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Abstract of the report

Liberalization of Gas Industries in Europe and the U.S.[1]
LNG terminals' third-party access in Europe and the U.S., and state-by-state status of gas industries in the U.S.

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<Background and Objective of Research>

In accordance with discussions held over a period of a year by the "The Study Forum on Gas Regulatory Reform" - a private study forum of the Ministry of Economy, Trade, and Industry - regarding reform of the Japanese gas industry, in April 2002, the "Grand Design (Long-Term Policy Prospects)" was presented as the fundamental policy. Based on the discussions of the forum, discussions on system reform will be resumed from this fall by the government's Gas Utility Industry Committee.

This study focused particularly on "Expansion of the Scope of Retail Liberalization" and "LNG Terminals' Third-Party Access" (hereinafter referred to as "TPA") of all system reform items discussed by the forum. The state-by-state situations[2] in the U.S. and the nation-by-nation statuses[3] in Europe and the U.S. were surveyed for the former and the latter, respectively.

When we look at the U.S. gas market in terms of "Retail Liberalization," we find that the gas distribution stage is under the authority of Public Utility Commission (PUC) - the regulatory body of each state - and the progress of liberalization, particularly that of retail sales to home-use consumers, varies from state to state.

For "LNG Terminals' TPA," on the other hand, access systems are individually established in respective countries based on the orders of the Federal Energy Regulatory Committee (FERC) in the U.S. and EU Gas Directive in Europe.

This survey is intended not only to enable understanding of the status of overseas gas industries, but also to clarify the considerations in pushing ahead with "Expansion of the Scope of Retail Liberalization" and "LNG Terminals' TPA" in Japan, in light of the differences between overseas gas markets and ours.

<Conclusion>

I. Liberalization of gas markets in the U.S.

1. The liberalization level of gas markets in the U.S. varies among states; as of December 2001, total liberalization including that for residential consumers has been achieved in six states, while partial liberalization for residential consumers has been achieved in seven states. Further, it is possible for residential consumers to select suppliers in eight states through voluntary pilot programs established by the Local Distribution Companies (LDCs).
2. As a result of the upsurge in natural-gas prices in the winter of 2000-2001, hedging against risks of price-volatility of procured gas and the provider of last resort[4] (POLR) to consumers associated with the expansion of liberalization became serious issues for the LDCs and the state's regulatory authority (State of Georgia). Moreover, the bankruptcy of Enron (end of 2001) - a firm that had been in the limelight due to its energy trading - has had no little impact on states' liberalization policies.
3. When we look at the percentages of consumers selecting marketers (migration) in those states in which residential consumers' liberalization is progressing, we find that they are 37.7%, 12.5%, and 6.8% for the States of Ohio, Pennsylvania, and Michigan, respectively, while the percentages are 3.0% or less in the remainder of the ten states selected for this research (figures based on the number of customers). As

for residential consumers' liberalization, LDC pilot programs have been newly approved in the States of Michigan, Ohio, and others. However, pilot programs for liberalization were discontinued in the States of Delaware and Wisconsin due to the fact that marketers were unable to become price-competitive over existing LDCs.

4. LDC-conducted unbundled transportation service is similar to that in Japan in that charges are basically set in "Cost of Service" basis. In the states targeted for this study, however, imbalance (the difference between the amount consumed at demand-side and the actual amount of gas transported) is determined on a daily basis and settled on a monthly basis (with Japanese system, imbalance is determined every hour).
5. States and LDCs are establishing systems and strategies for public-interest-related challenges such as "Supply Reliability," "Provider of Last Resort (POLR)," "Stranded Cost,"[5] and "Consumer Protections such as for Low-Income and Elderly Consumers" in pushing ahead with liberalization. Among such efforts, how the LDC-committed interstate-pipeline capacity and underground-storage-system capacity are to be maintained by LDCs or assigned to marketers has become important in terms of securing "Supply Reliability" in winter demand period and ensuring that LDCs are able to recover the "Stranded Cost."

- Considerations in expanding the scope of retail liberalization in Japan

1. The LDC-committed interstate-pipeline capacity cost (including expenses arising from capacity contracts) is often taken up first as a stranded cost for LDCs in the U.S. If we look at stranded costs in Japan from the same viewpoint as in the U.S., these costs correspond to contracts such as LNG purchase contracts concluded, and natural-gas wholesale supply contracts prior to expansion of the scope of liberalization. Future challenges will likely include appropriately evaluating the stranded costs of these contracts arising from breakaway demand, and taking necessary recovering measures in consideration of operators' (gas utilities') managerial efforts.
2. In the U.S., imbalance is often determined on a daily basis and settled on a monthly basis. In Japan, however, if we assume that liberalization will be expanded to residential consumers, questions of whether to provide a separate balancing menu in addition to existing balancing (demand adjustment) by the hour as in the current system, how to meter gas on the demand side during transportation service by gas utilities, and how to determine imbalance will need to be addressed.
3. Japan is headed in the direction in which the "borders between energy industries" will be removed as a result of amendment of the Electric and Gas Utility Industry Laws. At the same time, questions have been raised regarding the concept of "fair competition" in competition between electric, gas, and oil industries. In the future, issues concerning mutual market entries, operation permits, taxes, and obligations of stockpiling will be among the subjects of debate.

II. LNG terminals' TPA in Europe and the U.S.

1. In the United States, LNG terminals' TPA is regulated, as in the case of interstate pipelines, based on the FERC Order. In Europe, Spain and Italy established their regulated TPAs (hereinafter referred to as "R-TPAs" in 1997 and 2001, respectively, based on EU directives, as in the case of the U.S. Belgium, on the other hand, is in a transitional stage from Negotiated TPA (TPA based on negotiations between operators) to R-TPA. In France, however, the TPA rules were established voluntarily in August of 2000 by the operator (Gaz de France).
2. LNG terminals in Europe and the U.S. generally offer a higher regasified-gas delivery capacity relative to the LNG storage capacity compared to terminals in Japan, thus providing a higher apparent facility utilization factor. Note, however, that this is probably due to the fact that the demand-adjustment and stockpiling functions are rarely requested for LNG storage tanks, unlike in Japan, due to the availability of the underground storage system[6].
3. LNG accounts for only a several-percent share[7] of the natural-gas supply in both Europe and the U.S. However, its demand is expected to increase substantially in the future, with power generation as the

primary application, and as a result the building of many terminals is planned. In relation to the construction of new LNG terminals, Italy has set a higher rate of return for new terminals than for existing ones, to enhance economic incentive for investment.

4. Except for in Spain, establishment of the LNG terminals' TPA systems in Europe began in around 2000, and these systems are therefore in the early stage of introduction. To determine whether the LNG terminals' TPA system is actually useful at the time of access to the gas market of the country concerned by a new entrant (shipper), it is necessary to comprehensively evaluate factors such as access to the underground storage system, as required for demand adjustment and calculation of the pipeline utilization charge.
5. Although gas trading with liquidity (spot trading or resale) can be considered one of the factors in enhancing LNG terminals' TPA, European operators are aware of the importance of upgrading the natural-gas infrastructure in preparation for the future increase in demand, and that this requires "operational stability" based on long-term contracts. As a result, attention must be paid to how EU Commission will go about competitive gas trading, such as through the "shortening of long-term contracts" and the "abolition of the destination clause,"[8] while ensuring long-term stable gas supply must also be taken into consideration.

- Considerations in Japan's LNG terminals' TPA

1. In cases in which there are no pipelines running across the country and natural gas markets are separately distributed over urban areas as in Japan, LNG terminals' TPA can be treated as an option for promoting competition if LNG trading with no "destination clause" becomes increasingly common.
2. Another challenge will be ensuring the scale of minimum consumption (sales volume) required of entrants for access to LNG terminals. For example, such a scale is generally larger than the size of a new PPS[9] power plant, if power-generation demand is premised on the size of the LNG tanker. Further, it is unclear whether TPA, which is intended for supply to newly built PPS power-generation facilities, will move amid the ongoing investment delays in power stations of existing power companies, and the lowering of electricity rates.
3. Moreover, Japanese less developed underground storage system compared with that in Europe and the U.S. requires that LNG storage tanks possess demand-adjustment and stockpiling functions. How storage-tank utilization charges are set in TPA-related negotiations between terminal owners and shippers is likely to become an important factor in the future, in consideration of the differences in the above-mentioned functions.

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[1] The contents of this report are based on the "Survey on TPA System Design and Operation of LNG Terminals in Europe and the U.S." and the "Detailed Survey on System Design Associated with LDC Level Liberalization in the U.S." commissioned by the Gas Market Section, Electric, and Gas Industry Division of the Ministry of Economy, Trade, and Industry and made public with the consent of METI.

[2] The states focused for the state-by-state status survey were selected in accordance with the progress level of retail liberalization; the ten (10) states chosen were New Jersey, Pennsylvania, Massachusetts, Ohio, Colorado, Illinois, Indiana, Michigan, Oklahoma, and Texas.

[3] The LNG-terminal TPA system survey focusing five nations, the United States, France, Belgium, Spain, and Italy, was conducted locally in Europe in February 2002.

[4] Refers to the final supply service used in liberalized markets if a consumer is unable to conclude a supply contract with a new supplier other than the existing LDC, or if a new supplier cannot provide gas service for any reason. Basically, an existing LDC plays that role.

[5] Refers to the costs associated with assets, contracts, and the like for which investment has become partially unrecoverable due to variations in market prices and demand as a result of regulatory changes and the progress of liberalization.

[6] Refers to the natural-gas storage system using abandoned gas fields, aquifers, salt domes, and the like that has been prevalent, particularly in Europe and the U.S. This system is utilized for stockpiling, season-to-season demand adjustment, and other purposes.

