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Long-Term Contracts in the Natural Gas Industry – Literature Survey and Data on 426 Contracts (1965-2014)

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Data Documentation 77

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Long-Term Contracts in the Natural Gas Industry – Literature Survey and Data on 426 Contracts (1965-2014) [4]

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[4] This Data Documentation is the fruit of a decade of work, started at the German Institute for Economic Research (DIW Berlin), continued at the Chair of Energy Economics & Public Sector Management at Dresden University of Technology (TU Dresden), and completed – as it stands now – after returning to DIW Berlin. The Data Documentation accompanies a Special Issue of the Review of Environmental and Energy Policy (REEP) on natural gas; see Neumann and von Hirschhausen (2015). We thank colleagues and friends for numerous discussions at conferences and elsewhere on the various issue related to natural gas contracts, in particular Peter Hartley, Jim Jensen, Jeff Makholm, Karsten Neuhoff, and Jonathan Stern. Special thanks to Franziska Holz who always kept her eyes open and significantly contributed to the collection. The usual disclaimer applies.

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Abstract

Long-term contracts are an important element of all economic activity and, thus, critical for understanding modern economic structures. The natural gas industry provides particular insights into the functioning and dynamics of long-term contracts and industry structures, in a sector that is globally important. This Data Documentation provides a survey of the literature on long-term contracts in the natural gas sector, as seen from an institutional and industrial economics perspective; we also add suggestions for further research. The core of the documentation is a detailed database of 426 long-term contracts struck between sellers and buyers between 1965 and 2014. Though not comprehensive, the database covers a large share of contracts, both for pipeline gas and liquefied natural gas (LNG).

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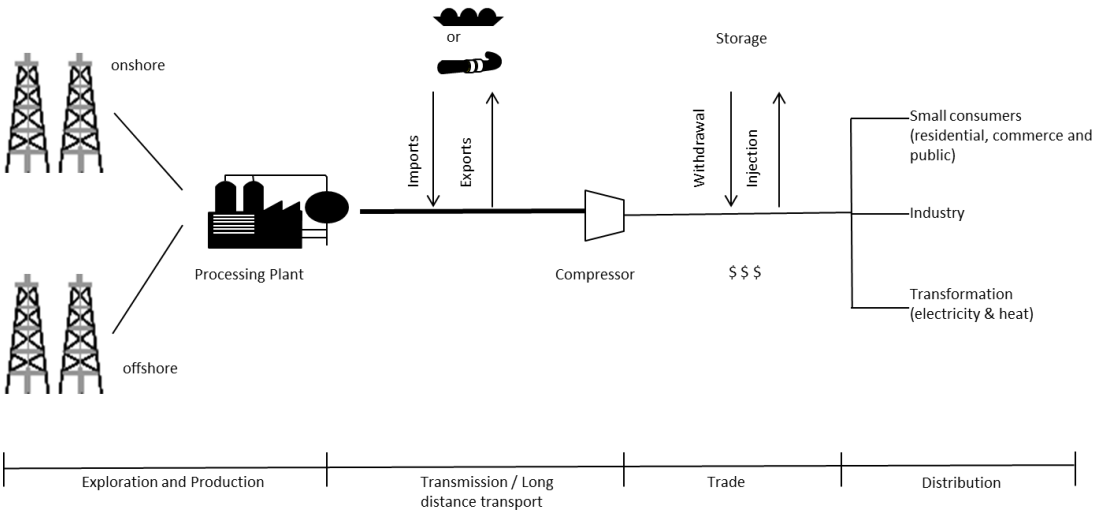
List of Abbreviations

bcm	billion cubic meter
bcm/a	billion cubic meter per year
FERC	Federal Energy Regulatory Commission
IEA	International Energy Agency
LNG	liquefied natural gas
mtpa	million tons of LNG per year
UK	United Kingdom
US	United States of America

1 Introduction

The natural gas industry spans a broad field of activities, from exploration and production, to transportation at various stages (e.g. high-pressure and low-pressure pipeline transportation, or shipping in the form of liquefied natural gas (LNG)), trading, storage and the final distribution to end customers (see Figure 1). The industry emerged with the diffusion of natural gas burning applications in heating, electrification, the transportation sector, and other non-energy activities, including the fertilizer industry. Previously considered as the "younger brother" (or: sister) of the electric power companies, or even the oil industry, the natural gas industry has evolved into a sector of its own following World War II.[5]

Figure 1: The natural gas value added chain



Source: Own depiction

Natural gas has several characteristics that make it an attractive fuel: it can be used in different sectors and for various applications, it is easy to manage, transport and store, while having the lowest CO_2-intensity among all fossil fuels.[6] The low carbon intensity also makes natural gas a preferred fuel to address the transition to low-carbon economies aimed for in many countries around the world (see also Neumann and von Hirschhausen, 2015). The International Energy Agency (IEA, 2012) even heralded the "golden age of natural gas"; Holz et al. (2015) provide a survey of the literature on the global perspectives of natural gas.

[5] This introductory chapter builds on Neumann and von Hirschhausen (2015).

[6] The CO_2-intensity of burning natural gas is significantly below that of coal, its main competitor in electrification: for one kWh of electricity, natural gas will produce (depending on the technology, the thermal efficiency and other technical and operational parameters) about 350 g of CO_2, whereas hard coal produces more than double this amount, and lignite-based power plants emit more than 1 kg CO_2/kWh (DEHST, 2007, Emissionsfaktoren und Kohlenstoffgehalte. Umweltbundesamt, Berlin.).

Contractual relationships and the structure of vertical coordination along the value added chain have always played an important role in the sector, shaping both industrial strategy and national policies vis-à-vis the industry until today. In particular, the degree of coordination between highly capital-intensive exploration and production on the one hand, with large-scale consumers and traders on the other, is a critical issue that has attracted a sizeable amount of interest from industrial and institutional economics.

The objective of this Data Documentation on "Long-term Contracts in the Natural Gas Industry" is to provide a comprehensive set of long-term natural gas supply contracts – covering both deliveries via pipeline and in the form of LNG – and their characteristics to the research community as well as to stakeholders in industry and policy.[7] This Data Documentation provides a detailed account of a large number of long-term contracts concluded between suppliers and buyers from the early years of this industry in the 1960s through 2015. In addition to the descriptive presentation of the database and the different data sources, we also provide some simple empirical statistics; in particular, we analyze the contract structure, differences between pipeline and LNG contracts, and also some country-specific effects. The Data Documentation should, therefore, be of use for academic research investigating the changing nature of international natural gas trading, as well as for industry analysts and policy makers interested in the underlying contract structures. By making this database publicly available, it is hoped that further in-depth research and conversations about this exciting topic is fostered.

This Data Documentation is structured as follows. Section 2 summarizes the literature on industry structures and long-term supply contracts in the natural gas sector, which inspired the idea to establish a database on this issue. We review not just the institutional economic analyses based on the transaction cost framework and incomplete contracting theories, but also the more traditional industrial organization literature on long-term versus short term trading. Section 3 introduces the structure of the database, describing the variables used and main sources of data. It also shows some descriptive statistics to illustrate possible applications of the database. Section 4 concludes. The Annex contains the printout of an Excel-sheet with the 426 contracts available as of 2015.

2 Industry Structure and the Nature of Long-Term Contracts

Long-term contracts are the cornerstone of all capital-intensive sectors with a high level of upfront investments. Conceptually, long-term contracts are one of the multiple forms of vertical coordination, one extreme form being short-term trading on anonymous spot markets (i.e. no cooperation) and the other extreme being full vertical cooperation (i.e. vertical integration of activities into one firm). This Data

[7] Another database of such contracts that we are aware of is hosted by the European Commission, but it is not publicly available.

Documentation mainly covers contracts struck between the producers and exporters of natural gas, on the one hand, with large-scale importers (e.g. industry, utilities) on the other. We do not consider transport activities for high- and low pressure pipeline transportation as these are mostly regulated.

The topic of long-term contracts excites both practitioners and academics, due to the crucial importance that these contracts have played (and continue to play) both in stabilizing the industry and in finding appropriate measures to maintain or increase competition at different levels. From an academic perspective, the sector lends itself naturally to theoretical and empirical analyses of institutional economics (Section 2.1) and industrial organization (Section 2.2).

2.1 Institutional economics literature

The institutional economics literature interprets long-term contracts as a device to avoid the risk of opportunistic behavior in transactions that involve high sunk investments. Thereby, considerations about the "best" form of organizing an industry go back to the seminal work of Ronald Coase (1937) on the "nature of the firm", asking for the determinants of "markets" vs. "coordinated hierarchies", i.e. firms and other forms of vertical coordination. Coase criticizes the simplified view of an economy assumed by most researchers before the first half of the 20th century, arguing instead that the "main reason why it is profitable to establish a firm would seem to be that there is a cost of using the price mechanism" (p. 389).

The work was followed by, amongst others, Oliver Williamson (1975, 1985, etc.) on "markets and hierarchies", and the determinants of the degree of coordination along the value added chain of an industry. Williamson operationalized transaction cost economics emphasizing the economic actors' behavioral characteristics and different transaction attributes. In this vein, the presence of relationship-specific investments transforms an exchange relationship from *ex-ante* competition, where the identity of the trading partners is irrelevant, to an *ex-post* bilateral dependency. Thus, Williamson identifies "asset specificity", i.e. the degree of rent creation in the process of specific investments, as a major determinant of the organizational structure, with higher asset specificity in uncertain environments implying a higher need for vertical coordination and, consequently, more hierarchical contract structures as opposed to market exchange.[8] At about the same time, Klein, Crawford, and Alchian (1978) noted that the challenge of appropriating quasi-rents in the process of idiosyncratic investments could be resolved by either vertical integration, or - long-term contracts.

[8] Jean Tirole's (1988) book on industrial economics contains a concise summary of this argument.

It is no coincidence that the natural gas industry was chosen by several institutional economists to test recent theories of the firm. High upfront investment costs along the whole value added chain and the irreversibility of such investments create the potential risk of hold-up and explain why this industry, to a large extent, relies on bilateral long-term contracts. Masten and Crocker (1985) and Crocker and Masten (1988) were among the first to develop theoretical models applied to the natural gas industry and to subsequently test some of these empirically. Their characterization of "take-or-pay" contracts suggested long-term contracts as an efficient device to share the inherent risks between natural gas sellers and buyers. Price indexation, typically to oil products, gave buyers long-term protection against prices exceeding those of the main competing fuels. Thus, the price risk was transferred to the seller, and the buyer took on the full quantity risk.

Mulherin (1986) tested contractual provisions in long-term natural gas contracts and contended that these were not an expression of market power, but rather resulted from attempts to find an inherent bargaining structure. Exclusive dealing and take-or-pay provisions served as means to protect persisting quasi-rents and to prevent opportunistic behavior. In a similar vein, Bolle (1989) pointed out that typical take-or-pay contracts were superior to contracts on the basis of marginal costs in static and dynamic efficiency as they reduced the moral-hazard options on both the demand and supply sides.

Hubbard and Weiner (1986) developed a theoretical model of contracting, emphasizing the determination of price and minimum-purchase provisions. They showed that wellhead price ceilings favored long-term contracts between producers and pipelines that include non-price contract provisions increasing the producers' total compensation. Masten and Crocker (1991) investigated the choice of alternative price adaptation clauses with the economic trade-off between flexibility and contractual completeness. Whereas the presence of uncertainty should favor renegotiation, the presence of high quasi-rents should support redetermination clauses based on pricing formulas that reduce the frequency of negotiations and therewith the hazard of opportunistic haggling. Using a detailed case study on a large LNG export project, Dailami and Hauswald (2000) confirmed the crucial role of specific contract design for assuring long-term investment and the efficient distribution of risks. They analyze risk shifting as a consequence of contractual incompleteness and relate its sources to the price of risky debt in the context of project finance.

A specificity of the early years of the industry was that all jurisdictions around the world treated natural gas as a regulated, and in most cases monopolistic industry; even the United States. Therefore, long-term contracts were not only a device to share risks, but also an instrument to secure monopolistic rents. This led to pricing schemes that were far from (hypothetical) "competitive" prices, e.g. cost-plus

regimes or – in most cases – oil-price indexed contracts. The latter pegged the natural gas price to a lagged oil price, and thus extracted the same willingness-to-pay from consumers as for the main competing fuel, oil. The Energy Charter Secretariat (2007) provides an in-depth description of these contracts.

