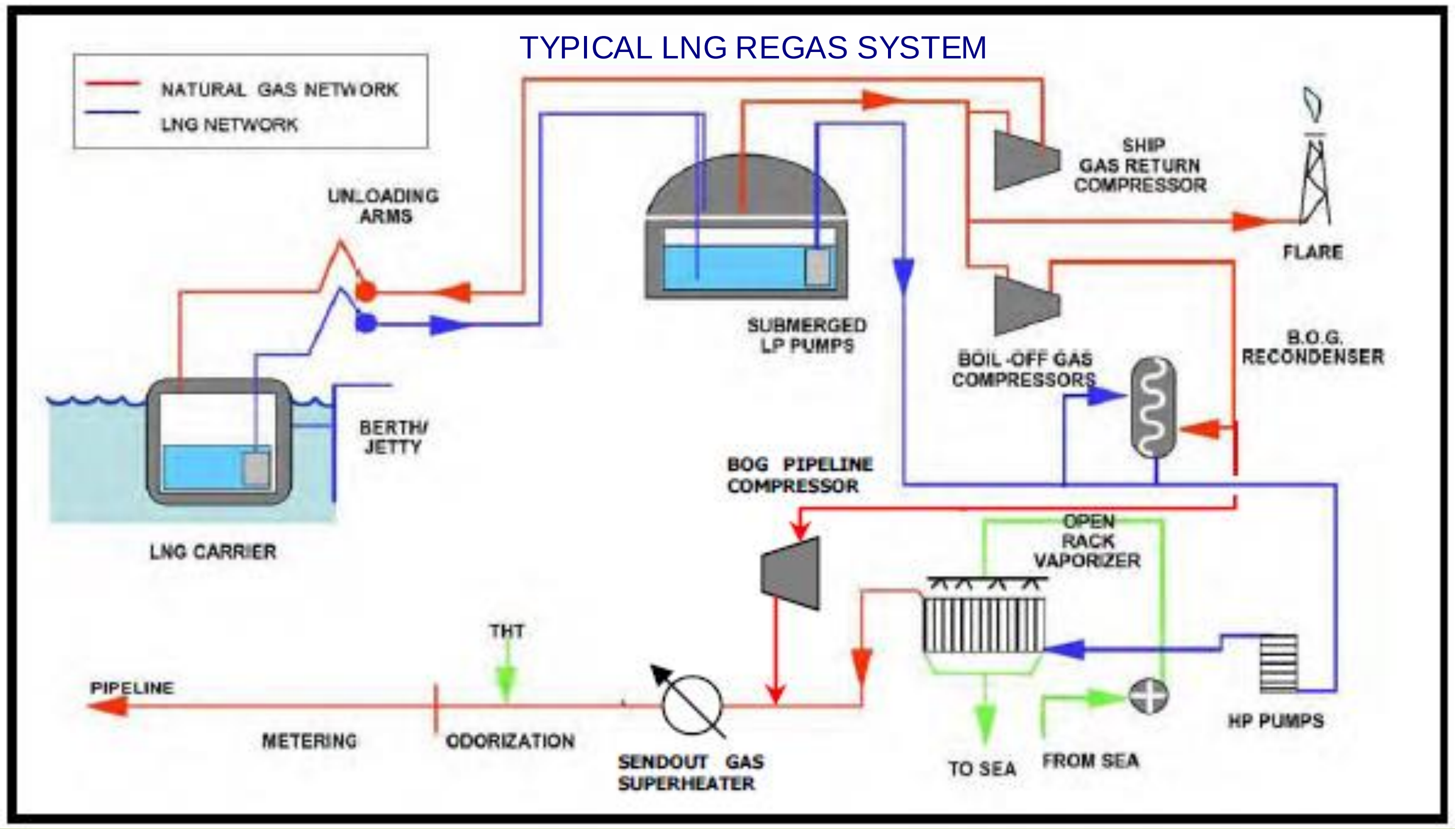
PAKPAS ENGINEERING AND CONSTRUCTION LTD

NATURAL GAS FACTS

REAN COMMODITY DMCC

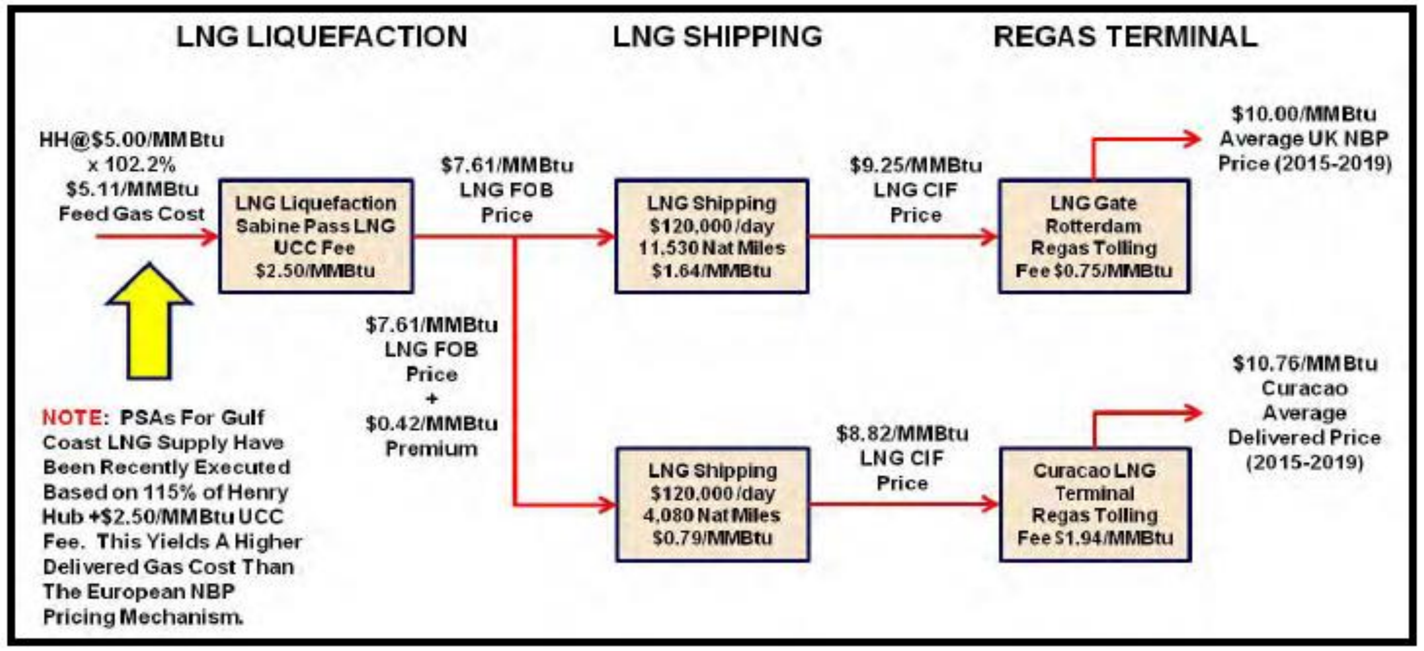
Job No	Page	Symbol	Unit No	Cat	Type+Format	Serial No	Rev
1715.75	1/1	DWG	00		UD	0100.29	6

SOME KEY FIGURES IN DECISION MAKING



Properties	Trinidad	Idku	Damietta	Nigeria	Nigeria	Nigeria	Malaysia	Oman	Qatar	Qatar (lean)
M.W.	16.82	16.55	16.39	17.44	17.64	17.51	18.05	18.20	18.24	17.02
LNG SpGr	0.44	0.43	0.43	0.45	0.45	0.45	0.46	0.47	0.46	--
NG SpGr	0.58	0.57	0.57	0.60	0.61	0.60	0.62	0.63	0.63	--
HHV	1056	1037	1028	1084	1095	1086	1114	1119	1127	1052
Wobbe	1385	1375	1367	1396	1402	1397	1410	1410	1420	--