[7] As of 2000, LNG accounted for 8% and 1% of the total natural-gas supply in Europe and the U.S., respectively.

8 Said clause is normally included in the gas-supply contracts concluded between gas producers such as Algeria, Russia, and Norway and European consumers, in which buyers are prohibited from reselling. The EU side demands that the provision be eliminated, claiming that it constitutes a detriment to the "formation of competitive gas markets."

9 New entrants to power retail markets. Abbreviation for "Power Producer and Supplier."

<Description>

(1) Liberalization of U.S. gas markets

As for interstate gas trade, the U.S. pushed forward with ensuring interstate pipelines' open access and unbundling gas transport/sales features, particularly since 1985 and primarily through FERC Orders 436 and 636. At the same time, the U.S. has seen the state-level stage-by-stage expansion of liberalization, including residential consumers and the LDC-handled provision of transportation service.

From a national standpoint, the level of liberalization varies among states, with some states already in a stage of complete liberalization including that of residential consumers, or in a tryout stage in the form of pilot programs and the like limited to the liberalization of only industrial large-volume consumers.

States in the stage of 100% liberalization of residential consumers and those on the ways to enacting such liberalization are relatively those consuming much natural gas, with some exceptions.

As for liberalization for residential consumers, issues such as last resort to consumers (State of Georgia) and price volatility risk handling by LDCs (price hedging) have raised concerns. Because of incidents such as the natural-gas price upsurge in the winter of 2000-2001, California's power crisis and the bankruptcy of Enron, whose major business transactions were centered on energy marketing, more careful examination is needed with regard to recent pro-liberalization discussions. In the case of LDC-conducted pilot programs, some were discontinued based on the judgment that market competition was not effectively functioning in terms of marketers' activities and consumers' program participation level (States of Delaware and Wisconsin).

Fig-Table 1: Structural Change in the Natural-Gas Industry (Upstream to Downstream)

Well source

1978 1985 1989 2000

Liberalization of natural-gas prices	Transition to competitive natural-gas prices

Natural Gas Policy Act1978
Newly developed gas-price liberalization
→Increase in natural-gas prices

Natural Gas Wellhead Decontrol Act 1989
Full liberalization of natural-gas prices

(Interstate) pipeline operators

1978 1985 1990 1992 1993/94 2000

Pipeline operators with gas sales function	(Interstate) pipeline open access	Transformation of the pipeline transport capacity into a commercially tradable "commodity"

FERC Order 436
Voluntary open access

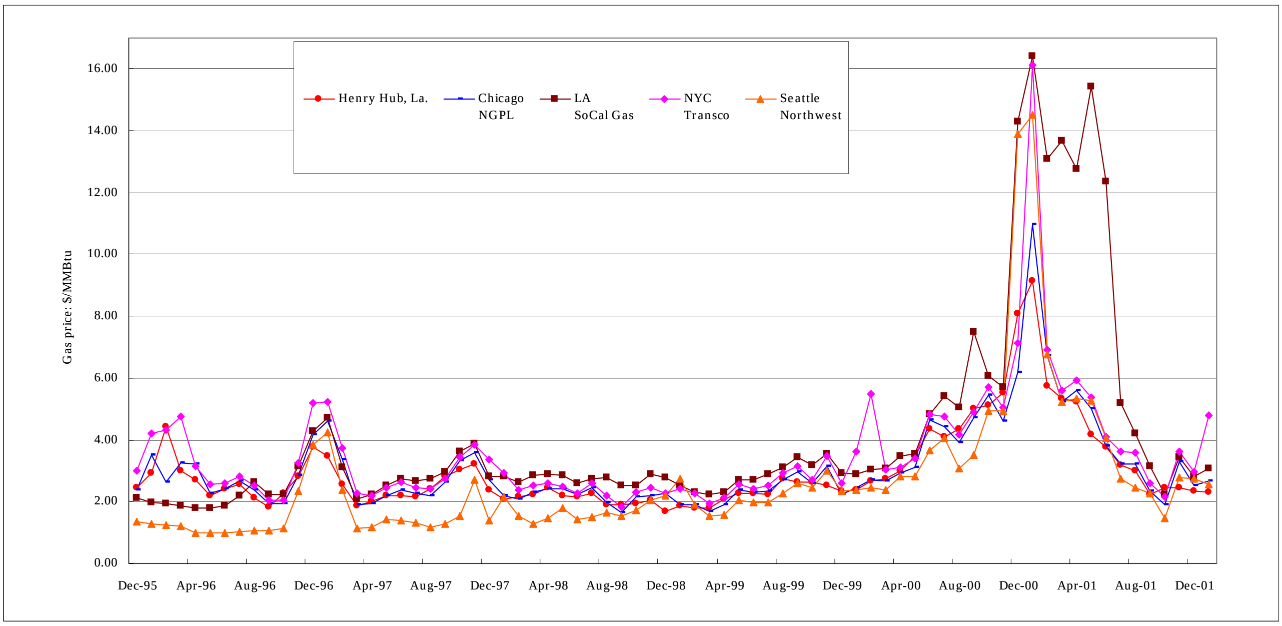
FERC Order 636
Mandatory open access (exception: DOMAC)

Gas (sales) operators

Bundled service only	Provision of LDCs' transport service to large-volume consumers	Liberalization of small-volume consumers

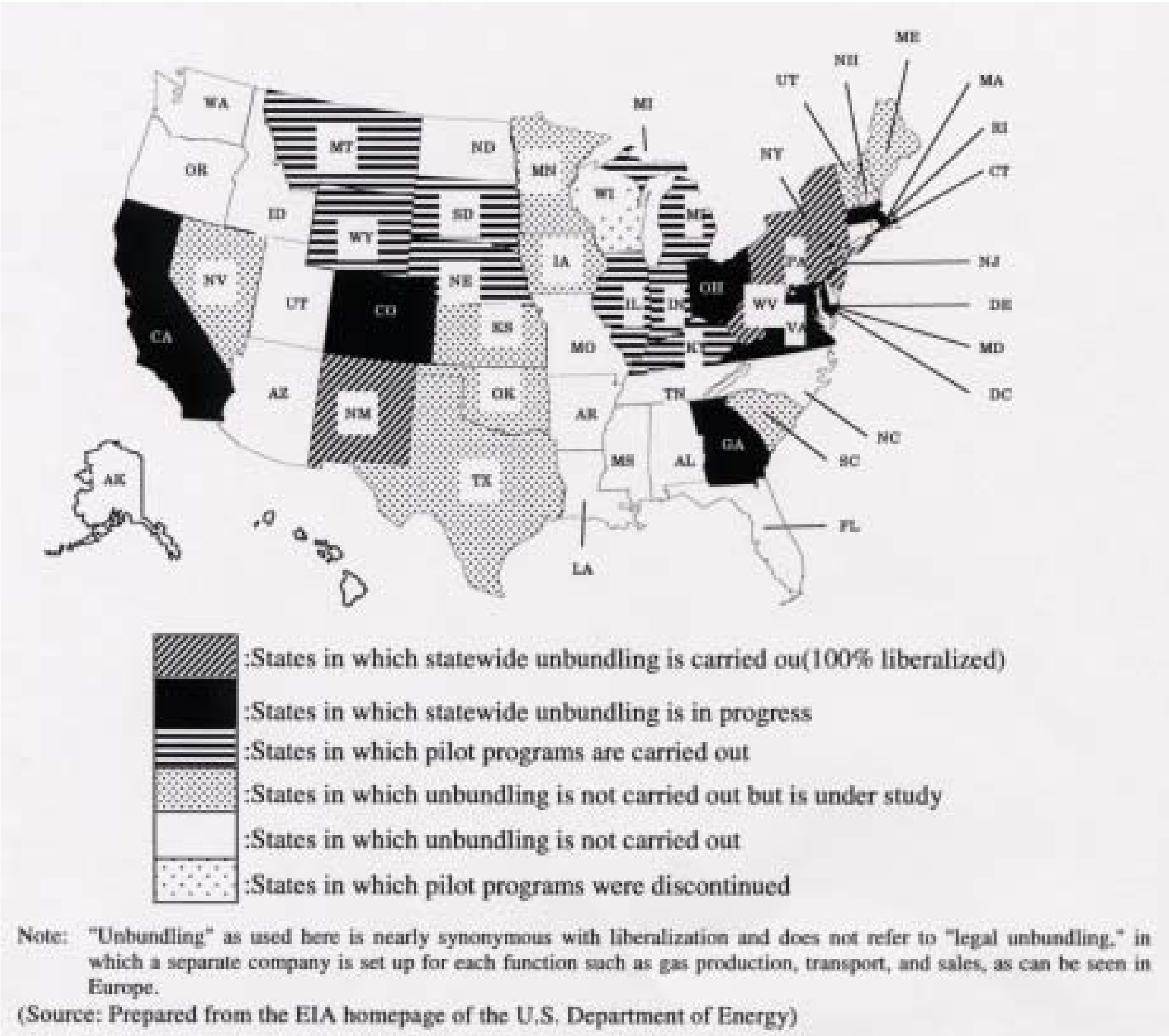
(Source: Prepared from data provided by Arthur Andersen/CERA)

Fig-Table 2: Gas-Price Changes at Major Hubs and City Gates (December 1995 through January 2002)