A new age of sectoral structures and of the corresponding research began with the restructuring of the sector. This process started in the US with the Natural Gas Policy Act (NGPA) of 1978, which provided for phased deregulation. Then, several FERC Orders forced the industry to unbundle the services of natural gas transportation, and to create competition in the upstream production market segment. A similar transformation was triggered in the UK in the late 1980s, which the European Union followed in 1998 with its first Natural Gas Directive in 1998 (see Neumann, 2009, and Makholm, 2012, 2015 for surveys). In parallel, technical innovation, regulatory reform, and reduced (relative) costs of transportation, contributed to trading of natural gas in the form of LNG over larger geographic areas, i.e. between the three previously segmented markets of North America, Europe, and Asia. This development opened new long-term contracting possibilities, described first comprehensively by Jensen (2004). Many observers, including the authors of this Data Documentation, considered the "globalization of natural gas markets" as a natural development toward fully competitive markets, implying the phasing out of conventional long-term contracts.

The corresponding "new generation" of the literature brought forward theoretical, empirical, and institutional interpretations. Doane and Spulber (1994) showed that changes in the regulatory framework toward increased competition, decreases transaction costs, thereby enhancing spot trade. Based on Williamson's transaction cost framework, Creti and Villeneuve (2004) discussed the economic fundamentals of EU provisions on long-term contracts in the natural gas industry. They argued that uncertainty about future demand and supply conditions, as well as the frequency of recurring transactions, were also important motivations for underlying long-term contracting. Brito and Hartley (2007) and Hartley (2015) discuss the effect of the changing regulatory framework on the equilibrium market structure, focusing on the particularly dynamic LNG market segment. Both papers suggest that long-term contracting is (inversely) affected by growing spot market liquidity, as LNG producers find it easier, and in many cases more profitable, to engage in short-term contracting or spot market trading. In particular, in his 2015 contribution, Hartley defines a self-reinforcing circle from increased LNG market liquidity to greater volume and destination flexibility in contracts, to increased short-term and spot market trades, and – to round the circle – to reinforced initial increases in market liquidity.

The corresponding empirical literature is based on the interpretation of data on long-term contracts, amongst others the body of data leading up to this Data Documentation. Neumann and von Hirschhausen (2004) was the first attempt to explain the main characteristics and changing nature of long-term contracts in times of changing technical, economic and institutional conditions through econometric analysis. The authors found that contract length of take-or-pay natural gas supply contracts to Europe had significantly decreased and that also the country of origin of the commodity affected contract duration. In a follow-up paper, von Hirschhausen and Neumann (2008) observe an inverse relation between contract length and the deliveries to the restructured markets of the US and the UK, post-1998 restructuring in Europe, and contracts not linked to substantial new investment.

Ruester (2009) focused on long-term LNG contracts, investigating the impact of market structure on optimal governance choice. She argued that contract duration was determined by the trade-off between the minimization of transaction costs due to repeated bilateral bargaining and the risk of being bound in an inflexible agreement in uncertain environments. She further found a negative effect on contract duration of three variables representing repeated interaction between the contracting parties, i.e. the number of contract (re-) negotiations, the number of years of the contract, and the extension of previously struck contracts. Ruester (2015) contributes a qualitative and quantitative analysis of the determinants of the debt ratio in LNG project finance, arguing that lenders will make their decision on how much to lend dependent on the risk profile of the project, with a project's off-take agreements serving as a security for financial contracts.

2.2 Industrial economics literature

The traditional literature on industrial economics considers long-term contracts as one of the several time horizons over which a resource producer can optimize her contract portfolio. Several classic papers in this research stream address the issue in its relation to market structure, i.e. whether long-term contracting favors competition or collusion. Where most literature on forward contracting was developed within the framework of perfect competition, Newbery (1984) had already illustrated that commodity trading typically occurs in an environment far from competitive.

Allaz and Vila (1993) derived a rationale for the use of forward markets even in case of certainty and perfect foresight. They suggest that the presence of a forward market will make the spot markets more competitive. Consumers benefit from long-term contracting, because at each contracting stage producers sell additional output. The smaller the quantity that producers subsequently sell at the spot market, the lower will be their incentive to reduce production. The resulting lower price is anticipated in all pre-

vious contracting stages. With the number of forward trading periods approaching infinity, the outcome will converge to the competitive solution.

More recently, some authors have suggested ways in which forward markets could be used to decrease the competitiveness of spot markets. Moving to collusive behavior, Le Coq (2004) showed that in a setting of long-term contracts, but with subsequent repeated interaction on the spot market, the contract market helps sustain collusion on the spot market. Green and Le Coq (2010) investigated how the length of forward contracts affects the risk of collusion in a repeated price-setting game. They suggest that contracts can both help and hinder collusion, because they reduce the size of the spot market, cutting both the immediate gain from defection and the punishment for deviation. Along similar lines, Liski and Montero (2006) found – contrary to the pro-competitive results of finite-horizon models – that in an infinitely-repeated oligopoly game, the possibility of forward trading allows firms to sustain collusive profits that otherwise would not be possible.

Several studies apply theories derived from industrial economics to the natural gas sector. Using an auction model, Parsons (1989) was the first to quantify the "strategic" value of long-term contracts in markets with large-scale upfront investments, i.e. the difference between the value of the commodity in the long-term contract and the sales price in a more competitive market. Applying the model to long-term contracts in Russia, Norway, and Canada, Parsons showed that the value of these contracts to the producer diminishes as the number of wholesale buyers increases, an event typical for a liberalizing natural gas sector. Along similar lines, Hartley and Brito (2002) applied a search model to derive that the duration of long-term (in this case LNG) contracts is likely to diminish with decreasing capital expenditures, with an increasing discount rate, declining transport costs, and a larger number of players in the market (suppliers and buyers).

Polo and Scarpa (2013) analyzed obstacles to retail competition in natural gas markets characterized by vertical integration among wholesalers (buying natural gas from producers under take-or-pay contracts) and retailers. They find that in the absence of functioning wholesale trade, retail competition suffers, thus concluding that the creation of a compulsory wholesale market can promote entry and retail competition even if wholesale and retail activities are not separated.

Neuhoff and Hirschhausen (2005) analyze the economics of long-term gas contracts under changing institutional conditions, i.e. natural gas sector restructuring. In contrast to Allaz and Vila (1993), whose model is based on the inherent assumption that long- and short-term demand elasticities coincide, the authors show that if the long-run demand elasticity is significantly higher than the short-run elasticity, natural gas producers prefer an institutional arrangement that allows for long-term contracting. As long-

term contracts promise lower prices, consumers will place more investment in gas consuming equipment and may switch to gas as a fuel, which in turn expands the market, and thus, also reflects long-term profits for producers.

2.3 Research outlook for the empirics of contracts

First, as empirical studies on long-term contracts in the natural gas industry are rather scarce, future research can still substantially contribute to the existing body of literature: Valuable insights would, for instance, originate from studies investigating the impact of increasingly competitive downstream markets on the optimal contract portfolio, combining long-term supply agreements of particular length and coverage on the one hand with mid- and short-term agreements as well as trade on liquid wholesale markets on the other. Another field of interesting research is the increasingly globalizing natural gas market (suppliers from the Middle East, for instance, deliver natural gas to all importing regions, i.e. to Europe, to Asia and to North and Central America). Thus, analyses of not just the impact of this linkage of formerly isolated markets on contracting practices of suppliers and buyers, but also on the structure of contracts themselves (e.g. changes in contract flexibility, price indexation, etc.) offer promising research areas.

Moreover, we observe adaptations in corporate strategies along the LNG value added chain. In this vein, Ruester and Neumann (2009) already suggested that alternative target market positions in the emerging global market for LNG were supported by respective underlying resource profiles and that the three strategic decisions on target market position, resource profile, and organizational structure are interdependent.[9] Ruester (2010) further argues that inter-organizational trust changes the relative costs of vertical integration and non-integration, which supports less hierarchical governance forms. Future research, thus, can improve the understanding of the impact of changing investment conditions and the changing institutional environment on the choice of more or less coordinated governance along the value added chain.

Second, combining this database with additional sources of information would allow for more sophisticated empirical analyses:

- *Endogeneity of right-hand-side variables:* Variables affecting contractual design often are themselves endogenous variables. This concerns e.g. the level of relationship-specific investments, the

[9] The authors showed that national oil and gas companies rely on less idiosyncratic assets than companies following a flexibility strategy (i.e. those investing in a portfolio of export and import positions) and that the last again rely on less idiosyncratic assets than chain optimizers (i.e. those investing along a single value added chain). Moreover, relationship-specific investments in uncertain environments have been found to have a positive impact on the likelihood of vertical integration.

contracted volume in long-term supply agreements, or contractual completeness. These variables are chosen simultaneously with and dependent on the governance form. However, as already pointed out by Masten and Saussier (2000), the "binding constraint here is not technique but data availability" (p. 232). Adequate instrumental variables are difficult to identify and researchers often lack access to written contracts, meaning that they have no information on contractual provisions such as price adaptation or renegotiation clauses. Thus, endogeneity of right-hand-side variables is a serious problem in econometric studies, which future research should address.

- *Self-selection into certain degree of vertical coordination*: The majority of empirical tests is based on reduced-form models where the probability of observing a certain form of vertical coordination (e.g. vertical integration, or long-term contracting) depends on transaction attributes, i.e., asset specificity, uncertainty, transaction frequency. Such studies, however, "establish correlations, not causal relations" (Klein, 2004, p. 25); they leave open the question of the costs misalignment. Managers, however, make strategic decisions not randomly but rather decide based on their expectation on how these choices affect future performance and self-select into the strategy where they expect a competitive advantage. The availability of additional data on firm performance under a specific governance choice would allow correcting for such self-selection bias by applying two-stage Heckman models.
- *Self-selection into certain financing model*: Similarly, it might be argued that the choice of a certain financing model for large-scale infrastructures (e.g. project finance vs. traditional corporate finance) is a strategic corporate decision, and that value creation will depend on such managerial decisions. Studies accounting for such self-selection could substantially improve the understanding of interactions among asset characteristics, business relationships and the web of contractual arrangements, including long-term supply contracts, surrounding a firm.

3 Structure of the Database and Descriptive Statistics

3.1 Structure of the database

Our *global database* (see Annex A-1 for detailed information on all contracts covered by this Data Documentation) covers long-term contracts from the early years of the industry in the 1960s through 2014, connecting producers/sellers with buyers/importers of natural gas. The database covers both pipeline and LNG deliveries. A long-term contract thereby is understood as a contract covering a time period of *five years or more*.

The database includes information on contracting parties (i.e. companies associated to a specific export or import country for the respective contract), annual and total contracted volumes (in billion cubic meters per year, or bcm),[10] the year the contract was signed, the start date of deliveries, as well as contract duration. In cases where only information about the date of contract signature was available, we assumed the start date of physical deliveries two years later. In cases where only yearly volumes were available, we calculated the total contracted volume by multiplying the yearly volume by the respective contract duration. In cases where only total volumes over the full contract duration were available, we assumed an even distribution of transported volumes over all years.

Contracts currently in place or agreed for with the start of delivery during the coming years as well as contracts that already have been terminated are incorporated. Moreover, contracts can be new, first-of-a-kind agreements or renewals of existing and terminated ones.

The database has been under construction since 2003, collecting information from various publicly available sources. These include industry reports, press releases, company and project websites, as well as a number of books and regular institutional publications. For details on those data sources see the last column of the contract database in Annex A-1 as well as the reference list in Annex A-2.[11]

3.2 Descriptive statistics

Out database includes 426 long-term natural gas supply contracts, of which 127 cover pipeline deliveries and 299 cover shipments in the form of LNG. About 60% of these contracts have deliveries starting in 2000 or later; see Figure 2.

[10] If data was provided in million tons of LNG per year (mtpa) we used a conversion factor of 0.72463768.

[11] The digital version of the Excel-file can be downloaded here.