LNG SUPPLY PROPERTIES



LNG PRICING MECHANISM

Rev	Description	Date	Name	Check
Rev-3				
Rev-2				
Rev-1				

Date	Drawn	Check	Appr.	Scale
MARCH 2019	O.Songur	O.Songur		NS

ENGINEERING ENERGY PETROLEUM INVESTMENT LTD

EEPI LLC

PAKPAS ENGINEERING AND CONSTRUCTION LTD

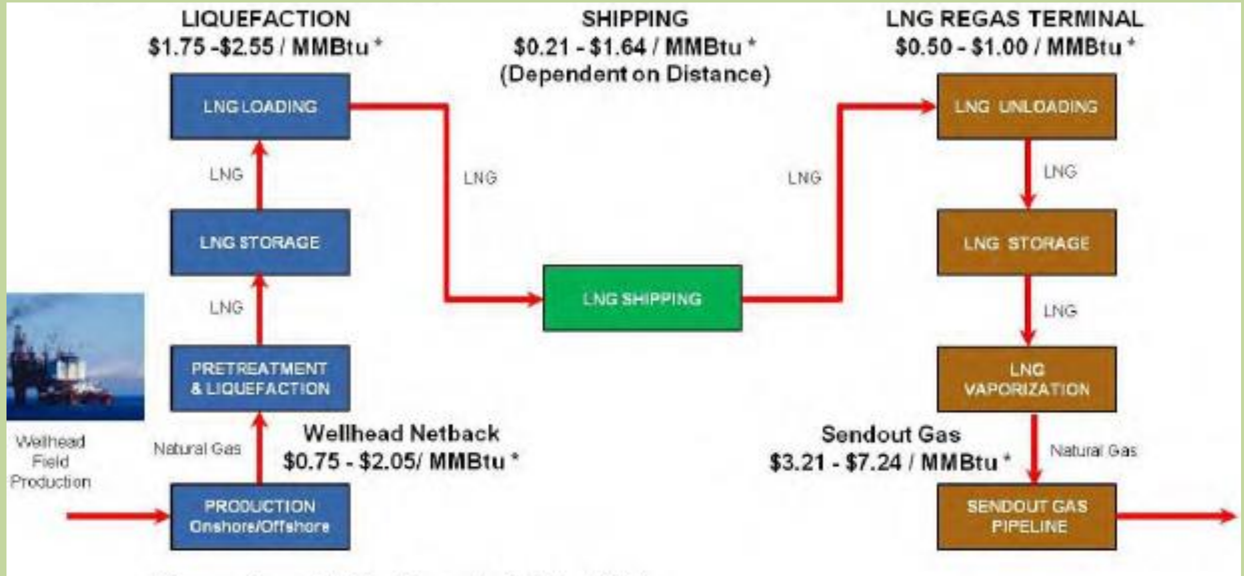
NATURAL GAS FACTS

REAN COMMODITY DMCC

Job No	Page	Symbol	Unit No	Cat	Type+Format	Serial No	Rev
1715.75	1/1	DWG	00		UD	0100.31	6

SOME KEY FIGURES IN DECISION MAKING

LNG PRICING MECHANISM



* Source: Drewry Maritime Research, Published 2011.

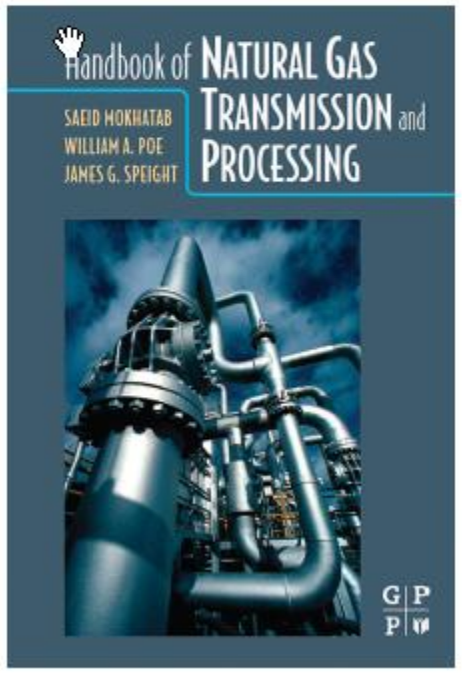
Natural gas and LNG	To Convert billion cubic metres NG	billion cubic feet NG	million tonnes oil equivalent	million tonnes LNG	trillion British thermal units	million barrels oil equivalent
From	------------ Multiply by ------------					
1 billion cubic metres NG	1	35.3	0.90	0.74	35.7	6.60
1 billion cubic feet NG	0.028	1	0.025	0.021	1.01	0.19
1 million tonnes oil equivalent	1.11	39.2	1	0.82	39.7	7.33
1 million tonnes LNG	1.36	48.0	1.22	1	48.6	8.97
1 trillion British thermal units	0.028	0.99	0.025	0.021	1	0.18
1 million barrels oil equivalent	0.15	5.35	0.14	0.11	5.41	1