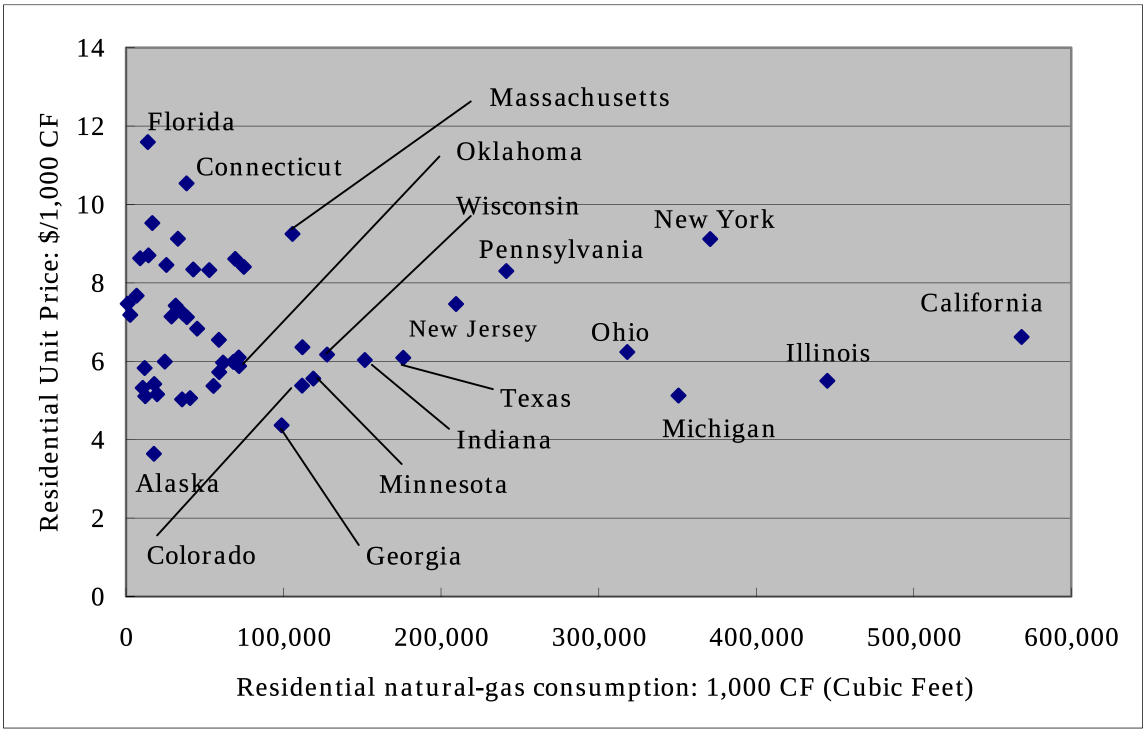
(Source: Prepared from the Natural-Gas Week Database)

Fig-Table 3: Statuses of Liberalization for Home-Use Consumers in North America (as of December 2001)



Liberalization stage	States (The shaded states are those surveyed in this study.)
Statewide unbundling carried out	Washington DC(DC), New Jersey (NJ), New Mexico (NM), New York (NY), Pennsylvania (PA), West Virginia (WV)
Statewide unbundling in progress	California (CA), Colorado (CO), Georgia (GA), Maryland (MD), Massachusetts (MA), Ohio (OH), Virginia (VA)
Pilot programs carried out	Illinois (IL), Indiana (IN), Kentucky (KY), Michigan (MI), Montana (MT), Nebraska (NE), South Dakota (SD), Wyoming (WY)
Unbundling not carried out but under study	Iowa (IA), Kansas (KS), Maine (ME), Minnesota (MN), Nevada (NV), New Hampshire (NH), Oklahoma (OK), South Carolina (SC), Texas (TX), Vermont (VT)
Unbundling not carried out	Alaska (AK), Alabama (AL), Arkansas (AR), Arizona (AZ), Connecticut (CT), Florida (FL), Hawaii (HI), Idaho (ID), Louisiana (LA), Mississippi (MS), Missouri (MO), North Carolina (NC), North Dakota (ND), Oregon (OR), Rhode Island (RD), Tennessee (TN), Utah (UT), Washington (WA)
Pilot programs discontinued	Delaware (DE), Wisconsin (WI)

Fig-Table 4: Relationship between Home-Use Natural-Gas Consumption and Home-Use Price (1999)



(Source: Prepared from the EIA Natural Gas Annual of the Information Agency of the U.S. Department of Energy)

Fig-Table 5: Basic Characteristics of the 10 States Surveyed (1999)

State	Home-use natural-gas consumption ranking	Home-use natural-gas consumption share %	Home-use natural-gas price ranking	Gas self-sufficiency %	Storage dependence %	Commencement of liberalization for large-volume & residential consumers
New Jersey	7th	34.2	18th	0.0	0.48	1995, 1997
Pennsylvania	6th	38.0	15th	6.3	12.5	1996, 1996
Massachusetts	14th	31.4	5th	0.0	1.57	1987, 1996
Ohio	5th	38.4	28th	4.5	8.18	1993, 1997
Colorado	13th	36.3	42nd	55.9	2.85	1982, 1999
Illinois	2nd	45.4	40th	0.01	9.08	-, 1997
Indiana	9th	25.9	32nd	0.04	1.15	1984, 1998
Michigan	4th	40.3	46th	13.6	18.9	1988, 1997
Oklahoma	21st	12.1	35th	73.4	5.7	1991, -
Texas	8th	4.7	31st	88.33	4.5	-

Note: The natural-gas consumption ranking is listed in order of descending consumption, while the natural-gas price ranking is listed in order of descending price.

Transport demand was excluded from natural-gas consumption in the calculation of consumption and residential shares.

Gas self-sufficiency and storage dependence represent the percentages of total supply (interstate trade and imports, gas production, and stored-gas delivery) accounted for by in-state production and stored-gas delivery, respectively.

Commencement of the liberalization of large-volume consumers is shown first, followed by that of residential consumers (commencement of pilot programs).

(Source: Prepared from the EIA, State Energy Data Report, and Natural Gas Annual of the U.S. Department of Energy)

When we look at the percentages of consumers selecting marketers (migration) in the states in which liberalization for residential consumers is moving ahead, we find that they are 37.7%, 12.5%, and 6.8% for the States of Ohio, Pennsylvania, and Michigan, respectively, while the percentages are 3% or less for the remainder of the ten states selected for this research (figures based on the number of customers). As for liberalization for residential consumers, LDC pilot programs have been newly approved in the States of Michigan, Ohio, and others. However, pilot programs for liberalization were discontinued in the States of Delaware and Wisconsin due to the fact that marketers were unable to achieve price-competitiveness over existing LDCs.

In response to price competition between marketers and LDCs, the State of Michigan, for example, saw several firms (e.g., Consumer Energy, MichCon (Michigan Consolidated Gas), and SEMCO) offer rate menus in which the procured-gas price was fixed for multiple years, as a result of which, also due to the natural-gas price upsurge in the winter of 2000-2001, marketers could not maintain a price-competitive edge over existing LDCs.

Fig-Table 6: Percentages of Customers Selecting Marketers in 10 States

Liberalization level - State		LDC	Number of customers residential(A)	Number of customers migrated (B)	%(B)/(A)
States in which 100% statewide liberalization for home-use consumers was carried out	New Jersey	Elizabethtown	235,792	0	0.0%
		NJNG	389,048	15,637	4.0%
		PSE&G	1,461,057	1,364	0.1%
		South Jersey	268,046	40,039	14.9%
		Total	2,353,943	57,040	2.4%
	Pennsylvania	Columbia Gas	392,000	120,221	30.7%
		Dominion Peoples	325,365	114,113	35.1%
		Equitable	239,102	24,499	10.2%
		PECO Gas	198,478	8	0.0%
		Total	2,072,621	258,841	12.5%
States in which statewide liberalization for home-use consumers is in progress	Massachusetts	Total	1,278,781	14,607	1.1%
	Ohio	CG&E	360,000	11,500	3.2%
		Columbia Gas	1,200,000	460,000	38.3%
		East Ohio Gas	1,100,000	530,000	48.2%
		Total	2,660,000	1,001,500	37.7%
	Colorado	Consignment service used by some large-volume consumers	1,315,619	3	0.0%
States in which pilot programs are carried out	Illinois	Total	3,631,762	65,833	1.8%
	Indiana	Total	1,590,925	10,001	0.6%
	Michigan	Consumers Energy		168,660	
		MichCon		31,200	
		SEMCO		3,732	
		Total	2,979,832	203,592	6.8%
States in which liberalization is	Oklahoma		887,371	-	-
	Texas		3,695,058	-	-

- Numerical data for the State of New Jersey is that available as of the end of December 2001.
- Numerical data for the State of Pennsylvania is that available as of January 2002.
- Numerical data for the State of Massachusetts is that available as of 2000. Note, however, that residential consumers' selection of customers is not conducted as of March 2002.
- Numerical data for the State of Ohio is that available as of November 2001.
- Numerical data for the State of Colorado is that available as of 2000.
- The number of customers who selected marketers and the number of residential customers for the State of Illinois are those available as of December 2001 and 2000, respectively.
- The number of customers who selected marketers and the number of residential customers for the State of Indiana are those available as of October 2001 and 2000, respectively.
- The number of customers who selected marketers and the number of residential customers for the State of Michigan are those available as of December 2001 and 2000, respectively.
- The numbers of residential customers for the States of Oklahoma and Texas are those available as of 2000.

(Source: Prepared from HPs for the respective states of the Department of Energy, EIA Natural-Gas Annual 2000, and other materials)

The five-year gas-price changes from 1995 through 2000 show that residential gas prices rose in all states surveyed. Note, however, that whether the proportion of increase in the residential gas price is larger than that for commercial-use and industrial-use gas prices varies among states.