Figure 2: Number of long-term supply contracts by transport mode

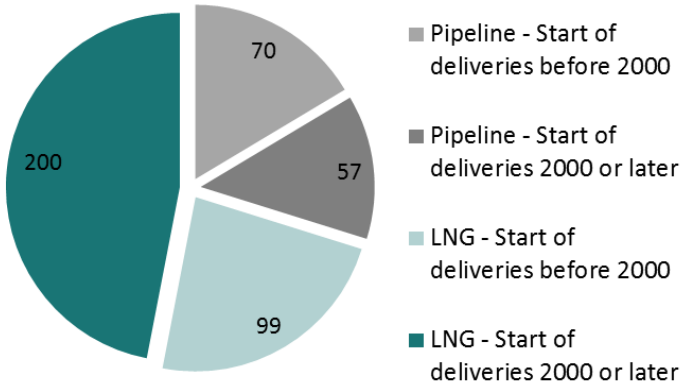
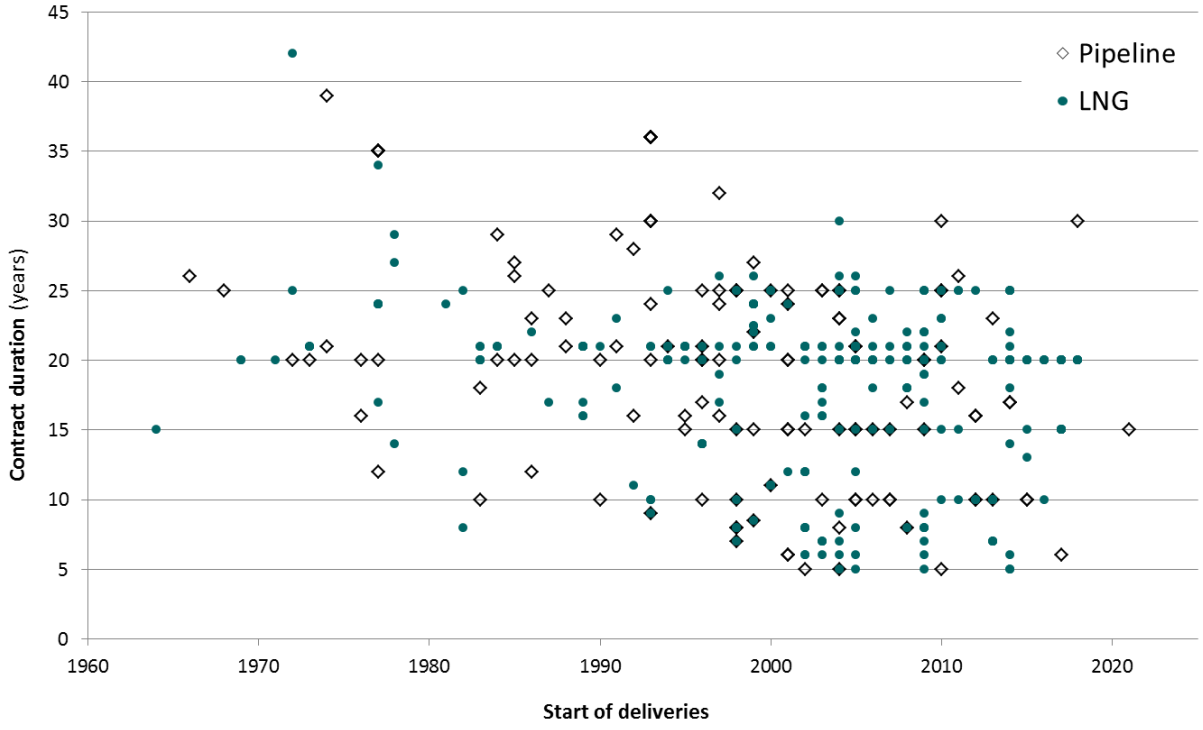


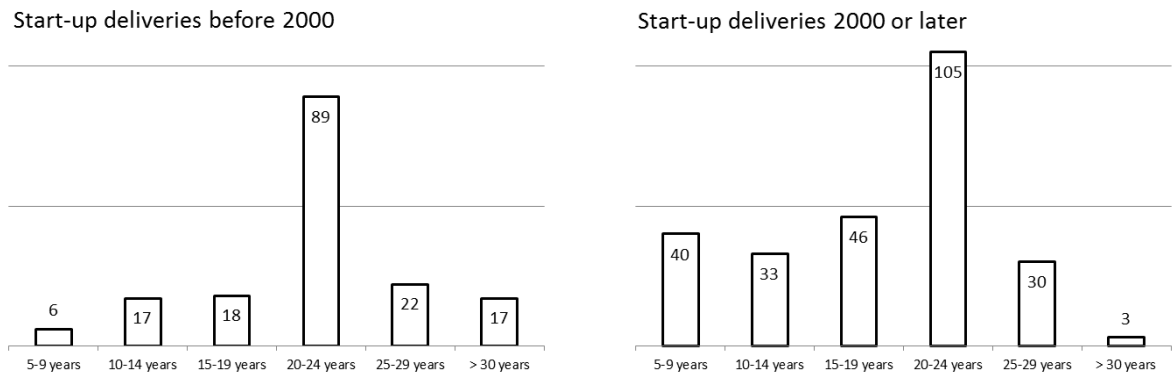
Figure 3 displays contract duration for the contracts of our database by the start date of deliveries. Very long contract durations of 30 or more years - even up to 40 years - are no longer common. In contrast, shorter agreements covering five to ten years increasingly complement the typical 20-25 year contracts, which are also illustrated in Figure 4.

Figure 3: Contract duration by start-up year of deliveries



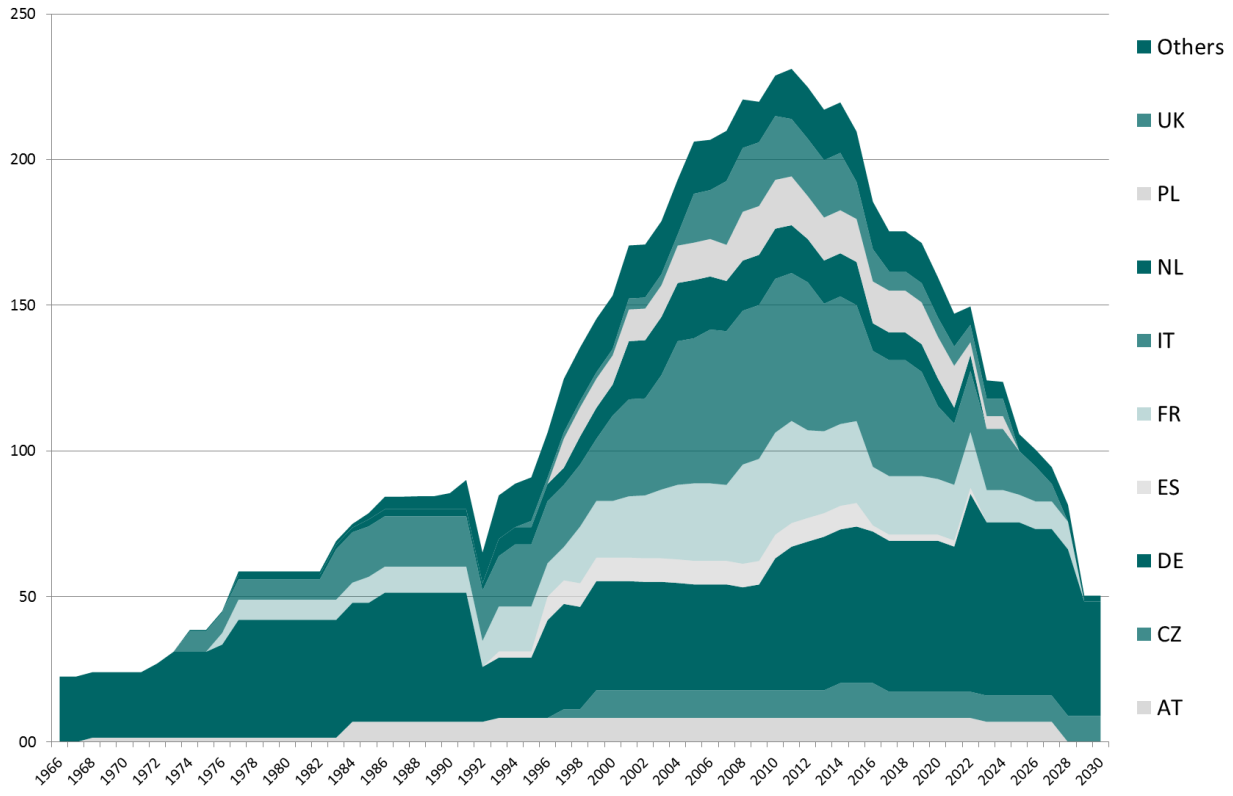
Remark: This figure displays all 426 contracts in our database. Several observations concern the same start-date of deliveries and the same contract duration, thus overlap as single points.

Figure 4: Number of contracts with a certain contract duration



Our database covers – with about two-thirds of total deliveries – a quite substantial share of the pipeline deliveries to European importing countries. Major importers as of 2015 include Italy, Germany, France, the UK and Spain (see Figure 5). Recently increasing contracted volumes in our database could be observed for, in particular, Italy and Germany. This might, in part, be explained by the commissioning of new major infrastructure project. The capacity of the TransMed Pipeline (connecting Italy and Algeria via Tunisia) was doubled in 1994; the Greenstream Pipeline (connecting Italy and Libya) was inaugurated in 2004; and the Nordstream Pipeline (connecting Germany and Russia) started transportation services at the end of 2011.

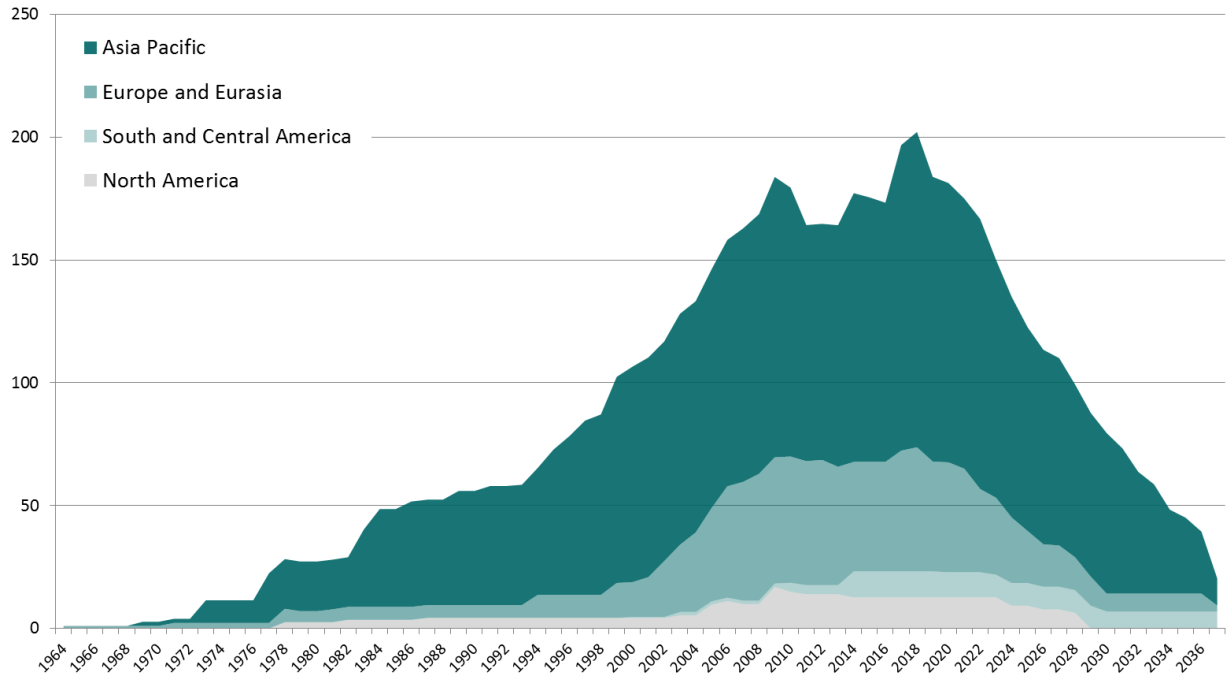
Figure 5: *Pipeline* deliveries *to Europe* covered by our database – in bcm/a by *importing country*



For trades in the form of LNG, our database, especially during the first four decades of the industry (i.e. from the mid-1960s to the mid-2000s), covers a substantial share of total global trade. The increasing gap between total trade and trade covered by our database in recent years might be explained by two key factors. First, our database probably does not cover all of the recently concluded long-term contracts. And, secondly, as discussed above, we observe an increasing importance of short-term agreements (shorter than 5 years) and spot trades in the industry, naturally widening this gap.

Figure 6 also illustrates that global LNG trade increased significantly over last two decades. Amongst others, Portugal started to receive deliveries in the form of LNG in 2003 with the opening of its first import terminal. In 2005, the UK also became an importer of LNG, with regasification capacities having been expanded substantially. Other new importers include e.g. Mexico, Brazil, China, and India. On the exporting side, the Middle East, accounting for more than 40% of worldwide proven natural gas reserves, has become the largest regional exporter of LNG. With Qatar and Oman, two additional suppliers started deliveries in 1997 and 2000, respectively. The region is quickly becoming a swing producer. Deliveries from this region to European and Asian markets and even to North America are feasible without a significant difference in transportation cost.