SOME FEEDSTOCK COMPOSITIONS

PROPERTIES	Trinidad	Idku	Damietta	Nigeria	Oman	Algeria	Peru	Sabine Pass	DESIGN
Molecular Weight	16.82	16.55	16.39	17.44	18.20	18.34	17.55	16.51	16.67
LNG Density lb/ft^3	27.46	26.83	26.83	28.08	29.32	29.60	28.42	27.14	27.09
NG Sp.Gr.	0.58	0.57	0.57	0.60	0.63	0.63	0.61	0.57	0.57
HHV Btu/scf	1,056	1,037	1,028	1,084	1,119	1,110	1,083	1,027	1,044
Wobbe Index	1,385	1,375	1,367	1,396	1,410	1,396	1,391	1,360	1,376
COMPOSITION	Mole%	Mole%	Mole%	Mole%	Mole%	Mole%	Mole%	Mole%	Mole%
CO_2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
N_2	0.01	0.01	0.02	0.08	0.43	1.40	0.55	0.50	0.00
C_1	96.07	97.06	97.81	92.85	89.68	86.90	89.20	97.19	95.50
C_2	2.75	2.41	2.01	4.69	6.19	9.00	10.21	1.92	4.50
C_3	0.77	0.36	0.07	1.93	2.31	1.95	0.04	0.25	0.00
i-C_4	0.21	0.08	0.04	0.24	0.71	0.25	0.00	0.06	0.00
n-C_4	0.18	0.07	0.01	0.19	0.66	0.50	0.00	0.05	0.00
i-C_5	0.01	0.01	0.00	0.02	0.02	0.00	0.00	0.02	0.00
n-C_5	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.01	0.00
C_6^+	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Appendix 1: Conversion Table

Conversion Units	*Source: BP Statistical Review of U.S. Energy June 2002*					
Natural gas (NG) and LNG	**To:** 1 billion cubic meters NG	1 billion cubic feet NG	1 million tons oil equivalent	1 million tons LNG	1 trillion British thermal units (Btus)	1 million barrels oil equivalent (Boe)
From:	**Multiply by:**					
1 billion cubic meters NG	1	35.3	0.90	0.73	36	6.29
1 billion cubic feet NG	0.028	1	0.026	0.021	1.03	0.18
1 million tons oil equivalent	1.111	39.2	1	0.81	40.4	7.33
1 million tons LNG	1.38	48.7	1.23	1	52.0	8.68
1 trillion British thermal units (Btus)	0.028	0.98	0.025	0.02	1	0.17
1 million barrels oil equivalent (Boe)	0.16	5.61	0.14	0.12	5.8	1



672 PAGES

1 TON LNG=1,300 NM3 NG (GAS)

1 M3 LNG=0.450 TON LNG

Rev-3				
Rev-2				
Rev-1				
Rev	Description	Date	Name	Check
Date	Drawn	Check	Appr.	Scale
MARCH 2019	O.Songur	O.Songur		NS

ENGINEERING ENERGY PETROLEUM INVESTMENT LTD

EEPI LLC

NATURAL GAS FACTS

PAKPAS ENGINEERING AND CONSTRUCTION LTD

REAN COMMODITY DMCC

Job No	Page	Symbol	Unit No	Cat	Type+Format	Serial No	Rev
1715.75	1/1	DWG	00		UD	0100.32	6

SOME KEY FIGURES IN DECISION MAKING

LNG

VOLUME REDUCES 600 TIMES

NATURAL GAS (NG)

1,000 M3

70 USD2018

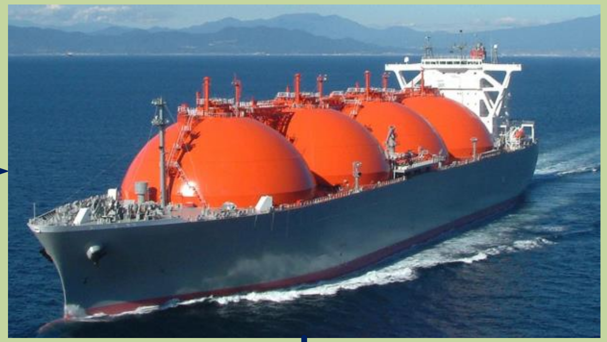
PIPE LINE

LIQUID NATURAL GAS (LNG)