Fig-Table 7: State-by-State Natural-Gas Price Changes

(Nominal Values from 1995 through 2000; Price Unit: $/1,000 Cubic Feet)

	1995	1999	2000	Price change 1995-99	Price change 1995-00		1995	1999	2000	Price change 1995-99	Price change 1995-00
State of New Jersey						State of Illinois					
City Gate	3.34	4.48	5.34	1.14	2	City Gate	2.59	3	5.01	0.41	2.42
Home use	7.27	7.46	7.28	0.19	0.01	Home use	4.66	5.5	7.33	0.84	2.67
Commercial use	5.76	3.99	5.92	-1.77	0.16	Commercial use	4.42	5.2	6.9	0.78	2.48
Industrial use	3.11	3.14	5.15	0.03	2.04	Industrial use	3.57	4.06	5.81	0.49	2.24
State of Pennsylvania						State of Indiana					
City Gate	3.09	3.65	5.09	0.56	2	City Gate	2.84	2.46	4.03	-0.38	1.19
Home use	7.16	8.3	8.49	1.14	1.33	Home use	5.37	6.03	6.42	0.66	1.05
Commercial use	6.28	7.29	7.72	1.01	1.44	Commercial use	4.38	5.17	5.74	0.79	1.36
Industrial use	3.9	3.99	5.03	0.09	1.13	Industrial use	3.41	4.16	5	0.75	1.59
State of Massachusetts						State of Michigan					
City Gate	3.53	3.74	5.43	0.21	1.9	City Gate	2.61	2.83	3.23	0.22	0.62
Home use	9.04	9.25	9.91	0.21	0.87	Home use	4.72	5.13	5.11	0.41	0.39
Commercial use	6.59	7.63	8.61	1.04	2.02	Commercial use	4.46	4.87	4.79	0.41	0.33
Industrial use	4.43	5.23	7.47	0.8	3.04	Industrial use	3.62	3.69	3.87	0.07	0.25
State of Ohio						State of Oklahoma					
City Gate	3.84	4.83	6.1	0.99	2.26	City Gate	2.52	2.84	3.91	0.32	1.39
Home use	5.46	6.24	7.7	0.78	2.24	Home use	5.56	5.97	7.36	0.41	1.8
Commercial use	4.92	5.59	7.02	0.67	2.1	Commercial use	4.48	5.11	6.43	0.63	1.95
Industrial use	3.93	3.94	5.12	0.01	1.19	Industrial use	2.27	3.52	5.3	1.25	3.03
State of Colorado						State of Texas					
City Gate	2.65	2.31	3.53	-0.34	0.88	City Gate	2.95	2.84	4.39	-0.11	1.44
Home use	4.8	5.38	6.14	0.58	1.34	Home use	5.92	6.09	7.41	0.17	1.49
Commercial use	4.23	4.43	5.37	0.2	1.14	Commercial use	4.09	4.42	5.74	0.33	1.65
Industrial use	2.86	2.82	3.49	-0.04	0.63	Industrial use	1.89	2.55	4.1	0.66	2.21

(Source: Prepared from the EIA Natural-Gas Annual 2000 of the U.S. Department of Energy)

Although LDC-conducted transportation service is similar to that in Japan in that charges are basically set in "Cost of Service basis," it is not a "forward-looking"[10] transportation service charge that takes into account such factors as future improvements in managerial efficiency.

Note that Japan's transportation system, which targets large-volume consumers, calculates imbalance by the hour, while imbalance (the difference between the volume consumed at demand side and the actual amount of gas supplied) is often determined on a daily basis and settled on a monthly basis in the states surveyed in this study. In general, the unit price of penalty charges imposed according to the level of imbalance varies. Note also that imbalance may be estimated from the daily anticipated load and gas transported, which in turn are estimated based on factors including past gas consumption and atmospheric temperature, in the case of small-volume demand such as that of residential and small-scale commercial-use consumers.

[10] Factors to be considered in forward-looking costs (fair expenses in the future) include past actual expenses, the likelihood of success in managerial efficiency improvement, expected demand, and expected macroeconomic indicators.

Fig-Table 8: Balancing Concept in Consignment[11]

Balancing and settlement for imbalance adjustment method
• Balancing is requested on a daily basis and settled on a monthly basis. • Note that gas consumption is estimated using formulas based on past gas-consumption patterns and actual consumption on specific days in the case of small-scale commercial/industrial-use consumers. These estimates are used as the basis for imbalance calculations (States of New Jersey, Pennsylvania, Massachusetts, Ohio, Illinois, and Indiana).
• In the case of MichCon and Consumers Energy, a marketer is requested to make deliveries every day in equal amounts 1/365 of the annual gas consumption (estimated consumption) by that customer. The tolerance on the deviation level is 10% of actual demand. Settlement is made on an annual basis (State of Michigan)
• The balancing issue is settled through individual negotiations between LDC and the marketer (State of Texas).

(Source: Prepared from various materials)

States and LDCs are establishing systems and strategies for public-interest-related challenges such as "Supply Reliability," "Provider of Last Resort (POLR)," "Stranded Cost," "Consumer Protections such as for Low-Income and Elderly Consumers" in pushing ahead with liberalization. Among such efforts, how the LDC-committed interstate pipeline capacity and underground-storage-system capacity are to be maintained by LDCs or assigned to marketers has become important in terms of securing "Supply Reliability" in winter demand period, and enabling LDCs to recover "Stranded Cost."

Some states voluntarily or forcedly assign LDC interstate pipeline-capacity to marketers, rather than the marketers securing the interstate pipeline capacity on their own, thus allowing these states to secure gas-supply reliability and prevent LDC-committed interstate pipeline capacity costs from becoming stranded costs as a result of breakaway demand.

11 The balancing concept shown in Fig-Table 8 is targeted primarily at "small-scale consumers," including small-volume commercial- and industrial-use consumers, and does not necessarily cover consignment cases targeted for home-use demand.

Fig-Table 9: Concept of Security for Public-Interest-Related Challenges (Examples of States Surveyed)

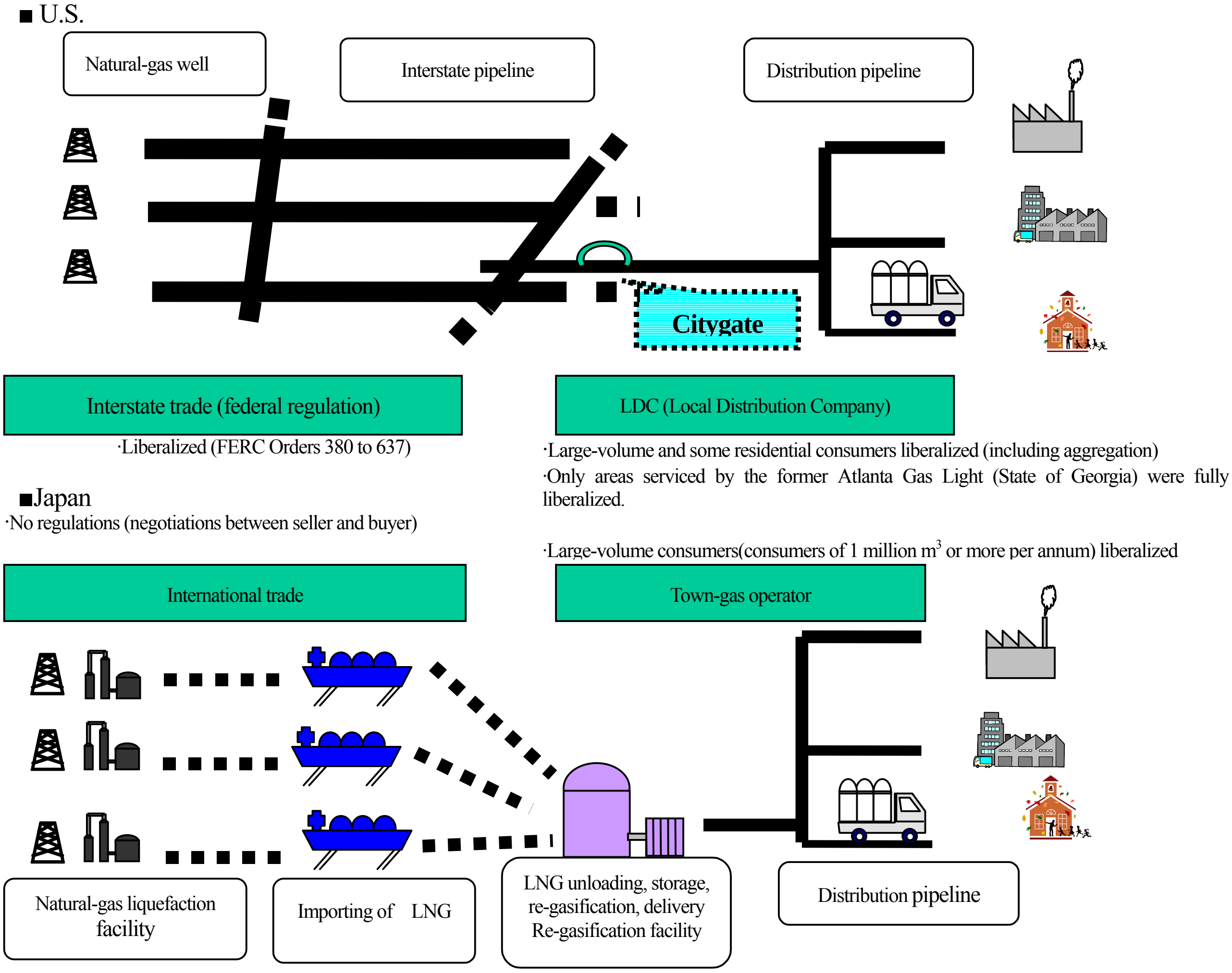
Item	Outline
Supply reliability	• LDCs have established criteria (e.g., a gas storage level) for marketers to address peak demand (States of New Jersey, Pennsylvania, and Ohio). • Marketers supply an amount equivalent to 1/365 of the annual load every day, while LDCs stock supplied gas in underground storage until the high-demand winter season sets in (State of Michigan). • LDCs mandatorily assign an interstate pipeline capacity to marketers in order to guarantee supply during peak demand (State of Massachusetts).
Provider of Last Resort (POLR)	• It is expected to become possible in the near future to make an application to the state regulatory authority for an entity other than existing LDCs to be the provider of last resort (State of Pennsylvania). • Existing LDCs play the role of provider of last resort (States other than Pennsylvania).
Stranded cost	• It is granted by the state regulatory authority that the interstate pipeline capacity cost can be primarily recovered as a stranded cost (States of New Jersey, Pennsylvania, Ohio, Colorado, Illinois, and Oklahoma). • There are no rules regarding stranded-cost recovery (States of Massachusetts, Indiana, Michigan, and Texas).
Consumer protections such as for low-income and elderly consumers	• There are rules regarding delaying supply discontinuing and payments for elderly and low-income consumers (States of Ohio, Oklahoma, Texas, and Illinois). • A fund, discount rates, and a system in which gas service is provided with the payment of a fixed percentage of income are available for those with low income (States of New Jersey, Pennsylvania, Massachusetts, Ohio, and Michigan).
Economic incentives for pipeline investment	• No states explicitly adopt the subsidy system. This is due to the fact that LDC pipeline investment can be recovered through transportation charges and the like even after liberalization.
Hedging against procured natural-gas price volatility	• It is granted by the state regulatory authority that LDCs hedge risks associated with natural-gas price volatility through financial derivatives (States of New Jersey, Pennsylvania, and Michigan). • LDCs are considering hedging prices through financial derivatives (States of Massachusetts, Ohio, Indiana, and Illinois).