Figure 6: *Global LNG* trade covered by our database – in bcm/a by *importing region*



Thereby, most LNG supply contracts in our database concern deliveries starting since 2000. Moreover, Table 1 illustrates that average yearly volumes covered by long-term contracts tend to be smaller when Pacific Basin destinations are concerned. This might be explained by the large number of small receiving terminals in Japan, a country strongly dependent on energy imports but lacking a well-developed national pipeline network, but relatively large for exports from the Middle East (which might be explained by the huge infrastructures, i.e. “mega liquefaction trains” that have to be financed).

Table 1: Number of LNG contracts by region

	Seller from		
	Atlantic Basin	Pacific Basin	Middle East
Total n° of contracts	96	145	58
# start deliveries before 2000	31	51	17
# start deliveries 2000 or later	65	94	41
Average yearly volume per contract (bcm/a)	2.1	1.5	2.4

4 Conclusions

Long-term contracts are an important element of all economic activity and, thus, critical for understanding modern economic structures. The natural gas industry provides particular insights into the functioning and dynamics of long-term contracts and industry structures, in a sector that is globally important. This Data Documentation provides a survey of the literature on long-term contracts in the natural gas sector, as seen from an institutional and industrial economics perspective; we also add suggestions for further research. The core of the documentation is a detailed database of 426 long-term contracts struck between sellers and buyers between 1965 and 2014. Though not comprehensive, the database covers a large share of contracts, both for pipeline gas and liquefied natural gas (LNG).

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Annex A-1: Database of Long-Term Contracts

#	Pro-duct[12]	Contract conclusion	Buyer (compa-ny)	Buyer (country)	Seller (company)	Seller (country)	Yearly volume (bcm)	Start of deliveries	End of deliveries	Contract duration	Total volume (bcm)	Data source
1	1	2006	GdF	France	Sonatrach	Algeria	1.00	2009	2028	20	20	http://www.datamonitor.com
2	1	2006	Endesa	Germany	Sonatrach	Algeria	0.96	2009	2028	20	19	Alexander's Gas & Oil Connections (2006)
3	1	1999	Edison	Italy	In Salah-gas	Algeria	4.00	2004	2018	15	60	Cedigaz News Report
4	1	1992	Enel	Italy	Sonatrach	Algeria	4.00	1994	2014	21	84	Aissaoui (1999, p. 73)
5	1	2003	Mogest	Italy	Sonatrach	Algeria	0.50	2005	2019	15	8	Gas Matters Today, 19/06/03
6	1	1977	Snam	Italy	Sonatrach	Algeria	10.30	1983	1992	10	103	Aissaoui (1999, p. 73)
7	1	1990	Snam	Italy	Sonatrach	Algeria	10.30	1992	2019	28	288	Aissaoui (2001, p. 189)
9	1	1994	Transgas	Portugal	Sonatrach	Algeria	2.50	1997	2020	24	60	Aissaoui (1999, p. 73)
10	1	1985	Petrol	Slovenia	Sonatrach	Algeria	0.60	1992	2007	16	10	Aissaoui (1999, p. 73)
11	1	1992	Enagas	Spain	Sonatrach	Algeria	6.00	1996	2015	20	120	Aissaoui (1999, p. 73)
12	1	1989	Etap	Tunisia	Sonatrach	Algeria	0.40	1990	1999	10	4	Aissaoui (1999, p. 73)
13	1	1997	Etap	Tunisia	Sonatrach	Algeria	0.40	1999	2020	22	9	Aissaoui (2001, p. 189)
14	1	2003	n.a.	Turkey	n.a.	Azerbaid.	6.60	2006	2020	15	89	Eastern Bloc Energy (06/2003)
15	1	2001	Rhodia	France	Distrigas	Belgium	0.55	2002	2006	5	3	Cedigaz News Report
16	1	1983	Ruhrgas	Germany	DANGAS	Denmark	0.37	1984	2003	20	7	Cedigaz News Report
17	1	1993	Ruhrgas	Germany	DANGAS	Denmark	1.84	1996	2012	17	31	Cedigaz News Report
18	1	2001	POGC	Poland	DONG	Denmark	2.00	2004	2011	8	16	Rey (2002)
19	1	1980	Swedegas	Sweden	DANGAS	Denmark	0.90	1985	2004	20	18	Cedigaz News Report
20	1	1989	Swedegas	Sweden	DANGAS	Denmark	1.10	1990	2010	20	10	Cedigaz News Report
21	1	2006	Gazprom	UK	Dong	Denmark	0.60	2007	2021	15	9	Scandinavian Oil-Gas Magazine (2006)

[12] (1=pipe, 2=LNG)

22	1	1995	MOL	Hungary	GdF	France	0.40	1997	2012	16	6	Cedigaz News Report
23	1	1995	MOL	Hungary	Ruhrgas	Germany	0.50	1996	2005	10	5	Stern (1998, p. 27)
24	1	2006	PGNIG	Poland	VNG	Germany	0.40	2006	2015	10	4	VNG press release (2006) - 21.08.06
25	1	1998	POGC	Poland	Ruhrgas/VNG	Germany	0.40	2001	2006	6	2	Rey (2002)
26	1	1984	GVM AG	Switzerl.	GVS	Germany	0.15	1986	2005	20	3	Cedigaz News Report
27	1	1981	GVO AG	Switzerl.	GVS/Ruhrgas	Germany	0.15	1983	2000	18	3	Cedigaz News Report
28	1	1975	Swissgas	Switzerl.	Ruhrgas	Germany	0.60	1977	1988	12	7	Cedigaz News Report
29	1	1986	Swissgas	Switzerl.	Ruhrgas	Germany	0.60	1988	2010	23	14	Cedigaz News Report
30	1	2008	Swissgas	Switzerl.	Ruhrgas	Germany	1.02	2010	2015	5	5	Erdöl Erdgas Kohle (2008, Heft 12); Wallstreet Online
31	1	1987	Swissgas	Switzerl.	Ruhrgas	Germany	0.15	1988	2008	21	3	Cedigaz News Report
32	1	1996	Botas	Turkey	NIGC/NIOC	Iran	10.00	2001	2023	25	250	www.cmi-capital.com, botas.gov.tr
33	1	2002	GdF	France	NOC/ENI	Libya	2.00	2004	2028	25	50	Cedigaz News Report
34	1	2002	Edison	Italy	NOC/ENI	Libya	4.00	2004	2026	23	92	Cedigaz News Report
35	1	2002	Energie S.P.A.	Italy	NOC/ENI	Libya	2.00	2004	2026	23	46	Cedigaz News Report
36	1	1991	Distrigaz	Belgium	Gasunie	NL	4.50	1991	2011	21	90	Cedigaz News Report
37	1	2002	GdF	France	Gasunie	NL	2.00	2003	2012	10	20	Gasunie press release (2002): http://www.gasunie.nl/n_eng/index.htm; Platts (2002): IGR 451, 10/06/02
38	1	1965	Consortium	Germany	Gasunie	NL	22.50	1966	1991	26	585	Cedigaz News Report
39	1	1997	SNAM	Italy	Gasunie	NL	4.00	2001	2020	20	80	Peebles (1999, p. 117)
40	1	1972	Swissgas	Switzerl.	Gasunie	NL	0.50	1974	1994	21	11	Cedigaz News Report
41	1	1985	Swissgas	Switzerl.	Gasunie	NL	0.50	1995	2009	15	8	Cedigaz News Report
42	1	2009	Swissgas	Switzerl.	Gasunie	NL	0.50	2009	2023	15	8	Erdöl Erdgas Kohle (2010, Heft 2)
43	1	2002	Centrica/ BG Trading	UK	Gasunie	NL	8.00	2005	2014	10	80	Gasunie press release (2002): http://www.gasunie.nl/n_eng/index.htm; Centrica (2002): http://centrica.com
44	1	1986	OMV	Austria	Statoil	Norway	1.30	1993	2022	30	39	Bartsch (1999, pp. 217 ff.)
45	1	1986	Distrigaz	Belgium	Statoil	Norway	1.80	1993	2028	36	65	Bartsch (1999, pp. 217 ff.)
46	1	1997	Transgas	Czech Republic	GFU	Norway	3.00	1997	2016	20	3	Bartsch (1999, p. 219), Stern (1998, p. 38)
47	1	2003	Maersk	Denmark	Norsk Hydro	Norway	0.60	2004	2008	5	3	Cedigaz News Report (2003): 42/41/14; 42/42/19
48	1	2003	EdF	France	Statoil	Norway	1.00	2005	2019	15	15	ZFK newsticker (2003): www.zfk.de/news/news.html (30.4.03); Platts EU Energy 57, 09/05/03; Gas Matters Today 28/04/03; Cedigaz News Report 42/20/22
49	1	1995	GdF	France	GFU?	Norway	8.00	1998	2022	25	200	Bartsch (1999, p. 219)
50	1	1973	GdF	France	PPCO	Norway	2.95	1977	2011	35	103	Cedigaz News Report
51	1	1982	GdF	France	GFU	Norway	2.00	1985	2011	27	54	Cedigaz News Report

52	1	1986	GdF 1	France	GFU	Norway	3.00	1993	2028	36	108	Bartsch (1999, pp. 217 ff.)
53	1	1986	GdF 2	France	GFU	Norway	3.50	1993	2028	36	126	Bartsch (1999, pp. 217 ff.)
54	1	1986	BEB	Germany	Statoil	Norway	1.20	1993	2028	36	43	Bartsch (1999, pp. 217 ff.)
55	1	1993	Consortium	Germany	GFU	Norway	2.00	1996	2020	25	50	Cedigaz News Report
56	1	1973	Consortium	Germany	Philips group	Norway	8.30	1977	1996	20	166	Cedigaz News Report
57	1	1997	Consortium	Germany	Philips group	Norway	8.90	1997	2028	32	285	Cedigaz News Report
58	1	1986	Ruhrgas	Germany	Statoil	Norway	4.40	1993	2028	36	158	Bartsch (1999, pp. 217 ff.)
59	1	1996	Ruhrgas	Germany	n.a.	Norway	2.30	1999	2025	27	62	IEA (1998, p. 56)
60	1	1976	Ruhrgas	Germany	Amoco	Norway	0.15	1977	2011	35	5	Cedigaz News Report
61	1	1984	Ruhrgas	Germany	Statoil	Norway	3.50	1986	1997	12	42	Cedigaz News Report
62	1	1986	Thyssengas	Germany	Statoil	Norway	2.40	1993	2028	36	86	Bartsch (1999, pp. 217 ff.)
63	1	1994	VNG	Germany	GFU	Norway	4.00	1996	2016	21	84	Bartsch (1999, p. 219)
64	1	2005	VNG	Germany	Statoil	Norway	4.00	2017	2022	6	24	Zfk Aktuell 19. Dezember 2005; Erdöl Erdgas Kohle (2006, Heft 1)
65	1	2002	VNG	Germany	Norsk Agip	Norway	0.17	2002	2016	15	3	VNG press release (2002) - 19.09.02
66	1	2012	Wintershall	Germany	Statoil	Norway	4.50	2013	2022	10	45	www.hydrobcarbonprocessing.com; Statoil webpage
67	1	1997	Snam	Italy	GFU	Norway	6.00	2000	2024	25	168	Bartsch (1999, p. 219); IEA (1998, p. 56)
68	1	1986	Gasunie	NL	Statoil	Norway	3.50	1993	2022	30	105	Bartsch (1999, p. 219)
69	1	1972	Gasunie	NL	Philips group	Norway	1.55	1977	2011	35	54	Cedigaz News Report
70	1	1975	Gasunie	NL	Amoco	Norway	0.05	1977	2011	35	2	Cedigaz News Report
71	1	1981	Gasunie	NL	Statoil	Norway	0.80	1985	2010	26	21	Cedigaz News Report
72	1	1988	SEP	NL	Statoil	Norway	2.00	1998	2022	25	50	Stern (1990,p. 32); Bartsch (1999, p. 219)
73	1	2001	POGC	Poland	Statoil	Norway	4.35	2008	2024	17	74	Statoil press release (2001): www.statoil.com/STATOILCOM/SVG00990.NSF/UNID/4B..
74	1	1998	POGC	Poland	Statoil	Norway	0.45	2001	2006	6	3	Rey (2002)
75	1	1988	Enagas	Spain	GFU	Norway	2.10	1993	2022	30	63	Bartsch (1999, p. 219)
76	1	2001	BP	UK	Statoil	Norway	1.60	2001	2015	15	24	BP press release (2001): www.bpenergy.com/news/press_releases/090701_statoil.html
77	1	2002	Centrica	UK	Statoil	Norway	5.00	2005	2014	10	50	Statoil press release (2003)
78	1	2011	Centrica	UK	Statoil	Norway	5.00	2015	2024	10	50	Statoil press release (2011)
79	1	2011	Centrica	UK	Statoil	Norway	1.00	2015	2024	10	50	Centrica new release (21 Nov 2001)
80	1	1991	National Power	UK	Statoil	Norway	2.20	1995	2010	16	35	Petroleum Economist (1996, p. 134)
81	1	2005	Scottish Power	UK	Statoil	Norway	0.50	2007	2016	10	5	ZfK Aktuell (5 Dez 2005); Scottish Power press release (28 Nov 2005)