450 TON-23350 MMBTU

1,000 MTON LNG=51,900 MM BTU

LNG TRANSPORT



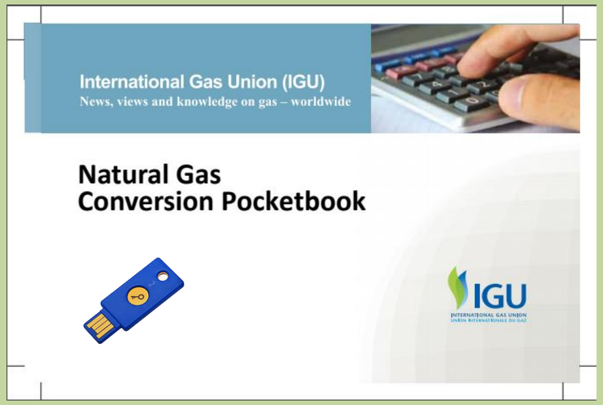
	2014	2015	2016	2017	2018
RUB/1,000 m³	3,506.5	3,641.3	3,815.5	3,808.3	3,981.3
USD/1,000 m³	90.8	59.4	57.1	65.3	63.3
EUR/1,000 m³	68.8	53.6	51.6	57.7	53.7

https://www.gazprom.com/about/marketing/russia/

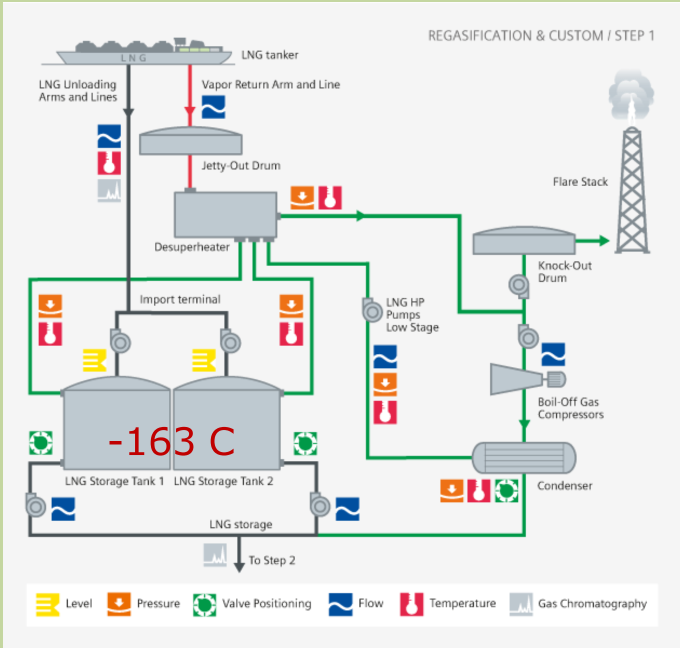
multiply by

	Tonnes LNG	m³ LNG	Nm³ gas	ft³ gas	mmBtu	boe
Tonnes LNG		2.222	1,300	45,909	53.38	9.203
m³ LNG	0.450		585	20,659	24.02	4.141
m³ gas	7.692×10^{-4}	0.0017		35.31	0.0411	0.0071
ft³ gas	2.178×10^{-5}	4.8×10^{-5}	0.0283		0.0012	2.005×10^{-4}
mmBtu	0.0187	0.0416	24.36	860.1		0.1724
boe	0.1087	0.2415	141.3	4,989	5.8	

For LNG
- 1 tonne LNG = 1,300 Nm³ gas [*N: Normal. Normal means "(0 ºC, 1 atm)"];
- Density = 450 kg/m³ LNG



RE-GASIFICATION



https://www.2b1stconsulting.com/regasification/

PIPE LINE

1 TON LNG=1,300 NM3 NG (GAS)

1 M3 LNG=0.450 TON LNG

Rev-3				
Rev-2				
Rev-1				
Rev	Description	Date	Name	Check
Date	Drawn	Check	Appr.	Scale
MARCH 2019	O.Songur	O.Songur		NS