(Source: Prepared from various materials)

(2) Considerations in expanding the scope of liberalization in Japan

The LDC-committed interstate pipeline capacity cost is often taken up first as a stranded cost for LDCs in the U.S. It is conceivable that consumer response facilities (e.g., call centers) and human assets, which are considered stranded costs in anticipation of the future increase in breakaway demand, are perceived but not explicitly addressed. If we look at stranded costs in Japan from the same viewpoint as in the U.S., these costs correspond to contracts such as LNG purchase contracts concluded natural-gas wholesale-supply contracts, prior to expansion of the scope of liberalization, as well as wholesale transportation contracts concluded in the future. Future challenges will likely include appropriately evaluating the stranded costs of these contracts arising from breakaway demand, and taking recouping necessary measures for recovering such costs in consideration of operators' (=utilities') managerial efforts.

Fig-Table 10: Comparison of the Gas Supply System between the U.S. and Japan



(source : Prepared by the Institute of Energy Economics, Japan)

In many of the states focused by this study, imbalance is determined on a daily basis and settled on a monthly basis. In Japan, however, if we assume that liberalization will be expanded to residential consumers, various issues will need to be addressed, such as questions of whether to provide a separate balancing menu in addition to the balancing (demand adjustment) by the hour demanded of the current transportation system, how to meter gas on the demand side during transportation, and how to identify imbalance. More specifically, it must be decided whether imbalance determination should be based on actual measurement using an hourly or daily meter, or whether the estimated load, derived from past gas-consumption data and the atmospheric temperature, should be used.

Finally, Japan is headed in the direction in which the "borders between energy industries" will be removed as a result of amendment of the Electric and Gas Utility Industry Laws, with a view toward expanding the scope of liberalization. At the same time, questions have been raised regarding what is truly "fair competition" between electric, gas, and oil industries. In the future, issues such as mutual market entries patterns[12], operation permits, operators-borne taxes, and obligations of stockpiling[13] will be subjects of debate.

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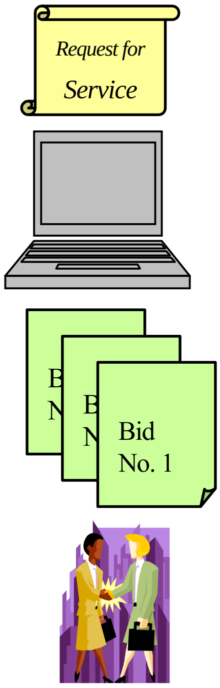
[12] For example, the main focus will be whether a firm should enter a new industry through as it is or as the form of its subsidiary, and how to handle assets divertible for entry into another operation (common assets). The approval conditions (February 2002) used by the Ministry of Economy, Trade, and Industry, applied when electric utilities enter Class-1 Telecommunications Industries, will serve as a reference.

[13] It has previously been pointed out by other industries at the time of the easing of large-volume supply requirements in town-gas operation that "fairness," associated with the presence/absence of obligations to bear oil taxes per heat quantity of oil and natural gas and stockpiling obligations, was detrimental to fair competition.

(3) LNG terminals' TPA in Europe and the U.S.

In the United States, LNG terminals' TPA is carried out in accordance with regulations, as in the case of interstate pipelines based on FERC Order 636, and LNG terminals' capacity is assigned to entrants (shippers) through bidding (open season).

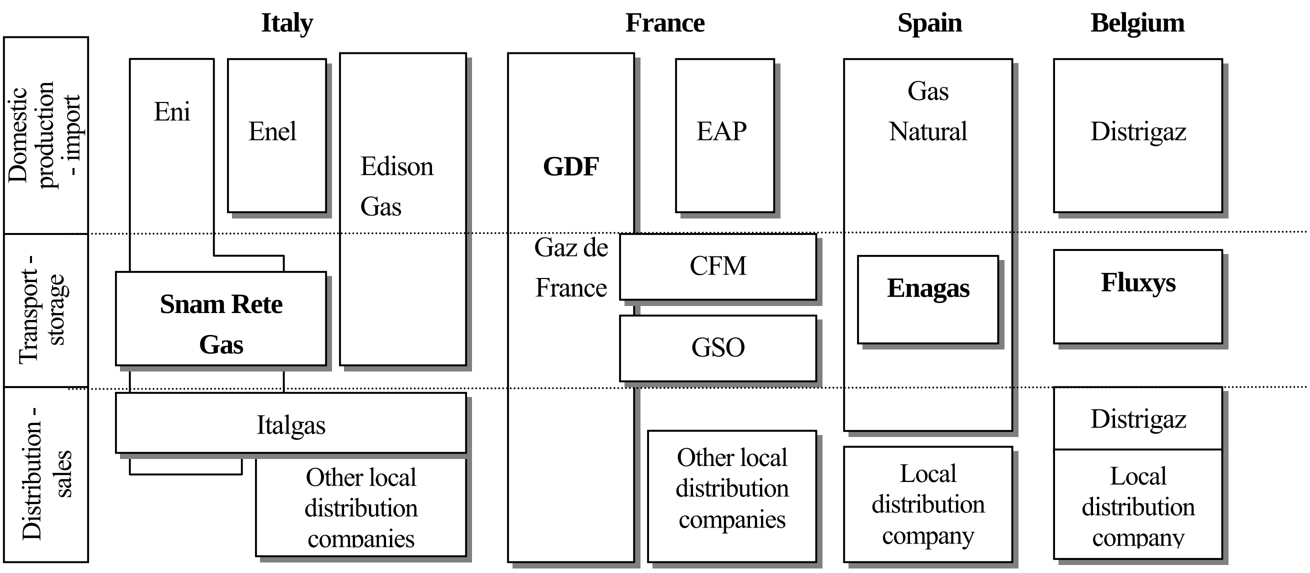
Fig-Table 11: Outline of Open Season



1. Request to use terminal from potential shipper
2. LNG terminal operator announces on its electronic bulletin board that it will hold an open season. Information such as the terminal specs, the services provided, and the available capacity will be shown.
3. Parties wishing to use the terminal bid to obtain the terminal usage right. The net present value (NPV) is calculated based on the shippers' desired LNG import volume, the usage charge, and the contract period. In addition to NPV, factors such as the likelihood of the conclusion of a contract for LNG imports are considered to determine the final successful bidder.
4. A service contract is concluded between the successful bidder and the terminal operator.

In Europe, on the other hand, Spain and Italy established their regulated TPAs (hereinafter referred to as "R-TPA") in 1997 and 2001, respectively, based on EU Gas Directive, as in the case of the U.S. Belgium is in a stage of transition from Negotiated TPA (TPA based on negotiations between operators) to R-TPA as a result of amendment of its federal gas law in July 2001, while the TPA system was established voluntarily in August of 2000 by the operator (Gaz de France) in France.