82	1	2003	Shell UK	UK	Statoil	Norway	4.00	2007	2016	10	40	Energy Charter Secretariat (2007, Chapter 4, p. 135)
83	1	2005	Dolphin Energy Ltd.	Dubai	n.a.	Qatar	7.00	2010	2034	25	175	Oil & Gas Journal (9 May 2005)
84	1	1982	OMV	Austria	Gazexport	Russia	5.50	1984	2012	29	160	Cedigaz News Report
85	1	2006	OMV	Austria	Gazexport	Russia	7.00	2012	2027	16	112	International Gas Report (2006): Issue 258
86	1	1968	ÖMV	Austria	Gazprom	Russia	1.50	1968	1993	25	38	Petroleum Economist (1996, p. 131)
87	1	1991	ÖMV	Austria	Gazprom	Russia	**1.50**	1993	2012	20	30	OMV press release (2012)
89	1	1999	Transgas	Czech R.	Gazeksport	Russia	6.50	1999	2013	15	135	Eastern Bloc Energy, June 2003; Cedigaz
90	1	2007	Transgas	Czech R.	Gazeksport	Russia	9.00	2013	2035	23	207	ICIS Heren news (2007)
91	1	2006	Dong	Denmark	Gazprom	Russia	2.00	2011	2028	18	36	Scandinavian Oil-Gas Magazine (2006)
92	1	1971	Neste Oy	Finland	Gazexport	Russia	2.00	1986	2008	23	46	Cedigaz News Report
93	1	1974	GdF	France	Gazprom	Russia	4.00	1976	1995	20	78	Petroleum Economist (1996, p. 132)
94	1	2003	GdF	France	Gazprom	Russia	8.00	2008	2015	8	64	EID newsticker (2003): Gazprom press release (2003)
95	1	2006	E.ON Ruhrgas	Germany	Gazprom	Russia	20.00	2021	2035	15	300	Alexander's Gas & Oil Connections (2006)
96	1	2006	E.ON Ruhrgas	Germany	Gazprom	Russia	4.00	2011	2036	26	104	Alexander's Gas & Oil Connections (2006)
97	1	2012	EnBW	Germany	Novatek	Russia	1.90	2012	2021	10	19	Süddeutsche Zeitung, 13 Jul 2012; Handelsblatt website (12 Jul 2012)
98	1	1970	Ruhrgas	Germany	Gazprom	Russia	3.00	1972	1991	20	60	Petroleum Economist (1996, p. 131)
99	1	1971	Ruhrgas	Germany	Gazprom	Russia	4.00	1973	1992	20	76	Petroleum Economist (1996, p. 132)
100	1	1974	Ruhrgas	Germany	Gazprom	Russia	2.50	1976	1992	16	40	Petroleum Economist (1996, p. 132)
101	1	1994	VNG	Germany	Wingas	Russia	7.00	1996	2015	20	140	Cedigaz News Report
102	1	2006	VNG	Germany	Gazprom/Wieh	Russia	5.29	2014	2030	17	90	www.wingas.de; Erdöl Erdgas Kohle (2007, Heft 9)
103	1	2006	VNG	Germany	Gazprom/Wieh	Russia	1.00	2014	2030	17	17	www.wingas.de; Erdöl Erdgas Kohle (2008, Heft 9)
104	1	2005	Wingas	Germany	Gazexport	Russia	9.00	2010	2034	25	225	Erdöl Erdgas Kohle (2005, Heft 11)
105	1	1990	DEPA	Greece	Promotheus	Russia	2.50	1993	2016	24	60	Cedigaz News Report
106	1	2012	GAIL	India	Gazprom Singa-pur	Russia	3.45	2018	2047	30	104	Energie Informationsdienst 44/12
107	1	2000	Edison	Italy	Promgas	Russia	2.00	2000	2010	11	22	Cedigaz News Report
108	1	2001	Enel	Italy	Gazprom	Russia	3.00	2005	2025	21	63	Cedigaz News Report
109	1	1984	Snam	Italy	Soyuzgazexport	Russia	7.00	1974	2012	39	273	Cedigaz News Report
110	1	1996	Snam	Italy	Gazexport	Russia	6.00	2003	2027	25	150	Cedigaz News Report
111	1	2000	Gasunie	NL	Gazexport	Russia	5.33	2001	2015	15	80	Gasunie press release (2000): www.gasunie.nl/neng/highlights/press/00/pe_000928.htm
112	1	1998	Gasunie	NL	Gazprom	Russia	4.00	2001	2020	20	80	IEA (2000, p. 67)

113	1	1996	POGC	Poland	Gazexport	Russia	10.00	1997	2021	25	250	Rey (2002)
114	1	2006	Conef Energy	Romania	Gazprom	Russia	2.00	2010	2030	21	42	Platts news release (5 April 2007)
115	1	2011	Srbijagas	Serbia	Gazprom	Russia	5.00	2012	2021	10	50	www.serbia-energy.com (22 Dec 2011)
116	1	1984	Botas	Turkey	Gazexport	Russia	6.00	1987	2011	25	150	Cedigaz News Report, Gazpromexport
117	1	1998	Botas	Turkey	Turusgaz	Russia	8.00	1998	2022	25	200	Cedigaz News Report, Gazpromexport
118	1	1997	Botas	Turkey	Gazprom	Russia	16.00	2003	2027	25	365	Cedigaz News Report
119	1	2006	CNPC	China	Turkmengaz	Turkmenist.	30.00	2010	2039	30	900	Erdöl, Erdgas, Kohle (2012, Heft 1); www.jamestown.org
120	1	2003	Gazexport	Russia	Turkmenneftegas	Turkmenist.	30.00	2004	2028	25	750	Gas Matters Today, 10/04/03; Energieinformationsdienst 18/03
121	1	2003	Gazprom	Russia	Turkmenneftegaz	Turkmenist.	0.48	2005	2025	21	10	Gas Matters Today, 02/04/03
122	1	1998	GdF	France	EFOG	UK	1.60	2001	2024	24	38	Cedigaz News Report
123	1	1997	Ruhrgas	Germany	BP	UK	1.00	1998	2012	15	15	Platts North Sea Letter (1997): Issue 1090, 22.01.1997
124	1	1997	Thyssengas	Germany	Centrica	UK	0.50	1998	2004	7	3	Centrica news release (1998): www.centrica.co.uk/newsdesk/archive/171198.htm
125	1	1997	Wingas	Germany	BG	UK	1.00	1998	2007	10	10	Platts North Sea Letter (1998): Issue 1179, 14.10.1998
126	1	1991	Wingas	Germany	Elf UK	UK	0.40	1993	2001	9	4	Cedigaz News Report
127	1	1997	Elsta	Netherlands	Centrica	UK	1.00	1998	2005	8	8	Peebles (1999, p. 115)
128	1	1987	EnTrade/Delta	Netherlands	Centrica	UK	0.75	1998	2005	8	6	Peebles (1999, p. 115), Centrica news release (1997): www.centrica.co.uk/newsdesk/archive/091097.htm
129	1	1998	Gasunie	Netherlands	Conoco	UK	1.00	1999	2006	8.5	9	Peebles (1999, p. 115)
130	2	1975	Tepco	Japan	Adgas	Abu Dhabi	2.50	1977	1993	17	43	Cedigaz News Report
131	2	1993	Tepco	Japan	Adgas	Abu Dhabi	5.81	1994	2018	25	145	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 128)
132	2	1975	Distrigaz	Belgium	Sonatrach	Algeria	4.50	1982	2006	25	113	Aissaoui (1999, p. 73)
133	2	1991	GdF	France	Sonatrach	Algeria	0.50	1993	2002	10	5	Aissaoui (2001, p. 189)
134	2	2000	GdF	France	Sonatrach	Algeria	0.50	2002	2013	12	6	Aissaoui (2001, p. 189)
135	2	2007	GdF	France	Sonatrach	Algeria	0.50	2013	2019	7	4	Datamonitor (2009): http://datamonitor.com
136	2	1971	GdF	France	Sonatrach	Algeria	3.50	1973	1993	21	74	Aissaoui (1999, p. 73)
137	2	1991	GdF	France	Sonatrach	Algeria	3.50	1993	2013	21	74	Aissaoui (2001, p. 189)
138	2	2007	GdF	France	Sonatrach	Algeria	1.43	2013	2019	7	10	GdF press release from 4 December 2007; http://datamonitor.com
139	2	1976	GdF	France	Sonatrach	Algeria	5.20	1982	1993	12	62	Aissaoui (1999, p. 73)
140	2	1991	GdF	France	Sonatrach	Algeria	5.20	1993	2002	10	52	Aissaoui (2001, p. 189)
141	2	2000	GdF	France	Sonatrach	Algeria	5.20	2002	2013	12	62	Platts Energy Information Center; International Gas Report (2000) Issue 400 - 09/06/2000
142	2	2007	GdF	France	Sonatrach	Algeria	5.20	2013	2019	7	36	Datamonitor (2009): http://datamonitor.com; GIINGL (2010)

143	2	1991	GdF	France	Sonatrach	Algeria	1.10	1992	2002	11	12	Aissaoui (1999, p. 73)
144	2	2000	GdF	France	Sonatrach	Algeria	1.10	2002	2013	12	13	Aissaoui (2001, p. 189)
145	2	2007	GdF	France	Sonatrach	Algeria	1.10	2013	2019	7	8	Datamonitor (2009): http://datamonitor.com; GIINGL (2010)
146	2	1965	GdF	France	Sonatrach	Algeria	2.00	1972	2013	42	84	Aissaoui (2001, pp. 184 ff.)
147	2	1988	Depa	Greece	Sonatrach	Algeria	0.70	2000	2020	21	15	Aissaoui (1999, p. 73)
148	2	1997	Enel	Italy	Sonatrach	Algeria	1.55	1999	2022	24	37	Cedigaz News Report
149	2	1997	ENI	Italy	Sonatrach	Algeria	1.80	1997	2015	19	34	Cedigaz News Report
150	2	1994	Snam	Italy	Sonatrach	Algeria	1.80	1996	2016	21	38	Aissaoui (1999, 73), Gasunie press release (2001) www.gasunie.nl/n_eng/highlights/press/01/pe_011003.htm
151	2	2000	Cepsa	Spain	Sonatrach	Algeria	1.06	2002	2022	21	22	GIIGNL (2012)
152	2	1976	Enagas	Spain	Sonatrach	Algeria	3.24	1978	2004	27	87	http://gmaiso.free.fr/lng
153	2	2000	Endesa	Spain	Sonatrach	Algeria	1.04	2002	2017	16	17	GIIGNL (2012)
154	2	2002	Iberdrola	Spain	Sonatrach	Algeria	1.00	2004	2018	15	15	Sonatrach (2002): Rapport Annuel
155	2	1992	Botas	Turkey	Sonatrach	Algeria	4.14	1994	2013	20	83	GIIGNL (2009)
156	2	1963	Britsh Methane	UK	Sonatrach	Algeria	1.00	1964	1978	15	15	Aissaoui (2001, pp. 184, 190)
157	2	1987	Distrigas	USA	Sonatrach	Algeria	0.75	1987	2003	17	13	Goliath Business News (14 February 2011)
158	2	2002	Distrigas	USA	Sonatrach	Algeria	0.75	2003	2008	6	5	Goliath Business News (14 February 2011)
159	2	1976	Distrigas	USA	Sonatrach	Algeria	1.30	1978	1991	14	18	Aissaoui (1999, p. 73)
160	2	1989	Distrigas	USA	Sonatrach	Algeria	1.30	1991	2013	23	30	Aissaoui (2001, p. 189)
161	2	1976	Distrigas	USA	Sonatrach	Algeria	1.22	1978	2006	29	35	http://gmaiso.free.fr/lng
162	2	1976	Duke Energy	USA	Sonatrach	Algeria	1.00	1982	1989	8	8	Aissaoui (1999, p. 73)
163	2	1987	Duke Energy	USA	Sonatrach	Algeria	1.00	1989	2009	21	21	Aissaoui (2001, p. 189)
164	2	1969	El Paso	USA	Sonatrach	Algeria	1.00	1972	1996	25	25	Aissaoui (2001, pp. 185, 190)
165	2	1987	Panhandle	USA	Sonatrach	Algeria	0.81	1989	2005	17	14	http://gmaiso.free.fr/lng
166	2	2001	Statoil	USA	Sonatrach	Algeria	1.04	2003	2009	7	7	GIIGNL (2012)
167	2	2010	CNOOC	China	QGC (BG)	Australia	4.97	2014	2033	20	99	BG Group press release (24 March 2010)
168	2	2002	Petrochina	China	BHP, BP, Chevron, Shell	Australia	4.05	2005	2030	26	105	Cedigaz News Report
169	2	2011	Sinopec	China	APLNG	Australia	10.49	2016	2035	20	210	www.marketwatch.com press release (20 Jan 2012); Bloomberg
170	2	2009	Petronet	India	n.a.	Australia	1.99	2015	2034	20	40	GIIGNL (2010)
171	2	2011	Total Gas & Power	International	Ichtys LNG	Australia	1.24	2017	2031	15	19	GIIGNL (2012)
172	2	1987	Chubu Electric	Japan	NWS	Australia	1.42	1989	2009	21	30	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 128)