ENGINEERING ENERGY PETROLEUM INVESTMENT LTD

EEPI LLC

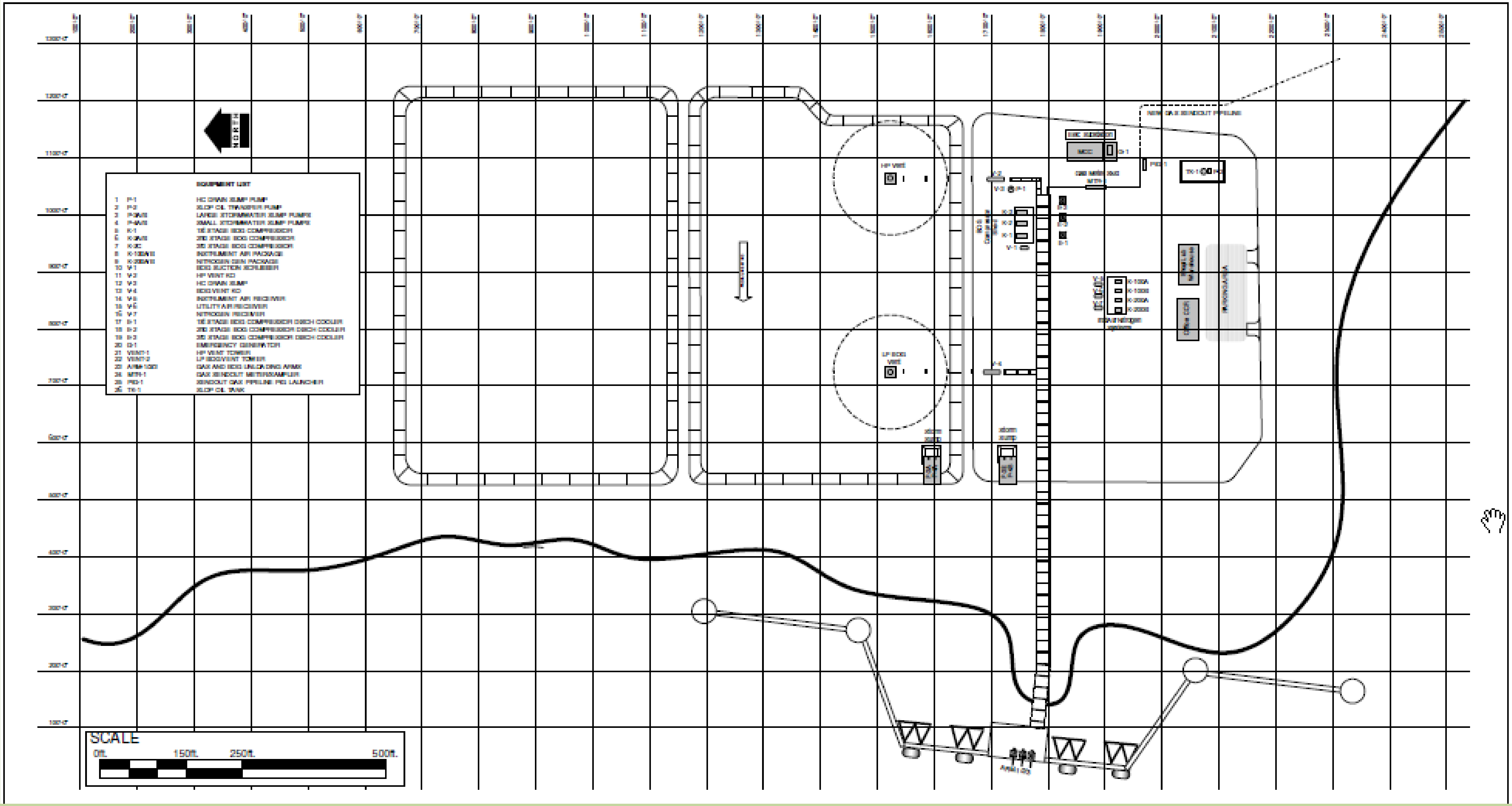
NATURAL GAS FACTS

PAKPAS ENGINEERING AND CONSTRUCTION LTD

REAN COMMODITY DMCC

Job No	Page	Symbol	Unit No	Cat	Type+Format	Serial No	Rev
1715.75	1/1	DWG	00		UD	0100.33	6

LNG PLANT TYPICAL LAYOUT PLAN



Rev-3				
Rev-2				
Rev-1				
Rev	Description	Date	Name	Check
Date	Drawn	Check	Appr.	Scale
MARCH 2019	O.Songur	O.Songur		NS

ENGINEERING ENERGY PETROLEUM INVESTMENT LTD

EEPI LLC

NATURAL GAS FACTS

PAKPAS ENGINEERING AND CONSTRUCTION LTD

REAN COMMODITY DMCC

Job No	Page	Symbol	Unit No	Cat	Type+Format	Serial No	Rev
1715.75	1/1	DWG	00		UD	0100.33	6