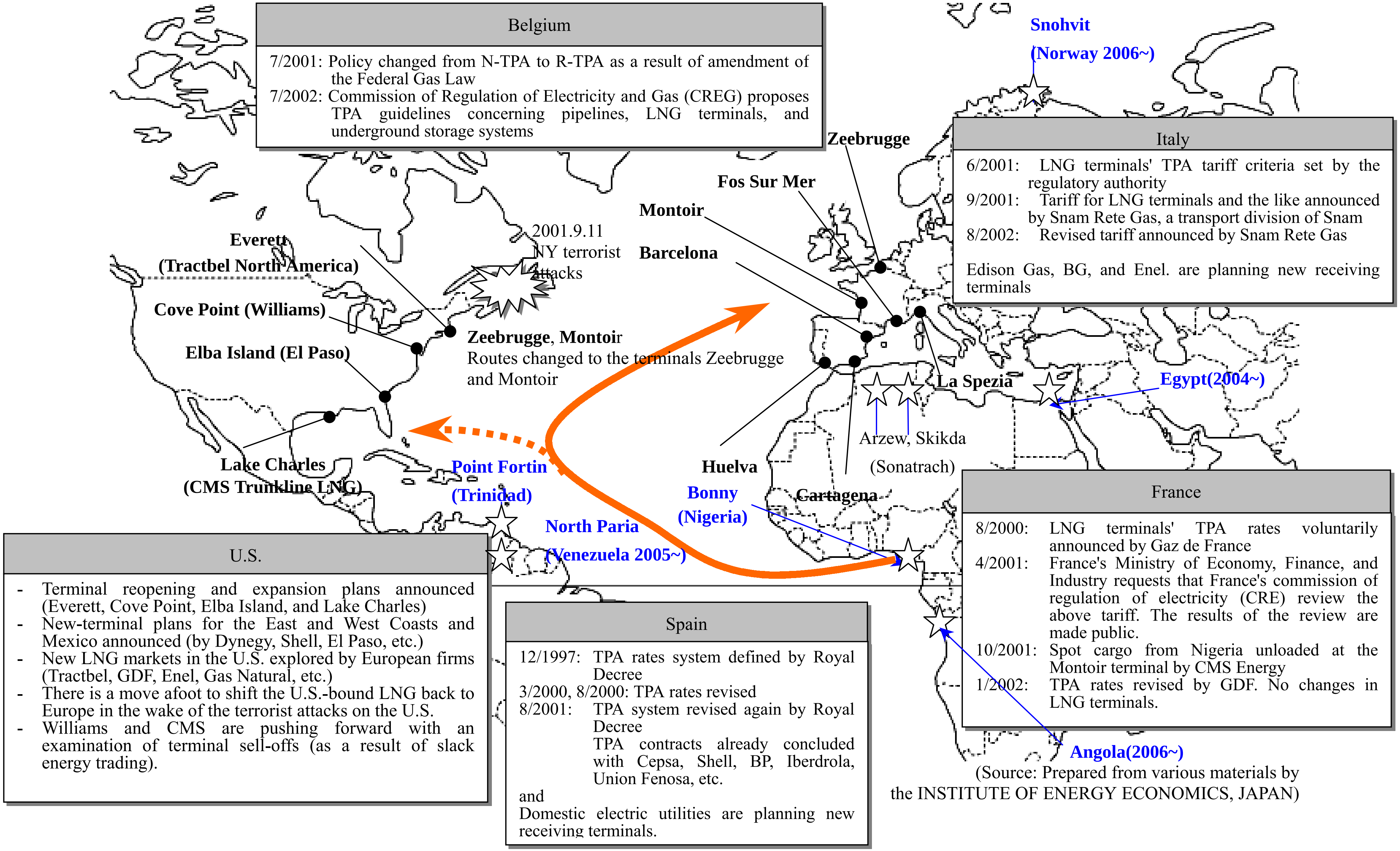
Fig-Table 12: Outline of the Gas Operation Structure in European Countries Surveyed



Note: EAP of France is a subsidiary of TotalFinalElf, while CFM and GSO are firms jointly financed by GDF and TotalFinalElf.

(Source: Prepared from IEA, Energy Policies in OECD countries, and other sources)

Fig-Table 13: Recent Developments in LNG Terminals in Europe and the U.S. (Outline for 2000 and beyond)



Belgium

7/2001: Policy changed from N-TPA to R-TPA as a result of amendment of the Federal Gas Law
7/2002: Commission of Regulation of Electricity and Gas (CREG) proposes TPA guidelines concerning pipelines, LNG terminals, and underground storage systems

Italy

6/2001: LNG terminals' TPA tariff criteria set by the regulatory authority
9/2001: Tariff for LNG terminals and the like announced by Snam Rete Gas, a transport division of Snam
8/2002: Revised tariff announced by Snam Rete Gas

Edison Gas, BG, and Enel. are planning new receiving terminals

France

8/2000: LNG terminals' TPA rates voluntarily announced by Gaz de France
4/2001: France's Ministry of Economy, Finance, and Industry requests that France's commission of regulation of electricity (CRE) review the above tariff. The results of the review are made public.
10/2001: Spot cargo from Nigeria unloaded at the Montoir terminal by CMS Energy
1/2002: TPA rates revised by GDF. No changes in LNG terminals.

U.S.

- Terminal reopening and expansion plans announced (Everett, Cove Point, Elba Island, and Lake Charles)
- New-terminal plans for the East and West Coasts and Mexico announced (by Dynegy, Shell, El Paso, etc.)
- New LNG markets in the U.S. explored by European firms (Tractbel, GDF, Enel, Gas Natural, etc.)
- There is a move afoot to shift the U.S.-bound LNG back to Europe in the wake of the terrorist attacks on the U.S.
- Williams and CMS are pushing forward with an examination of terminal sell-offs (as a result of slack energy trading).

Spain

12/1997: TPA rates system defined by Royal Decree
3/2000, 8/2000: TPA rates revised
8/2001: TPA system revised again by Royal Decree
TPA contracts already concluded with Cepsa, Shell, BP, Iberdrola, Union Fenosa, etc.
and
Domestic electric utilities are planning new receiving terminals.

(Source: Prepared from various materials by the INSTITUTE OF ENERGY ECONOMICS, JAPAN)

Fig-Table 14: Outline of LNG Terminals' TPA

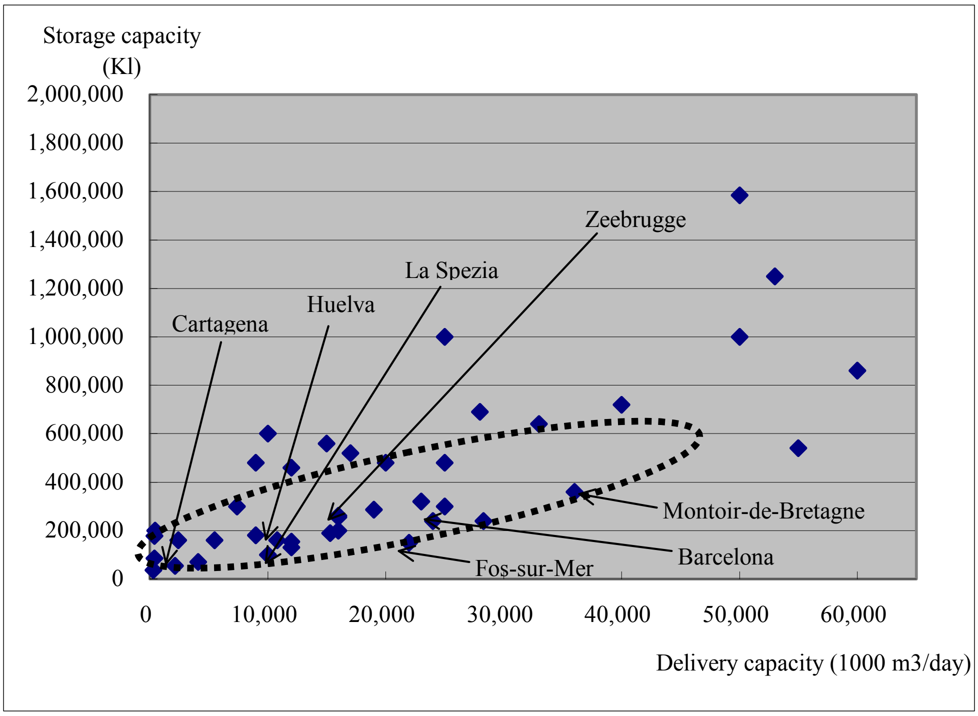
Nation (terminal owner)	Entity implementing TPA	Remarks
France Gaz de France	None	Entities wishing to implement TPA can use the terminal on a first-come, first-served basis if it has reserve capacity.
Belgium Fluxys	None	Entities wishing to implement TPA can use the terminal on a first-come, first-served basis if it has reserve capacity. Fluxys is currently holding consultations with potential terminal users.
Spain Enagas	Shell, CEPSA BP, Iberdrola	Entities wishing to implement TPA can use the terminal on a first-come, first-served basis if it has reserve capacity. Imported LNG is used for CCGT power plants, gas operators, and the like.
Italy Snam Rete Gas	Enel, Eni Gas & Power, Edison Gas	As for long-term contracts, terminal capacity is assigned in accordance with the contracted LNG volume. Acceptance of spot LNG is basically on a first-come, first-served basis.
U.S. Tractbel Williams El Paso CMS Energy	Duke Energy CMS Energy Coral Energy Mirant Tractbel El Paso	TPA is not implemented at Everett terminal (closed operation). Users are determined through a bidding system referred to as "open season," as in the case of interstate pipelines. Elba Island Terminal (El Paso) sold its upgrading-generated additional capacity through "open season," with the winning bid made by Shell Gras & Power (30 years from 2005). As for Lake Charles Terminal, the current residual capacity and additional one made through upgrading will be committed by BG (British Gas Group) for 22 years from 2002.

(Source: Prepared from various materials)

LNG terminals in Europe and the U.S. generally offer a higher re-gasified gas delivery capacity relative to the LNG storage capacity than those in Japan, thus providing a higher apparent functions utilization factor. Note, however, that this is likely due to the fact that the demand-adjustment and stockpiling features are rarely requested for LNG storage tanks, unlike those in Japan, due to the availability of the underground storage system.

Fig-Table 15: Delivery and Storage Capacities of the World's Major LNG Receiving Terminals

Note: Sodegaura terminal excluded



(Source: Prepared from the World LNG/GTL Review 2001-2002 by Zeus Development Corp.)