173	2	2002	Chubu Electric	Japan	NWS	Australia	0.68	2009	2029	21	14	LNG project database underlying Ruester (2010)
174	2	2012	Chubu Electric	Japan	Ichtys LNG	Australia	0.68	2017	2031	15	10	www.lngworldnews.com (10 Jan 2012)
175	2	2008	Chubu Electric	Japan	n.a.	Australia	0.69	2009	2015	7	5	GIIGNL (2009)
176	2	2009	Chubu Electric	Japan	n.a.	Australia	1.99	2014	2038	25	50	GIIGNL (2010)
177	2	2011	Chubu Electric	Japan	BG	Australia	0.57	2014	2034	21	12	GIIGNL (2012)
178	2	2013	Chubu Electric	Japan	Wheatstone	Australia	1.38	2016	2035	20	28	www.hydrobcarbonprocessing.com
179	2	1987	Chugoku Elec.	Japan	NWS	Australia	1.42	1989	2009	21	30	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 128)
180	2	1994	Chugoku Elec.	Japan	NWS	Australia	0.15	1996	2009	14	2	http://gmaiso.free.fr/lng
181	2	1985	Kansai Electric Power	Japan	NWS	Australia	1.42	1989	2009	21	30	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 128)
182	2	2003	Kansai Electric Power	Japan	NWS	Australia	1.02	2009	2023	15	15	GMT 10/09/03; CNR/42/40/2
183	2	1994	Kansai Electric Power	Japan	NWS	Australia	0.15	1996	2009	14	2	http://gmaiso.free.fr/lng
184	2	2011	Kansai Electric Power	Japan	Ichtys LNG	Australia	1.10	2017	2031	15	17	www.lngworldnews.com (6 Dec 2011)
185	2	2009	Kansai Electric Power	Japan	NWS	Australia	0.55	2009	2016	8	4	GIIGNL (2010)
186	2	2011	Kansai Electric Power	Japan	APLNG	Australia	1.38	2016	2035	20	28	GIIGNL (2012)
187	2	1987	Kyushu Electric Power	Japan	NWS	Australia	1.42	1989	2009	21	30	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 128)
188	2	2007	Kyushu Electric Power	Japan	NWS	Australia	0.97	2009	2017	9	9	GIIGNL (2012)
189	2	2011	Kyushu Electric Power	Japan	Ichtys LNG	Australia	0.41	2017	2031	15	6	www.lngworldnews.com (6 Dec 2011)
190	2	2011	Kyushu Electric Power	Japan	Chevron	Australia	0.41	2015	2029	15	6	GIIGNL (2012)
191	2	2011	Kyushu Electric Power	Japan	Chevron	Australia	0.97	2017	2036	20	19	GIIGNL (2012)
192	2	1987	Osaka Gas	Japan	NWS	Australia	0.92	1989	2009	21	19	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 128)
193	2	1994	Osaka Gas	Japan	NWS	Australia	0.09	1996	2009	14	1	http://gmaiso.free.fr/lng
194	2	2002	Osaka Gas	Japan	NWS	Australia	1.35	2004	2033	30	41	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 128)
195	2	2011	Osaka Gas	Japan	Ichtys LNG	Australia	1.10	2017	2031	15	17	www.lngworldnews.com (6 Dec 2011)
196	2	2008	Osaka Gas	Japan	NWS	Australia	0.69	2009	2014	6	4	GIIGNL (2009)
197	2	2009	Osaka Gas	Japan	Chevron	Australia	1.90	2014	2038	25	47	Chevron press release (16 Dec 2009)
198	2	2003	Shizuoka Gas Co.	Japan	NWS	Australia	0.18	2005	2029	25	5	Cedigaz News Report
199	2	1987	Tepco	Japan	NWS	Australia	1.42	1989	2009	21	30	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 128)

200	2	2007	Tepco	Japan	NWS	Australia	1.38	2010	2019	10	14	Oil & Gas Journal (2008) - 07.04.08
201	2	1994	Tepco	Japan	NWS	Australia	0.15	1996	2009	14	2	http://gmaiso.free.fr/lng
202	2	2010	Tepco	Japan	Chevron	Australia	2.00	2014	2038	25	50	Oil & Gas Journal (15 March 2010)
203	2	2011	Tepco	Japan	Chevron	Australia	4.28	2016	2035	20	86	OGJ, 1 Aug 2011; OGJ, 14 Dec 2009; Online WSJ
204	2	2011	Tepco	Japan	Ichtys LNG	Australia	1.45	2017	2031	15	22	www.lngworldnews.com (6 Dec 2011)
205	2	2009	Tepco	Japan	NWS	Australia	0.41	2009	2016	8	3	GIIGNL (2010)
206	2	1987	Toho Gas	Japan	NWS	Australia	0.28	1989	2009	21	6	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 128)
207	2	1994	Toho Gas	Japan	NWS	Australia	0.03	1996	2009	14	0	http://gmaiso.free.fr/lng
208	2	2001	Toho Gas	Japan	NWS	Australia	0.41	2004	2029	26	11	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 128)
209	2	2012	Toho Gas	Japan	Ichtys LNG	Australia	0.39	2017	2031	15	6	www.lngworldnews.com (10 Jan 2012)
210	2	2003	Tohoku Electric Power	Japan	NWS	Australia	0.54	2005	2019	15	8	Cedigaz News Report (2003): 42/11/1
211	2	2013	Tohoku Electric Power	Japan	n.a.	Australia	1.24	2017	2036	20	25	GIIGNL (2014)
212	2	1987	Tokyo Gas	Japan	NWS	Australia	0.92	1989	2009	21	19	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 128)
213	2	1994	Tokyo Gas	Japan	NWS	Australia	0.09	1996	2009	14	1	http://gmaiso.free.fr/lng
214	2	2001	Tokyo Gas	Japan	NWS	Australia	1.44	2004	2028	25	36	Wybrew-Bond and Stern (2002, p. 128)
215	2	2009	Tokyo Gas	Japan	Chevron	Australia	1.60	2010	2034	25	40	Oil Gas European Magazine 4/2005
216	2	2011	Tokyo Gas	Japan	QGC (BG)	Australia	1.66	2015	2034	20	33	BG Group press release (7 March 2011)
217	2	2011	Tokyo Gas	Japan	Ichtys LNG	Australia	1.45	2017	2031	15	22	www.lngworldnews.com (6 Dec 2011)
218	2	2008	Tokyo Gas	Japan	NWS	Australia	0.73	2009	2016	8	6	GIIGNL (2009)
219	2	2009	Tokyo Gas	Japan	n.a.	Australia	1.52	2014	2038	25	38	GIIGNL (2010)
220	2	2009	Petronas	Malaysia	GLNG	Australia	2.76	2014	2033	20	55	Santos press release (18 Jun 2009)
221	2	2003	Kogas	South Korea	NWS	Australia	0.68	2003	2009	7	5	Platts - Energy Economist (2003): Issue 258, 26/03/03; Gas Matters Today 17/01/03
222	2	2010	Kogas	South Korea	Chevron	Australia	2.07	2013	2032	20	41	Oil & Gas Journal, 26 July 2010
223	2	2012	CPC	Taiwan	Ichtys LNG	Australia	2.42	2017	2031	15	36	www.lngworldnews.com (10 Jan 2012)
224	2	2013	Shell Eastern Trading	International	Brunei Coldgas	Brunei	1.10	2013	2022	10	11	GIIGNL (2014)
225	2	1971	Osaka Gas	Japan	Brunei Coldgas	Brunei	0.92	1973	1993	21	19	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 128)
226	2	1993	Osaka Gas	Japan	Brunei Coldgas	Brunei	0.92	1994	2013	20	18	LNG project database underlying Ruester (2010)
227	2	2013	Osaka Gas	Japan	Brunei Coldgas	Brunei	0.55	2013	2022	10	6	GIIGNL (2014)
228	2	1970	Tepco	Japan	Brunei Coldgas	Brunei	5.02	1973	1993	21	105	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 128)
229	2	1993	Tepco	Japan	Brunei Coldgas	Brunei	5.02	1994	2013	20	100	LNG project database underlying Ruester (2010)

230	2	2013	Tepco	Japan	Brunei Coldgas	Brunei	2.76	2013	2022	10	28	GIIGNL (2014)
231	2	1971	Tokyo Gas	Japan	Brunei Coldgas	Brunei	1.54	1973	1993	21	32	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 128)
232	2	1993	Tokyo Gas	Japan	Brunei Coldgas	Brunei	1.54	1994	2013	20	31	LNG project database underlying Ruester (2010)
233	2	2013	Tokyo Gas	Japan	Brunei Coldgas	Brunei	1.38	2013	2022	10	14	GIIGNL (2014)
234	2	1997	Korea Gas Co.	Korea	Brunei Coldgas	Brunei	0.95	1997	2013	17	16	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 128)
235	2	2002	GdF	France	BG	Egypt	4.86	2005	2024	20	97	Oil & Gas Journal (2003) - 10.02.03; Gaz de France press release (2003); Oil Gas European Magazine 3/2005
236	2	2008	Kogas	South Korea	BG	Egypt	1.79	2008	2015	8	14	GIIGNL (2009)
237	2	2003	BP Global	Spain	Egas	Egypt	1.38	2005	2024	20	28	GIIGNL (2009)
238	2	2003	Union Fenosa Gas	Spain	Egas	Egypt	4.55	2005	2029	25	114	GIIGNL (2009)
239	2	2003	BG Global	USA	Egas	Egypt	0.97	2005	2010	6	6	GIIGNL (2009)
240	2	2004	CNOOC	China	Tangguh	Indonesia	3.60	2009	2033	25	90	Asian Centre for Energy press release (2002); International Gas Report (2006, Issue 558)
241	2	1975	Chubu Electric	Japan	Pertamina+	Indonesia	2.90	1977	2000	24	70	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 128)
242	2	1998	Chubu Electric	Japan	Pertamina+	Indonesia	2.90	2000	2010	11	32	Wybrew-Bond and Stern (2002, p. 128)
243	2	1981	Chubu Electric	Japan	Pertamina+	Indonesia	2.27	1983	2002	20	45	http://gmaiso.free.fr/lng
244	2	2000	Chubu Electric	Japan	Pertamina+	Indonesia	2.27	2002	2009	8	18	Wybrew-Bond and Stern (2002, p. 128)
245	2	2002	Japan Petro-leum Expl.	Japan	n.a.	Indonesia	0.65	2003	2020	17	11	Cedigaz News Report
246	2	1975	Kansai Elec.	Japan	Pertamina+	Indonesia	3.47	1977	2000	24	83	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 128)
247	2	1998	Kansai Elec.	Japan	Pertamina+	Indonesia	3.47	2000	2010	11	38	Wybrew-Bond and Stern (2002, p. 128)
248	2	1981	Kansai Elec.	Japan	Pertamina+	Indonesia	1.20	1983	2002	20	24	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 128)
249	2	2000	Kansai Elec.	Japan	Pertamina+	Indonesia	1.20	2002	2009	8	10	Wybrew-Bond and Stern (2002, p. 128)
250	2	2013	Kansai Elec.	Japan	Pertamina+	Indonesia	1.38	2014	2035	22	30	GIIGNL (2014)
251	2	1975	Kyushu Elec.	Japan	Pertamina+	Indonesia	2.11	1977	2000	24	51	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 128)
252	2	1998	Kyushu Elec.	Japan	Pertamina+	Indonesia	2.11	2000	2010	11	23	Wybrew-Bond and Stern (2002, p. 128)
253	2	1975	Nippon Steel	Japan	Pertamina+	Indonesia	0.74	1977	2000	24	18	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 128)
254	2	1998	Nippon Steel	Japan	Pertamina+	Indonesia	0.74	2000	2010	11	8	Wybrew-Bond and Stern (2002, p. 128)
255	2	1975	Osaka Gas	Japan	Pertamina+	Indonesia	1.76	1977	2010	34	60	http://gmaiso.free.fr/lng
256	2	1981	Osaka Gas	Japan	Pertamina+	Indonesia	0.61	1983	2002	20	12	http://gmaiso.free.fr/lng
257	2	2000	Osaka Gas	Japan	Pertamina+	Indonesia	0.61	2002	2009	8	5	Wybrew-Bond and Stern (2002, p. 128)
258	2	1992	Osaka Gas	Japan	Pertamina+	Indonesia	1.49	1994	2014	21	31	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 128)
259	2	2001	Osaka Gas	Japan	n.a.	Indonesia	1.22	2005	2025	21	26	Cedigaz News Report

260	2	1982	Tepco	Japan	Pertamina+	Indonesia	0.70	1984	2004	21	15	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 128)
261	2	2003	Tepco	Japan	Pertamina+	Indonesia	0.70	2004	2009	5	4	Oil & Gas Journal Newsletter (2007) - 15.01.07
262	2	1982	Tepco	Japan	n.a.	Indonesia	0.69	1984	2004	21	14	Cedigaz News Report
263	2	1975	Toho Gas	Japan	Pertamina+	Indonesia	0.07	1977	2000	24	2	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 128)
264	2	1998	Toho Gas	Japan	Pertamina+	Indonesia	1.76	2000	2010	11	19	Wybrew-Bond and Stern (2002, p. 128)
265	2	1981	Toho Gas	Japan	Pertamina+	Indonesia	0.76	1983	2002	20	15	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 128)
266	2	2000	Toho Gas	Japan	Pertamina+	Indonesia	0.74	2002	2009	8	6	Wybrew-Bond and Stern (2002, p. 128)
267	2	1992	Toho Gas	Japan	Pertamina+	Indonesia	0.14	1994	2014	21	3	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 128)
268	2	1982	Tohoku	Japan	Pertamina+	Indonesia	4.05	1984	2004	21	85	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 128)
269	2	2009	Tohoku Electric	Japan	n.a.	Indonesia	0.17	2010	2024	15	2	GIIGNL (2010)
270	2	1992	Tokyo Gas	Japan	Pertamina+	Indonesia	1.08	1994	2014	21	23	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 128)
271	2	2004	Sempra	Mexico	Tangghu	Indonesia	5.38	2008	2029	22	118	GIIGNL (2009)
272	2	2004	K Power	South Korea	Tangguh	Indonesia	1.08	2006	2025	20	22	www.focus.comdirect.co.uk
273	2	1983	Kogas	South Korea	Pertamina+	Indonesia	3.11	1986	2007	22	68	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 200)
274	2	1991	Kogas	South Korea	Pertamina+	Indonesia	2.70	1994	2014	21	57	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 200)
275	2	1995	Kogas	South Korea	Pertamina+	Indonesia	1.35	1998	2017	20	27	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 200)
276	2	2011	Kogas	South Korea	Tangguh (BP)	Indonesia	0.97	2015	2027	13	13	GIIGNL (2012)
277	2	2003	Posco	South Korea	Tangghu	Indonesia	0.76	2005	2024	20	15	GIIGNL (2009)
278	2	1988	CPC	Taiwan	Pertamina+	Indonesia	2.03	1990	2010	21	43	http://gmaiso.free.fr/lng
279	2	1996	CPC	Taiwan	Pertamina+	Indonesia	2.48	1998	2018	21	52	http://gmaiso.free.fr/lng
280	2	2007	Quintero	Chile	BG	International	2.35	2010	2030	21	49	Oil & Gas Journal, 11 June 2007
281	2	2013	CNOOC	China	BG	International	6.90	2015	2034	20	138	GIIGNL (2014)
282	2	2008	GdF Suez	France, Spain	Shell	International	0.55	2013	2032	20	11	GIIGNL (2009)
283	2	2013	GSPC	India	BG	International	1.73	2015	2034	20	35	www.hydrobcarbonprocessing.com
284	2	2010	Osaka Gas	Japan	Shell	International	1.10	2012	2036	25	28	GIIGNL (2011)
285	2	2011	Dong	Netherlands	Iberdrola	International	1.00	2012	2021	10	10	Iberdrola press release (01 June 2011)
286	2	2011	Kogas	South Korea	Total	International	2.76	2014	2031	18	50	GIIGNL (2012)
287	2	2011	BP	Spain	Iberdrola	International	0.50	2012	2021	10	5	Iberdrola press release (01 June 2011)
288	2	2005	n.a.	India	n.a.	Iran	6.75	2010	2034	25	169	Oil & Gas Journal (20 June 2005)
289	2	1968	Enagas	Spain	NOC	Libya	1.24	1971	1990	20	25	http://gmaiso.free.fr/lng
290	2	1990	Enagas	Spain	NOC	Libya	1.24	1991	2008	18	22	Cedigaz News Report

291	2	1979	Gas Natural Fenosa	Spain	NOC	Libya	0.76	1981	2004	24	18	GIIGNL (2012)
292	2	2002	Gas Natural Fenosa	Spain	NOC	Libya	0.76	2004	2012	9	7	GIIGNL (2012)
293	2	2006	CNOOC	China	Petronas	Malaysia	4.18	2009	2033	25	105	Oil & Gas Journal, 26 Oct 2009
294	2	2003	Hiroshima Gas	Japan	MLNG	Malaysia	0.11	2005	2012	8	1	Oil & Gas Journal (25 July 2005)
295	2	2001	Japex	Japan	MLNG	Malaysia	0.66	2003	2020	18	12	LNG project database underlying Ruester (2010)
296	2	1994	Kansai Elec.	Japan	MLNG	Malaysia	0.57	1995	2015	21	12	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 129)
297	2	1994	Osaka Gas	Japan	MLNG	Malaysia	0.81	1995	2015	21	17	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 129)
298	2	2002	Osaka Gas	Japan	MLNG	Malaysia	0.16	2004	2023	20	3	Wybrew-Bond and Stern (2002, p. 129)
299	2	1990	Saibu Gas	Japan	MLNG	Malaysia	0.49	1993	2013	21	10	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 129)
300	2	1996	Sendai Gas	Japan	MLNG	Malaysia	0.20	1997	2017	21	4	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 129)
301	2	1996	Shizuoka Gas	Japan	MLNG	Malaysia	0.61	1996	2015	20	12	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 129)
302	2	2013	Shizuoka Gas	Japan	MLNG	Malaysia	0.41	2016	2025	10	4	GIIGNL (2014)
303	2	1981	Tepco	Japan	MLNG	Malaysia	6.48	1983	2003	21	130	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 129)
304	2	2003	Tepco	Japan	MLNG	Malaysia	6.48	2003	2018	16	104	Wybrew-Bond and Stern (2002, p. 129)
305	2	1993	Toho Gas	Japan	MLNG	Malaysia	0.38	1995	2015	21	8	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 129)
306	2	2002	Toho Gas	Japan	MLNG	Malaysia	0.30	2004	2023	20	6	Wybrew-Bond and Stern (2002, p. 129)
307	2	1994	Tohoku Elec.	Japan	MLNG	Malaysia	0.68	1996	2015	20	14	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 129)
308	2	2003	Tohoku Elec.	Japan	MLNG	Malaysia	0.68	2005	2024	20	14	Wybrew-Bond and Stern (2002, p. 129)
309	2	1981	Tokyo Gas	Japan	MLNG	Malaysia	3.51	1983	2003	21	70	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 129)
310	2	2003	Tokyo Gas	Japan	MLNG	Malaysia	3.51	2003	2018	16	56	Wybrew-Bond and Stern (2002, p. 129)
311	2	1994	Tokyo Gas	Japan	MLNG	Malaysia	1.08	1995	2015	21	23	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 129)
312	2	2002	Tokyo Gas	Japan	MLNG	Malaysia	0.46	2004	2023	20	9	Wybrew-Bond and Stern (2002, p. 129)
313	2	1993	Kogas	South Korea	MLNG	Malaysia	2.70	1995	2015	21	57	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 200)
314	2	2001	Kogas	South Korea	MLNG	Malaysia	2.70	2003	2010	7	19	http://gmaiso.free.fr/lng
315	2	2005	Kogas	South Korea	MLNG	Malaysia	1.60	2008	2027	20	32	Oil & Gas Journal (25 July 2005)
316	2	1994	CPC	Taiwan	MLNG	Malaysia	3.04	1995	2014	20	64	http://gmaiso.free.fr/lng
317	2	2004	Centrica	UK	Petronas	Malaysia	3.00	2007	2021	15	45	Petronas press release (2004); Energie Informationsdienst 36/04
318	2	1992	GdF	France	NLNG	Nigeria	0.54	1999	2020.5	22.5	12	www.nigerianoil-gas.com/naturalgas/liquefied_natural_gas_project.htm
319	2	1997	Enel	Italy	NLNG	Nigeria	3.38	1999	2020.5	22.5	76	www.nigerianoil-gas.com/naturalgas/liquefied_natural_gas_project.htm
320	2	2001	ENI SPA	Italy	NLNG	Nigeria	1.50	2005	2025	21	32	Cedigaz News Report

321	2	2004	Shell W. LNG	Mexico	NLNG	Nigeria	1.52	2006	2025	20	30	GIIGNL (2009)
322	2	1997	Transgas	Portugal	NLNG	Nigeria	0.35	2004	2023	20	7	http://gmaiso.free.fr/lng
323	2	2002	Transgas	Portugal	NLNG	Nigeria	2.00	2005	2025	21	42	Cedigaz News Report
324	2	1999	Transgas	Portugal	NLNG	Nigeria	1.00	2002	2022	21	21	Cedigaz News Report
325	2	1992	Enagas	Spain	NLNG	Nigeria	1.61	1999	2019	21	34	http://gmaiso.free.fr/lng
326	2	2000	Enagas	Spain	NLNG	Nigeria	2.70	2002	2022	21	57	http://gmaiso.free.fr/lng
327	2	2003	Endesa	Spain	NLNG	Nigeria	1.04	2005	2025	21	22	GIIGNL (2012)
328	2	2003	ENI SPA	Spain	NLNG	Nigeria	1.59	2006	2028	23	37	GIIGNL (2012)
329	2	2003	Galp Energia	Spain	NLNG	Nigeria	0.25	2005	2016	12	3	GIIGNL (2012)
330	2	2004	Galp Energia	Spain	NLNG	Nigeria	1.96	2006	2026	21	41	GIIGNL (2012)
331	2	2000	Galp Energia	Spain	NLNG	Nigeria	1.01	2002	2022	21	21	GIIGNL (2012)
332	2	1997	Galp Energia	Spain	NLNG	Nigeria	0.36	1999	2022	24	9	GIIGNL (2012)
333	2	2003	Iberdrola	Spain	NLNG	Nigeria	0.50	2005	2026	22	11	www.africaonline.com/site/Articles/1,3,52627.jsp
334	2	2001	Iberdrola	Spain	GNA	Nigeria	1.38	2003	2020	18	25	GIIGNL (2012)
335	2	1995	Botas	Turkey	NLNG	Nigeria	1.20	1999	2020	22	25	http://gmaiso.free.fr/lng
336	2	2003	Total	US/Europe	NLNG	Nigeria	1.20	2007	2026	20	24	Gas Matters Today 18/09/03; Petroleum Argus (2003): Vol. VII, No.19, 02/10/03, p.7; Cedigaz News Report 42/39/2
337	2	2003	BG	USA	NLNG	Nigeria	3.38	2005	2024	20	68	Gas Matters Today 13/05/03; World Gas Intelligence (2003): Vol. XIV(42) 15/10/03
338	2	2004	GdF	France	n.a.	Norway	0.70	2008	2025	18	13	Tusiani and Shearer (2007)
339	2	2004	Total	France	n.a.	Norway	1.10	2008	2025	18	20	Tusiani and Shearer (2007)
340	2	2001	Iberdrola S.A	Spain	Statoil, RWE, Hess, Petoro	Norway	1.60	2008	2025	18	29	Statoil press release (2001): www.statoil.com/STATOILCOM/SVG00990.NSF/UNID/41..
341	2	2003	BP	Europe	Oman LNG	Oman	5.40	2004	2009	6	32	Cedigaz News Report (2003): 42/24/2; Alexander´s Gas & Oil Connections (2003): 8(13) 26/06/03
342	2	2004	Itochu	Japan	Oman LNG	Oman	0.95	2006	2025	20	19	Oil & Gas Journal, 12.07.2004, p.9; GIIGNL, 2009
343	2	2004	Mitsubishi	Japan	Oman LNG	Oman	1.08	2006	2020	15	16	Oil & Gas Journal, 12.07.2004, p.9; GIIGNL, 2009
344	2	1998	Osaka Gas	Japan	Oman LNG	Oman	0.89	2000	2024	25	22	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 129)
345	2	2004	Osaka Gas	Japan	Oman LNG	Oman	1.08	2009	2025	17	18	Oil & Gas Journal, 12.07.2004, p.9
346	2	1996	Korea Gas Co.	South Korea	Oman LNG	Oman	2.67	2000	2024	25	67	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 200)
347	2	2002	BP	Spain	Oman LNG	Oman	0.91	2004	2010	7	6	LNG project database underlying Ruester (2010)
348	2	2000	Shell Western	Spain	Oman LNG	Oman	0.95	2002	2007	6	6	http://gmaiso.free.fr/lng
349	2	2004	Union Fenosa Gas	Spain	Qalhat LNG	Oman	2.28	2006	2025	20	46	GIIGNL (2009)