Fig-Table 16: Delivery and Storage Capacities of the World's Major LNG Receiving Terminals (Numerical Data)

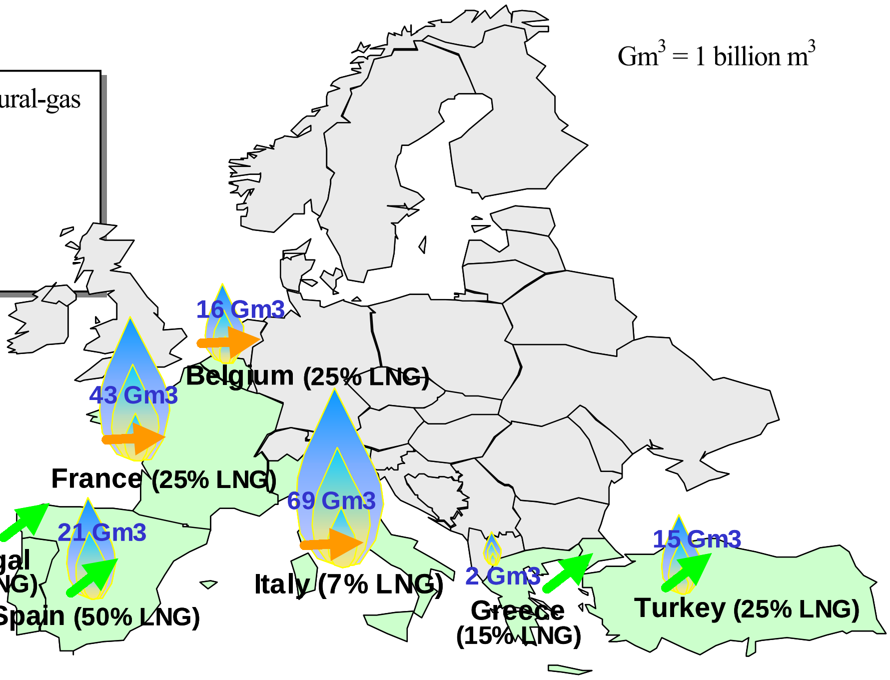
Receiving terminal	Delivery capacity (1000 m^3/day)	Storage capacity (Kl)
Nihonkai LNG Higashi Niigata LNG Terminal	40,000	720,000
Tokyo Electric Futtsu LNG Terminal	60,000	860,000
Tokyo Electric Tokyo Gas Sodegaura LNG Terminal	110,000	2,660,000
Tokyo Electric Higashi Ogijima LNG Terminal	55,000	540,000
Tokyo Electric Ogijima LNG Terminal	10,000	600,000
Tokyo Electric Tokyo Gas Negishi Plant	53,000	1,250,000
Shimizu LNG Shimizu LNG Terminal	400	177,200
Chubu Electric Toho Gas Chita LNG Joint Terminal	25,000	300,000
Chita LNG Chita LNG Terminal	33,000	640,000
Chubu Electric Yokkaichi LNG Center	23,000	320,000
Toho Gas Yokkaichi Plant	2,400	160,000
Chubu Electric Kawagoe LNG Terminal	20,000	480,000
Osaka Gas Senboku No. 1 LNG Terminal	9,000	180,000
Osaka Gas Senboku No. 2 LNG Terminal	50,000	1,585,000
Osaka Gas Himeji Manufacturing Plant	15,000	560,000
Kansai Electric Himeji LNG Control Station	17,000	520,000
Hiroshima Gas Hatsukaichi LNG Terminal	400	85,000
Chugoku Electric Yanai LNG Terminal	9,000	480,000
Oita LNG Oita LNG Terminal	12,000	460,000
Kitakushu LNG Toita LNG Terminal	25,000	480,000
Seibu Gas Fukuhoku LNG Terminal	4,100	70,000
Nihon Gas Kagoshima LNG Plant	300	36,000
Toho Gas Chita Midorihama Plant	16,000	200,000
Everett Massachusetts	12,000	154,000
Cove Point Maryland	28,300	240,000
Elba Island Gerogia	15,290	189,000
Lake Charles Louisiana	19,000	286,200
Eco Electrica Terminal , Penuelas/Puerto Rico	5,500	160,000
Montoir-de-Bretagne	36,000	360,000
Fos-sur-Mer	22,000	150,000
La Spezia	10,000	100,000
Barcelona	24,000	240,000
Huelva	10,800	160,000
Cartagena	2,136	55,000
Bilbao	7,400	300,000
Sines	450	200,000
Zeebrugge	16,000	261,000
Marmara Ereglisi	16,000	255,000
Revithousa	12,000	130,000
Pyeong Taek	50,000	1,000,000
Inchon	25,000	1,000,000
Yung An, Kaohsiung	28,000	690,000

(Source: Prepared from the World LNG/GTL Review 2001-2002 by Zeus Development Corp.)

LNG accounts for only a several-percent share of the natural-gas supply in both Europe and the U.S. However, its demand is expected to increase substantially in the future, with power generation as the primary application, and as a result the building of many terminals is planned. In relation to new LNG terminals, Italy has set a higher rate of return for such terminals than for existing ones to enhance economic incentive for investment.

Fig-Table 17: Position of LNG in Europe (Year 2000 Data) and New-Terminal Construction Plans

LNG accounts for 8% of natural-gas demand.
<Breakdown>
Algeria (77%), Nigeria (15%)
Libya (2%), Trinidad (2%)
Middle East (3%)



Projects	Country	Participants
Le Verdon	France	TFE
Fos sur Mer 2	France	GdF
Sines	Portugal	Transgas
Bilbao (under construction)	Spain	BP, Repsol, Iberdrola, EVE
El Ferrol	Spain	Sonatrach, Union Fenosa
Sagunto (Valencia)	Spain	Union Fenosa
Marina di Rovigo	Italy (offshore Adriatic)	Edison, Exxon Mobil
Brindisi	Italy	BG Group
Izmir	Turkey	Private companies
Offshore Izmir	Turkey	
Iskenderun	Turkey	Botas

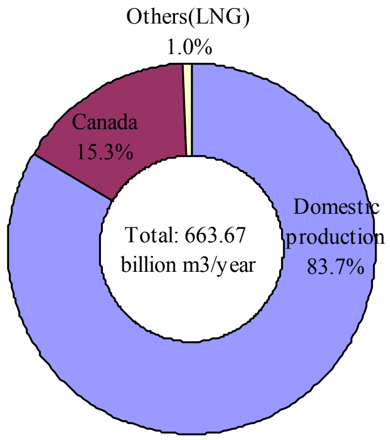
Note: Other than the above, ENEL, an electric utility, is planning the construction of receiving terminals in Italy.
(Source: Sylvie Comot-Gandolphe, "LNG Recent Development in Europe" IEA)

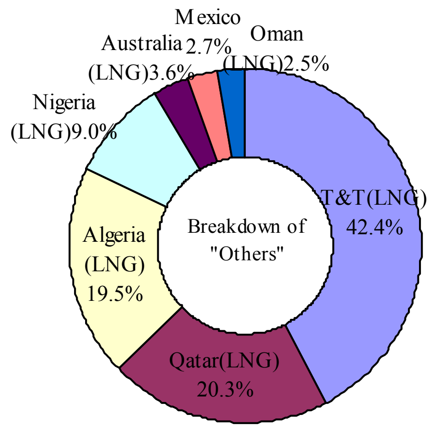
Fig-Table 18: Estimated LNG Demand in Europe (Unit:Million t)

Country	Demand in 2000	Estimated demand in 2010	Annual average growth %
France	9.3	10 to 12	0.7 to 2.6
Belgium	3.1	3 to 3.5	-0.3 to 1.2
Spain	6.3	11 to 13	5.7 to 7.5
Italy	2.9	5 to 6	5.6 to 7.5

(Source: Cedigaz, World LNG Outlook 1999)

Fig-Table 19: Natural-Gas Production and Imports in the U.S. and Breakdown of LNG Imports (2000)





Natural gas was imported from Mexico through pipelines.
(Source: IEA Energy Balance of OECD Countries)

Note: LNG demand in the U.S. was approximately 4.9 million tons in 2000, and is expected to increase approximately fourfold, to 16.8 million tons, in 2010, according to the U.S Department of Energy's EIA forecast[14].

(Source: IEA Energy Balance of OECD Countries)

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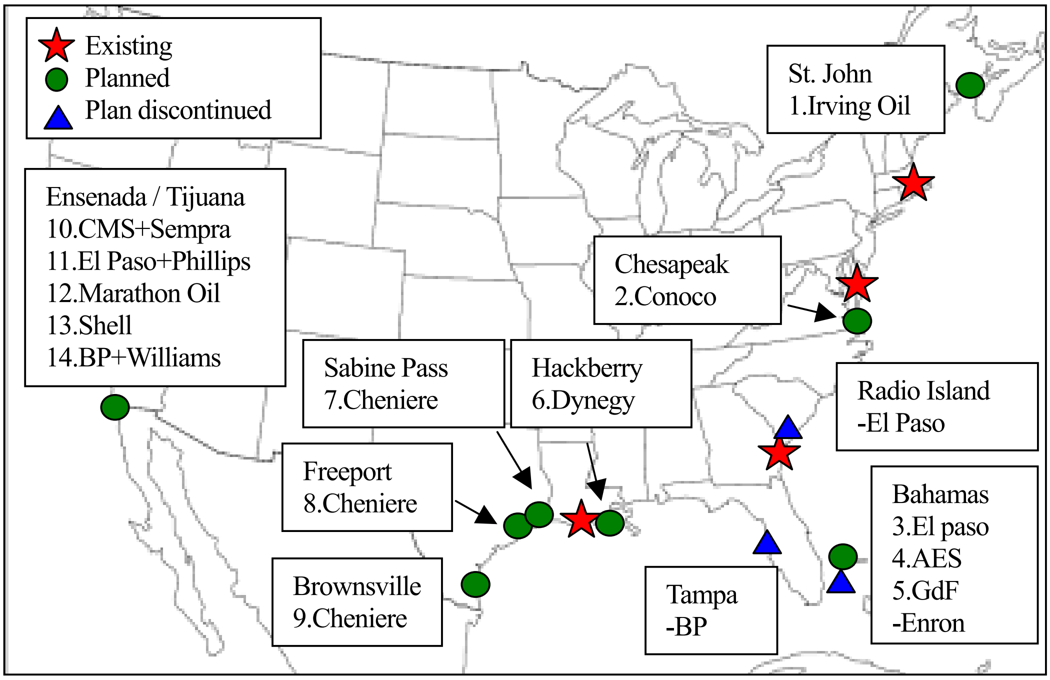
[14] EIA Annual Energy Outlook 2002 (AEO2002) reference case, U.S. Natural-Gas Markets: Mid-Term Prospects for Natural-Gas Supply Dec. 2001

Fig-Table 20: LNG-Receiving-Terminal Construction Plans



	Capacity: MMcf/d
1	500
2	275
3	500
4	550
5	N.A.
6	750
7	1,000
8	1,000
9	1,000
10	1,000
11	680
12	750
13	1,300
14	N.A.