350	2	2009	Sinopec	China	PNG	Papua New Guinea	2.76	2014	2033	20	55	GIIGNL (2010)
351	2	2009	Osaka Gas	Japan	PNG	Papua New Guinea	2.07	2014	2033	20	41	GIIGNL (2010)
352	2	2009	Tepco	Japan	PNG	Papua New Guinea	2.48	2014	2033	20	50	GIIGNL (2010)
353	2	2010	CPC	Taiwan	PNG	Papua New Guinea	1.66	2014	2033	20	33	Oil & Gas Journal, 8 March 2010
354	2	2011	Enarsa	Argentina	Qatargas	Qatar	6.90	2014	2033	20	138	www.lngworldnews.com (29 June 2011)
355	2	2005	Distrigas	Belgium	RasGas	Qatar	2.83	2007	2027	21	59	GIIGNL (2009)
356	2	2008	CNOOC	China	Qatargas	Qatar	2.76	2009	2033	25	69	Oil & Gas Journal, 26 Oct 2009
357	2	2008	Petrochina	China	Qatargas	Qatar	4.14	2011	2035	25	104	GIIGNL (2009)
358	2	2008	Shell Western	China	Qatargas	Qatar	4.14	2011	2035	25	104	www.lngworldnews.com (20 Nov 2011)
359	2	2003	Petronet	India	RasGas	Qatar	6.75	2004	2028	25	169	Cedigaz News Report (2003): 42/41/2
360	2	2003	Petronet	India	RasGas	Qatar	3.40	2004	2024	21	71	LNG project database underlying Ruester (2010)
361	2	2001	Edison Gas	Italy	RasGas	Qatar	6.30	2007	2031	25	158	Oil & Gas Journal 01/12/2003
362	2	1992	Chubu Electric	Japan	Qatargas	Qatar	5.40	1997	2022	26	14	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 129)
363	2	2011	Chubu Electric	Japan	Qatargas	Qatar	0.28	2014	2019	6	2	GIIGNL (2012)
364	2	1994	Chugoku Elec.	Japan	Qatargas	Qatar	0.16	1999	2022	24	4	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 129)
365	2	1994	Kansai Elec.	Japan	Qatargas	Qatar	0.39	1999	2022	24	10	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 129)
366	2	1994	Osaka Gas	Japan	Qatargas	Qatar	0.47	1998	2022	25	12	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 129)
367	2	1994	Tepco	Japan	Qatargas	Qatar	0.27	1999	2022	24	6	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 129)
368	2	1994	Toho Gas	Japan	Qatargas	Qatar	0.23	2000	2022	23	6	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 129)
369	2	1994	Tohoku Elec.	Japan	Qatargas	Qatar	0.70	1999	2022	24	17	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 129)
370	2	1994	Tokyo Gas	Japan	Qatargas	Qatar	0.47	1998	2022	25	12	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 129)
371	2	2011	Petronas	Malaysia	Qatargas	Qatar	2.07	2013	2032	20	41	Oil & Gas Journal, 1 Aug 2011
372	2	2008	Total Gas & Power	Mexico	Qatargas	Qatar	0.97	2009	2028	20	19	Oil & Gas Journal, 14 Jan 2008
373	2	2013	E.ON Global Commodities	Netherlands	Qatargas	Qatar	2.07	2014	2018	5	10	GIIGNL (2014)
374	2	2009	PGNiG	Poland	Qatargas	Qatar	1.38	2015	2034	20	28	Oil & Gas Journal, 6 July 2009
375	2	1995	Kogas	South Korea	RasGas	Qatar	6.48	1999	2024	26	168	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 200)
376	2	2005	Kogas	South Korea	RasGas	Qatar	2.90	2007	2026	20	58	GIIGNL (2009)
377	2	2008	PTT LNG	South Korea	Qatargas	Qatar	1.38	2011	2020	10	14	Oil & Gas Journal, 3 Mar 2008
378	2	2003	Endesa	Spain	RasGas	Qatar	1.08	2005	2024	20	22	Alexander's Gas & Oil Connections (2003): 8(16) 21/08/03; Gas Matters Today 31/07/03

379	2	2002	ENI SPA	Spain	RasGas	Qatar	1.04	2004	2023	20	21	GIIGNL (2009)
380	2	2001	Gas Natural Group	Spain	Qatargas	Qatar	2.03	2001	2012	12	24	GIIGNL (2009)
381	2	2001	Gas Natural Group	Spain	Qatargas	Qatar	0.78	2002	2007	6	5	Cedigaz News Report
382	2	2001	Iberdrola	Spain	Qatargas	Qatar	1.21	2003	2022	20	24	GIIGNL (2009)
383	2	2003	CPC	Taiwan	RasGas	Qatar	2.27	2008	2028	21	48	Cedigaz News Report
384	2	2013	Centrica	UK	Qatargas	Qatar	1.52	2014	2018	5	8	GIIGNL (2014)
385	2	2006	Centrica	UK	RasGas	Qatar	3.40	2008	2027	20	68	Oil & Gas Journal, 10 Nov 2008
386	2	2006	Chubu Electric	Japan	Sakhalin Energy	Russia	0.67	2011	2025	15	10	Platts press release (12 July 2006)
387	2	2004	Kyushu Elec.	Japan	Sakhalin Energy	Russia	0.68	2010	2032	23	16	Shell News Release (2004) - 09.06.04; Platts International Gas Report (2003): Issue 483
388	2	2009	Osaka Gas	Japan	Sakhalin Energy	Russia	0.28	2010	2032	23	6	GIIGNL (2010)
389	2	2004	Tepco	Japan	Sakhalin Energy	Russia	2.00	2009	2030	22	44	Gas Matters Today. 19/05/03; www.oilandgasreporter.com
390	2	2003	Tokyo Gas	Japan	Sakhalin Energy	Russia	1.50	2009	2030	22	33	Gas Matters Today. 19/05/03; www.oilandgasreporter.com; Oil & Gas Journal (2005) - 20.06.05, p.10
391	2	2003	Tokyo Gas	Japan	Sakhalin Energy	Russia	0.68	2010	2029	20	14	Oil & Gas Journal (20 June 2005)
392	2	2006	Toho Gas	Japan	Sakhalin Energy	Russia	0.97	2009	2027	19	18	Tusiani and Shearer (2007)
393	2	2006	Tohoku Gas	Japan	Sakhalin Energy	Russia	0.70	2010	2030	21	15	Tusiani and Shearer (2007)
394	2	2006	Hiroshima Gas	Japan	Sakhalin Energy	Russia	0.41	2008	2028	21	9	Tusiani and Shearer (2007)
395	2	2013	Saibu Gas	Japan	Sakhalin Energy	Russia	0.14	2014	2027	14	2	GIIGNL (2014)
396	2	2005	Kogas	South Korea	Sakhalin Energy	Russia	2.03	2010	2030	20	41	Itar-Tass press release (2005)
397	2	2007	Repsol YPF	Canada	ALNG	Trinidad & T.	1.38	2009	2027	19	26	GIIGNL (2012)
398	2	2001	AES Group	Dom. Rep.	ALNG	Trinidad & T.	1.01	2003	2023	21	21	Cedigaz News Report
399	2	2000	BP	International	ALNG	Trinidad & T.	1.10	2002	2021	20	22	GIIGNL (2012)
400	2	1998	EcoElectrica	Puerto Rico	ALNG	Trinidad & T.	0.35	2000	2020	21	7	Cedigaz News Report
401	2	1997	Enagas	Spain	ALNG	Trinidad & T.	1.62	1999	2019	21	34	http://gmaiso.free.fr/lng
402	2	2003	Gas Natural	Spain	ALNG	Trinidad & T.	2.10	2004	2023	20	42	Europe Energy (2003): 822, April 8
403	2	2009	GNA	Spain	ALNG	Trinidad & T.	0.99	2009	2013	5	5	GIIGNL (2010)
404	2	2001	Naturgas Energia	Spain	ALNG	Trinidad & T.	0.97	2003	2023	21	20	GIIGNL (2012)
405	2	2004	Repsol YPF	Spain	ALNG	Trinidad & T.	1.56	2006	2023	18	28	GIIGNL (2012)
406	2	2011	GAIL	India	Cheniere	USA	4.83	2017	2036	20	97	Reuters (11 Dec 2011)
407	2	2013	Petronet	India	United LNG	USA	5.52	2018	2037	20	110	www.hydrobcarbonprocessing.com

408	2	2013	Pertamina	Indonesia	Cheniere	USA	1.10	2018	2037	20	22	GIIGNL (2014)
409	2	2011	BG	International	Cheniere	USA	4.83	2017	2036	20	97	Cheniere news release (26 Oct 2011); IEA (2013)
410	2	2013	BP	International	Freeport	USA	6.00	2017	2036	20	120	www.hydrobcarbonprocessing.com
411	2	2013	GdF Suez	International	Sempra Cameron	USA	5.52	2018	2037	20	110	IEA (2013); LNGWorldnews
412	2	2012	Total	International	Cheniere	USA	2.76	2017	2036	20	55	IEA (2013); Reuters
413	2	2013	Chubu Electric	Japan	Freeport	USA	3.00	2017	2036	20	60	www.hydrobcarbonprocessing.com
414	2	2013	Mitsubishi	Japan	Sempra Cameron	USA	5.52	2018	2037	20	110	IEA (2013); LNGWorldnews
415	2	2013	Mitsui	Japan	Sempra Cameron	USA	5.52	2018	2037	20	110	IEA (2013); LNGWorldnews
416	2	2013	Osaka Gas	Japan	Freeport	USA	3.00	2017	2036	20	60	www.hydrobcarbonprocessing.com
417	2	2013	Sumitomo	Japan	Dominion Energy	USA	3.17	2017	2036	20	63	IEA (2013); Reuters
418	2	2012	Kogas	South Korea	Cheniere	USA	4.83	2017	2036	20	97	Reuters (30 Jan 2012)
419	2	2011	Gas Natural Fenosa	Spain	Cheniere	USA	4.83	2017	2036	20	97	Reuters (21 Nov 2011)
420	2	2013	Centrica	UK	Cheniere	USA	2.42	2018	2037	20	48	www.hydrobcarbonprocessing.com
421	2	1967	Tepco	Japan	Phil-lips/Marathon	USA-Alaska	1.23	1969	1988	20	25	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 128)
422	2	1987	Tepco	Japan	Phil-lips/Marathon	USA-Alaska	1.23	1989	2004	16	20	Cedigaz News Report
423	2	2002	Tepco	Japan	Phil-lips/Marathon	USA-Alaska	1.23	2005	2009	5	6	Oil & Gas Journal Newsletter (2007) - 15.01.07
424	2	1967	Tokyo Gas	Japan	Phil-lips/Marathon	USA-Alaska	0.45	1969	1988	20	9	http://gmaiso.free.fr/lng; Wybrew-Bond and Stern (2002, p. 128)
425	2	1987	Tokyo Gas	Japan	Phil-lips/Marathon	USA-Alaska	0.45	1989	2004	16	7	Cedigaz News Report
426	2	2005	Tractabel	Belgium	YLNG	Yemen	3.40	2009	2028	20	68	Oil & Gas Journal (26 Sept 2005)
427	2	2005	Total	France	YLNG	Yemen	2.70	2009	2028	20	54	Oil & Gas Journal (26 Sept 2005)
428	2	2005	Kogas	South Korea	YLNG	Yemen	1.80	2008	2027	20	36	Oil & Gas Journal (26 Sept 2005)

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