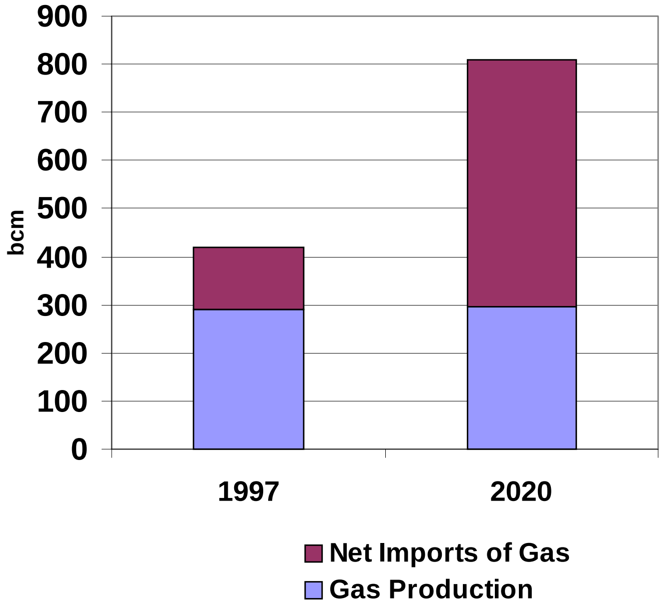
Note: In addition to the above, Belgium's Tractbel(owner of the Everett Terminal)is planning the construction of a receiving terminal in Lazaro Cardenas Port, in western Mexico. There is also a plan to construct a 475-bcf/year terminal in the Altamira region of eastern Mexico by El Paso and Shell.
(Source: Prepared from various materials)

Except for in Spain, establishment of the LNG terminals' TPA systems in Europe began in around 2000, and these systems are therefore in the early stages of introduction. To determine whether the LNG terminals' TPA system is actually useful at the time of access to the gas market of the country concerned by a new entrant (shipper), it is necessary to comprehensively evaluate factors such as access to the underground storage system[15], as required for demand adjustment and calculation of the pipeline utilization charge.

Although gas trading with liquidity (spot trading or resale) can be considered one of the factors in the invigoration of LNG terminals' TPA, European operators are aware of the importance of upgrading the natural-gas infrastructure in preparation for the future increase in demand, and that this requires "operational stability" based on long-term contracts. As a result, attention must be paid to how the EU will go about competitive gas trading, such as through the "shortening of long-term contracts" and the "abolition of the destination clause," while ensuring long-term stable gas supply must also be taken into consideration.

[15] TPA for underground storage systems has been established in Spain and Italy through regulations, unlike in France. In Belgium, it will be established in the future.

Fig-Table 21: Increase in Natural-Gas Import Dependence in Europe



(Source: World Energy Outlook 2000 WEO 2001 "Assessing today's supply to fuel tomorrow's growth")

(4) Considerations regarding Japan's LNG terminals' TPA

In cases in which there are no pipelines running across the country and natural gas markets are separately distributed over urban areas as in Japan, LNG terminals' TPA can be treated as an option for promoting competition if LNG trading with no "destination clause" becomes increasingly common.

Another challenge will be ensuring the scale of minimum consumption (sales scale) required of entrants for access to LNG terminals. For example, such a scale is generally larger[16] than the size of a new PPS power plant, if power-generation demand is premised on the size of the LNG tanker. Further, it is unclear whether TPA, which is intended for supply to newly built PPS power-generation facilities, will move amid the ongoing investment delays in power stations of existing power companies, and the lowering of electricity rates.

Moreover, Japanese less developed underground storage compared with that in Europe and the U.S. requires that LNG storage tanks possess demand-adjustment and stockpiling functions. How storage-tank utilization charges are set in TPA-related negotiations between terminal owners and shippers is likely to become an important factor in the future, in consideration of the differences in the above-mentioned functions[17].

[16] Let us suppose that the LNG tanker is 145,000 m^3 in size. Then, this tanker contains approximately 65,000 tons of LNG. Based on the assumption that the annual availability factor, heat efficiency, and station power use ratio are 80%, 50%, and 2%, respectively, this LNG volume is equivalent to a power station of 70 megawatts.

[17] For example, in France, a tank storage charge is collected according to the LNG volume unloaded per ship arrival, regardless of the frequency of LNG ships' entry into ports per annum. This system drew criticism from France's Commission of Regulation of Electricity (CRE), which claimed that it constituted a cost burden for small-size shippers to carry out TPA and access markets with competitive prices.

Fig-Table 22: Major Pipelines and LNG Terminals in Japan

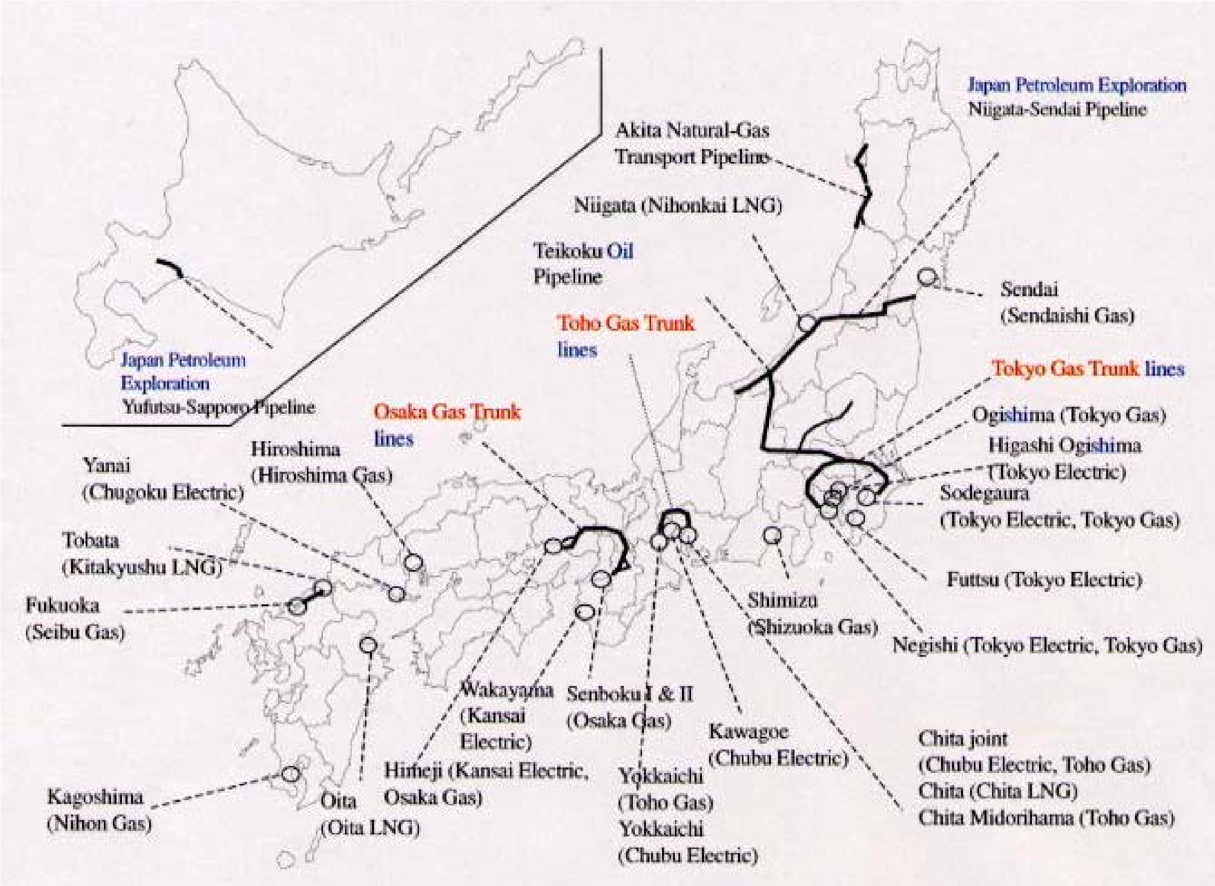


Fig-Table 23: Outline of Underground Storage in Europe and the U.S.

Country	Number of facilities	Possible storage capacity of 100 million m^3 (A)	Annual gas consumption of 100 million m^3 (B)	(A)/(B)%
France	15	108	430	25
Belgium	1	5	160	3
Spain	2	13	210	6
Italy	9	151	690	22
U.S.	415	1,104	5,794	19
Japan	5	12	762	1.6

Note: Storage capacity based on Year 2000 data with working gas basis
Annual consumption determined from Year 2000 data such as BP and Cedigaz statistical data
Plans afoot to upgrade the underground storage capacity in Belgium and Spain
Underground-storage data for Japan quoted from the "Survey on Natural-Gas Storage Systems" of the Information Center for Petroleum Exploration and Production (ICEP)

(Source: Prepared from various materials)

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